Draft Comprehensive Conservation Plan and Environmental Impact Statement

Charles M. Russell National Wildlife Refuge
UL Bend National Wildlife Refuge

Montana

September 2010
Prepared by the U.S. Fish and Wildlife Service

Charles M. Russell National Wildlife Refuge
Airport Road
Lewistown, Montana 59457
406/538 8706
and
Region 6, Mountain-Prairie Region
Division of Refuge Planning
134 Union Boulevard, Suite 300
Lakewood, Colorado 80228
303/236 8145

Abstract

Draft Comprehensive Conservation Plan and Environmental Impact Statement

Charles M. Russell National Wildlife Refuge and *UL Bend National Wildlife Refuge, Montana*

Type of Action: Administrative

Lead Agency: U.S. Fish and Wildlife Service

Responsible Official: Steve Guertin, regional director, region 6, U.S. Fish and Wildlife Service

Abstract: This draft comprehensive conservation plan and environmental impact statement identifies the purpose and need for a management plan, outlines the legal foundation for management of two refuges in Montana, Charles M. Russell National Wildlife Refuge and UL Bend National Wildlife Refuge, and describes and evaluates four alternative plans for managing wildlife, habitat, and wildlife-dependent public use. This process has involved the development of a vision, goals, objectives, and strategies that meet the legal directives of the U.S. Fish and Wildlife Service (Service) and has considered the input of interested groups and the public.

Under the no-action alternative (A), few changes would occur in managing existing wildlife populations and habitat. The habitat regime would be maintained mostly through a fire suppression program with little use of prescribed fire. There would be continued emphasis on big game management, annual livestock grazing, fencing, invasive species control, and water development. Habitats would continue to be managed in 65 units, and residual cover would be measured. Wildlife-dependent public use would occur at current levels, which includes hunting, fishing, and limited interpretation and environmental education programs. About 670 miles of road would remain open. The Service would continue to manage the 20,819-acre UL Bend Wilderness and 155,288 acres of proposed wilderness in the Charles M. Russell National Wildlife Refuge.

Under alternative B's wildlife population emphasis, the Service would manage the landscape in cooperation with partners to emphasize abundant wildlife populations using both (1) natural ecological processes such as fire and wildlife ungulate herbivory (grazing) and (2) responsible synthetic methods such as farming practices or tree planting. Wildlife-dependent public use would be encouraged, but economic uses would be limited when they compete for habitat resources. About 106 miles of road would be closed.

Under alternative C's public use and economic use emphasis, the Service would manage the landscape in cooperation with partners to emphasize and promote maximum levels of compatible, wildlife-dependent public use and economic use. Wildlife populations and habitats would be protected with various management tools that would minimize damaging effects to wildlife and habitats while enhancing and diversifying public and economic opportunities.

Under the Service's proposed action—alternative D's ecological processes emphasis—the Service would work with partners to use natural, dynamic, ecological processes along with active management in a balanced, responsible manner to restore and maintain biological diversity, biological integrity, and environmental health. Once natural processes were restored, more passive approaches would be favored. The Service would provide for quality wildlife-dependent public use and experiences and would limit economic uses when they were injurious to ecological processes. About 23 miles of road would be closed.

Commenting: Comments are due 60 days after the notice of availability of this document is published in the Federal Register. Comments should be mailed to U.S. Fish and Wildlife Service, Attention: Laurie Shannon, Planning Team Leader, Division of Refuge Planning, P.O. Box 25486, Denver, Colorado 80225. In addition, comments can be delivered to 134 Union Boulevard, Lakewood, Colorado 80228. Comments may also be sent by email to cmrplanning@fws.gov. All comments received from the public and interested groups will be placed in the agency's record for this planning process. Comments will be made available for inspection by the public, and copies may also be provided to the public. For further information, contact Laurie Shannon at 303/236 4317.

Cooperating Agencies: U.S. Army Corps of Engineers; Bureau of Land Management; Montana Department of Fish, Wildlife, and Parks; Montana Department of Natural Resources; Fergus, Garfield, McCone, Petroleum, Phillips, and Valley Counties; and Missouri River Council of Conservation Districts (for the previously listed counties).

Contents

Abstract . . . iii
Summary . . . xv
Abbreviations . . . xxviii

CHAPTER 1–Introduction . . . 1

1.1 Purpose and Need for Action . . . 2
Decision to Be Made . . . 2

1.2 The U.S. Fish and Wildlife Service and the Refuge System . . . 3
U.S. Fish and Wildlife Service . . . 3
National Wildlife Refuge System . . . 3

1.3 National and Regional Mandates . . . 5

1.4 Refuge Contributions to National and Regional Plans . . . 5
Fulfilling the Promise . . . 5
Bird Conservation . . . 5
Recovery Plans for Threatened and Endangered Species . . . 6
State Comprehensive Fish and Wildlife Conservation Strategy . . . 6

1.5 Strategic Habitat Conservation . . . 7
Climate Change . . . 7

1.6 Planning Process . . . 8

1.7 Public Involvement . . . 9
Cooperating Agencies . . . 9
Tribal Coordination . . . 11
Involvement of Interested Groups and the Public . . . 11

1.8 Significant Issues to Address . . . 11
Habitat and Wildlife . . . 12
Water Resources . . . 12
Public Use and Access . . . 12
Wilderness . . . 12
Socioeconomics . . . 12
Partnerships and Collaboration . . . 12
Cultural Values, Traditions, and Resources . . . 13

1.9 Issues Not Addressed . . . 13
Enhancement Act . . . 13
Exercise of Private Property Rights for Mineral Extraction . . . 13
Fort Peck Lake Levels . . . 13
Livestock Grazing Fees, Transfer of Grazing Permits, and Animal Unit Months . . . 14
Refuge Revenue-sharing Payments and Payments in Lieu of Taxes . . . 14
Roads under Revised Statute 2477 and Petitioned Roads . . . 14
Military Overflights . . . 15

1.10 Scope of the Document . . . 15
Decision Area . . . 15
Analysis Area . . . 15

CHAPTER 2–Refuge History and Vision . . . 19

2.1 Establishment, Acquisition, and Management History . . . 19
Charles M. Russell National Wildlife Refuge . . . 20
UL Bend National Wildlife Refuge . . . 26
Existing Management . . . 27

2.2 Special Values . . . 28
2.3 Vision . . . 29
2.4 Goals . . . 29
Goal for Habitat and Wildlife Management . . . 30
Goal for Threatened and Endangered Species and Species of Concern . . . 30
Goal for Research and Science . . . 30
Goal for Fire Management . . . 30
Goal for Public Use and Education . . . 30
Goal for Wilderness . . . 30
Goal for Cultural and Paleontological Resources . . . 30
Goal for Refuge Operations and Partnerships . . . 30

CHAPTER 3–Alternatives . . . 31
3.1 Criteria for Alternatives Development . . . 31
3.2 Elements Common to All Alternatives . . . 31
3.3 Structure of the Alternative Descriptions . . . 32
3.4 Summary of Alternative A—No Action . . . 33
Habitat and Wildlife Management, Threatened and Endangered Species and Species of Concern, Research and Science, and Fire Management . . . 33
Public Use and Education . . . 34
Wilderness . . . 34
Cultural and Paleontological Resources . . . 34
Refuge Operations and Partnerships . . . 34
3.5 Summary of Alternative B—Wildlife Population Emphasis . . . 39
Habitat and Wildlife Management, Threatened and Endangered Species and Species of Concern, Research and Science, and Fire Management . . . 39
Public Use and Education . . . 40
Wilderness . . . 45
Cultural and Paleontological Resources . . . 45
Refuge Operations and Partnerships . . . 45
3.6 Summary of Alternative C—Public Use and Economic Use Emphasis . . . 46
Habitat and Wildlife Management, Threatened and Endangered Species and Species of Concern, Research and Science, and Fire Management . . . 46
Public Use and Education . . . 51
Wilderness . . . 52
Cultural and Paleontological Resources . . . 52
Refuge Operations and Partnerships . . . 52
3.7 Summary of Alternative D—Ecological Processes Emphasis (Proposed Action) . . . 52
Habitat and Wildlife Management, Threatened and Endangered Species and Species of Concern, Research and Science, and Fire Management . . . 52
Public Use and Education . . . 58
Wilderness . . . 58
Cultural and Paleontological Resources . . . 59
Refuge Operations and Partnerships . . . 59
3.8 Objectives and Strategies . . . 59
OBJECTIVES for Goals—Habitat and Wildlife Management, Threatened and Endangered Species and Species of Concern, Research and Science, and Fire Management . . . 60
Habitat–Upland . . . 60
Habitat–River Bottom . . . 69
Habitat–Riparian Area and Wetland . . . 72
Habitat–Shoreline . . . 75
Habitat–Fire Management . . . 77
Habitat–Invasive Species . . . 82

Habitat–Climate Change . . . 85
Wildlife–Big Game . . . 86
Wildlife–Furbearers and Small Predators . . . 90
Wildlife–American Bison Restoration . . . 92
Wildlife–Birds . . . 94
Wildlife–Other Wildlife . . . 96
Threatened and Endangered Species and Species of Concern . . . 97
OBJECTIVES for Goal—Public Use and Education . . . 103
Public Use–Hunting . . . 103
Public Use–Fishing . . . 107
Public Use–Wildlife Observation, Photography, and Interpretation . . . 110
Public Use–Environmental Education . . . 114
Public Use–Outreach . . . 116
Public Use–Access . . . 118
Public Use–Recreation Sites . . . 121
Public Use–Commercial Recreation . . . 122
OBJECTIVES for Goal—Wilderness . . . 124
OBJECTIVES for Goal—Cultural and Paleontological Resources . . . 126
Cultural Resources . . . 126
Paleontological Resources . . . 128
OBJECTIVES for Goal—Refuge Operations and Partnerships . . . 129
Refuge Operations . . . 129
Partnerships . . . 131
Research and Science . . . 133
OBJECTIVES for Goal—Research and Science . . . 133

3.9 Foreseeable Activities . . . 134
Federal Land Management . . . 134
State Wildlife Management . . . 135
Nongovernmental Conservation Activities . . . 136
Livestock Grazing Lease Acquisitions . . . 136
Regional Demographic and Economic Changes . . . 136
Infrastructure Development . . . 136

3.10 Elements Considered but Eliminated from Further Consideration . . . 137
Developing Goals for Livestock Grazing and Socioeconomic Uses . . . 137
Eliminating All Livestock Grazing . . . 137
Managing Only for Sharp-tailed Grouse, Pronghorn, and Livestock Grazing . . . 138
Developing a Memorandum of Understanding for Livestock Grazing . . . 138
Opening Roads in Wilderness . . . 138

3.11 Partnerships . . . 139

3.12 Monitoring and Evaluation . . . 139

3.13 Plan Amendment and Revision . . . 140

3.14 Funding and Personnel . . . 140

3.15 Comparison of Alternatives . . . 144

CHAPTER 4–Affected Environment . . . 159

4.1 Topics Not Analyzed Further . . . 159
Moose . . . 159
Black Bear . . . 159

4.2 Physical Environment . . . 160
Climate . . . 160
Air Quality . . . 160
Visual Resources . . . 161
Soundscapes . . . 171

Land Features, Soils, and Geology 172
Water Resources 173

4.3 Biological Resources 176
Disturbance Factors Affecting Major Ecological Processes 177
Uplands 185
River Bottoms 193
Riparian Areas and Wetlands 194
Shoreline 199
Invasive Species 199
Big Game 203
Furbearers and Small Predators 208
American Bison 209
Birds 213
Other Wildlife 213
Threatened and Endangered Species and Species of Concern 215

4.4 Special Management Areas 225
Wilderness 225
Lewis and Clark National Historic Trail 225
Hell Creek and Bug Creek National Natural Landmarks 225
Research Natural Areas 225
Upper Missouri Breaks Wild and Scenic River 226
Missouri River Breaks Back Country Byway 226
Lands Where USACE has Primary Jurisdiction 226
Upper Missouri River Breaks National Monument 226

4.5 Visitor Services 227
Hunting 227
Fishing 228
Wildlife Observation and Photography 229
Interpretation 229
Environmental Education 230
Outreach 230
Access 230
Recreation Sites 232
Commercial Recreation 233
Refuge Headquarters and Field Stations 233

4.6 Human History and Cultural Resources 233
Prehistoric History 233
Historical Period 234
Known Cultural Resources 238
Refuge Resources Important to Tribes 238

4.7 Paleontological Resources 239

4.8 Socioeconomics 239
Regional Economic Setting 240
Population and Demographics 240
Employment and Income 241
Key Refuge Activities that Affect the Local Economy 244
Land Use and Ownership Changes Surrounding the Refuge 250
Attitudes, Values, and Beliefs 252

CHAPTER 5–Environmental Consequences 255

5.1 Analysis Method 255

5.2 Assumptions 256

5.3 Cumulative Impacts 257

5.4 Environmental Consequences for the Physical Environment . . . 257
Effects on Climate Change . . . 257
Effects on Air Quality . . . 258
Effects on Visual Resources . . . 260
Effects on Soundscapes . . . 263
Effects on Soils . . . 264
Effects on Water Resources . . . 266
Cumulative Impacts on the Physical Environment . . . 267

5.5 Environmental Consequences for Biological Resources . . . 267
Effects on Uplands . . . 267
Effects on River Bottoms . . . 272
Effects on Riparian Areas and Wetlands . . . 274
Effects on Shoreline . . . 277
Effects on Big Game . . . 277
Effects on Furbearers and Small Predators . . . 283
Effects on Bison Restoration . . . 284
Effects on Birds . . . 285
Effects on Other Wildlife . . . 288
Effects on Threatened and Endangered Species and Species of Concern . . . 291
Cumulative Impacts on Biological Resources . . . 294

5.6 Environmental Consequences for Visitor Services . . . 295
Effects on Hunting . . . 295
Effects on Fishing . . . 298
Effects on Wildlife Observation and Photography . . . 299
Effects on Environmental Education . . . 301
Effects on Interpretation . . . 302
Effects on Outreach . . . 302
Effects on Access . . . 303
Effects on Recreation Sites . . . 304
Effects on Commercial Recreation . . . 304
Cumulative Impacts on Visitor Services . . . 306

5.7 Environmental Consequences for Special Areas . . . 306
Effects on Special Management Areas . . . 306
Effects on Wilderness . . . 307
Cumulative Impacts on Special Areas . . . 310

5.8 Environmental Consequences for Cultural and Historical Resources . . . 310
Effects Common to All Alternatives . . . 310
Effects of Alternatives B, C, and D . . . 310
Conclusion . . . 310
Mitigation . . . 310
Cumulative Impacts on Cultural and Historical Resources . . . 310

5.9 Environmental Consequences for Paleontological Resources . . . 311
Effects Common to All Alternatives . . . 311
Effects of Alternatives B, C, and D . . . 311
Conclusion . . . 311
Mitigation . . . 311
Cumulative Impacts on Paleontological Resources . . . 311

5.10 Environmental Consequences for the Socioeconomic Environment . . . 312
Method for the Regional Economic Impact Analysis . . . 312
Economic Impacts of Alternative A . . . 313
Economic Impacts of Alternative B . . . 318
Economic Impacts of Alternative C . . . 321
Economic Impacts of Alternative D . . . 324
Impacts on Livestock Permittees . . . 327

Impacts on State Grazing Lands . . . 329
Effects on Environmental Justice . . . 329
Conclusion . . . 329
Mitigation . . . 330
Cumulative Impacts on the Socioeconomic Environment . . . 330

5.11 Irreversible and Irretrievable Resource Commitments . . . 331

5.12 Short-term Uses of the Environment and Maintenance of Long-term Productivity . . . 331

5.13 Adherence to Planning Goals . . . 331
Habitat and Wildlife Management . . . 332
Threatened and Endangered Species and Species of Concern . . . 332
Research and Science . . . 332
Fire Management . . . 333
Public Use and Education . . . 333
Wilderness . . . 333
Cultural and Paleontological Resources . . . 333
Refuge Operations and Partnerships . . . 333

5.14 Unavoidable Adverse Effects . . . 333

5.15 Conflicts with Federal, State, Tribal, and Local Agencies . . . 334

5.16 Comparison of Environmental Consequences . . . 335

Glossary . . . 341

Appendixes
Appendix A–List of Preparers and Contributors . . . 349
Appendix B–Public Involvement Summary . . . 353
Appendix C–Draft Compatibility Determinations . . . 361
Appendix D–Key Legislation and Policy . . . 377
Appendix E–Wilderness Review and Summary . . . 381
Appendix F–List of Plant and Animal Species . . . 395

Bibliography . . . 417

TABLES

1. Planning process summary for the CCP for the Charles M. Russell and UL Bend refuges . . . 10
2. History of significant land authorizations for the Charles M. Russell and UL Bend refuges . . . 20
3. Step-down management plans for the Charles M. Russell and UL Bend refuges . . . 140
4. Costs over 15 years to carry out the CCP alternatives for the Charles M. Russell and UL Bend refuges . . . 141
5. Cost analysis for the CCP alternatives for the Charles M. Russell and UL Bend refuges . . . 141
6. Personnel to carry out the CCP alternatives for the Charles M. Russell and UL Bend refuges . . . 142
7. Comparison of actions for the CCP alternatives for the Charles M. Russell and UL Bend refuges . . . 145
8. Average daily discharge and peak flows for six USGS water stations on or near the Charles M. Russell and UL Bend refuges . . . 174
9. Historical fire data for the Charles M. Russell and UL Bend refuges . . . 189
10. Comparison of riparian health of 82 streams across the Charles M. Russell National Wildlife Refuge . . . 198
11. Acreage of treated weeds at the Charles M. Russell and UL Bend refuges . . . 199
12. MFWP's elk population objectives, estimates, and needed herd-size reductions for hunting districts covering the Charles M. Russell and UL Bend refuges . . . 203
13. Bird species of concern on the Charles M. Russell and UL Bend refuges . . . 212
14. Least tern nest success at Fort Peck Lake . . . 217
15. History of stocking pallid sturgeon in the Middle Missouri River, Montana . . . 218
16. Piping plover nest success at Fort Peck Lake . . . 218

17. Population estimates for the Nation and the counties surrounding the Charles M. Russell and UL Bend refuges . . . 242
18. Employment by type for Montana and the counties surrounding the Charles M. Russell and UL Bend refuges 243
19. Employment by industry for the counties surrounding the Charles M. Russell and UL Bend refuges 244
20. Income, earnings, and unemployment for the nation, Montana, and counties surrounding the Charles M. Russell and UL Bend refuges 245
21. Farm operators whose primary employment is farming in Montana and the counties surrounding the Charles M. Russell and UL Bend refuges 246
22. Animal inventory and AUMs of feed needed for the counties surrounding the Charles M. Russell and UL Bend refuges 248
23. Total AUMs for the counties surrounding the Charles M. Russell and UL Bend refuges. 249
24. Seasonal housing in the counties surrounding the Charles M. Russell and UL Bend refuges. 251
25. Wildlife value orientations and proportions in western States and Montana 252
26. Comparison of access, visitation, and facilities between the CCP alternatives for the Charles M. Russell and UL Bend refuges. 295
27. Wilderness protection under the CCP alternatives for the Charles M. Russell and UL Bend refuges 307
28. Full fee-simple acquisition acreage and refuge revenue-sharing payments for the Charles M. Russell and UL Bend refuges. 313
29. Annual economic impacts from refuge revenue-sharing payments by the Charles M. Russell and UL Bend refuges for CCP alternative A 313
30. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative A 314
31. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative A 314
32. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative A 315
33. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative A. 316
34. Grazing permits and AUMs for the Charles M. Russell and UL Bend refuges. 316
35. Economic impact of grazing on the Charles M. Russell and UL Bend refuges. 317
36. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative A. 317
37. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative B 318
38. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative B 318
39. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative B 319
40. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative B 320
41. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative B. 320
42. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative B compared with CCP alternative A 321
43. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative C 321
44. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative C 322
45. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative C 322
46. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative C. 323
47. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative C. 324
48. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative C compared with CCP alternative A 326

49. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative D 325
50. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative D 325
51. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative D. 326
52. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative D. 327
53. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative D compared with CCP alternative A 327
54. Acres of grazing lands available under the CCP alternatives for the Charles M. Russell and UL Bend refuges. 328
55. Ratings for how well the actions in the CCP alternatives meet the goals for the Charles M. Russell and UL Bend refuges 332
56. Summary of the environmental consequences for actions of the CCP alternatives for the Charles M. Russell and UL Bend refuges. 336

Appendix Tables

A. Original 13 proposed wilderness units for the Charles M. Russell and UL Bend refuges 381
B. Current proposed wilderness units for the Charles M. Russell and UL Bend refuges 382
C. Evaluation of how well the current proposed wilderness units for the Charles M. Russell and UL Bend refuges meet wilderness criteria 386
D. Additions to proposed wilderness units at the Charles M. Russell and UL Bend refuges under CCP alternative B 388
E. Reductions to proposed wilderness units at the Charles M. Russell and UL Bend refuges under CCP alternative C 388
F. Reductions and additions to proposed wilderness units at the Charles M. Russell and UL Bend refuges under CCP alternative D. 389
G. Areas excluded from consideration for wilderness designation at the Charles M. Russell and UL Bend refuges 390

FIGURES

1. Vicinity map for the Charles M. Russell and UL Bend refuges 1
2. Map of the bird conservation regions in North America. 6
3. Map of the Plains and Prairie Potholes Geographic Area 8
4. The process for comprehensive conservation planning and environmental analysis 9
5. Map of the decision and analysis areas for the Charles M. Russell and UL Bend refuges 17
6. Topographic base map of the Charles M. Russell and UL Bend refuges 22
7. Map of management under CCP alternative A for the Charles M. Russell and UL Bend refuges 36
8. Map of management under CCP alternative B for the Charles M. Russell and UL Bend refuges 42
9. Map of management under CCP alternative C for the Charles M. Russell and UL Bend refuges 48
10. Map of management under CCP alternative D for the Charles M. Russell and UL Bend refuges 54
11. Adaptive management process. 139
12. Map of potential visibility of roads at 1 mile along the Charles M. Russell and UL Bend refuges 162
13. Map of potential visibility of roads at 3 miles along the Charles M. Russell and UL Bend refuges 163
14. Chart of the number of road segments visible across the Charles M. Russell and UL Bend refuges and from proposed wilderness units. 163
15. Map of water and geographic features in the Charles M. Russell and UL Bend refuges 166
16. Map of habitat units (grazing) in the Charles M. Russell and UL Bend refuges 168

17. Map of habitat types for the Charles M. Russell and UL Bend refuges 180
18. Map of fire frequency for the Charles M. Russell and UL Bend refuges 182
19. Graph of residual cover after grazing in the East Indian Butte Habitat Unit of the Charles M. Russell National Wildlife Refuge 192
20. Map of river bottoms in need of restoration at the Charles M. Russell and UL Bend refuges 193
21. Map of Riparian and Wetland Research Program survey locations at the Charles M. Russell and UL Bend refuges 197
22. Map of invasive species occurrence at the Charles M. Russell and UL Bend refuges 201
23. Chart of mule deer densities within six counties covering the Charles M. Russell and UL Bend refuges 204
24. Map of the aerial survey blocks for mule deer and elk at the Charles M. Russell and UL Bend refuges 205
25. Chart of the ratios of adult bucks to does within the six counties covering the Charles M. Russell and UL Bend refuges 205
26. Chart of the number of mule deer harvested in hunting districts on and adjacent to the Charles M. Russell and UL Bend refuges 206
27. Map of the aerial bighorn sheep survey at the Charles M. Russell National Wildlife Refuge 207
28. Map of areas within 328 yards (300 meters) of escape cover for bighorn sheep at and around the Charles M. Russell and UL Bend refuges 208
29. Map of lek locations for sharp-tailed grouse on the Charles M. Russell and UL Bend refuges. 210
30. Chart of survey results for the listening route for sharp-tailed grouse on the Charles M. Russell and UL Bend refuges 211
31. Graph of data for the black-footed ferret population at the UL Bend National Wildlife Refuge 216
32. Map of critical habitat for piping plover at Fort Peck Reservoir 219
33. Map of the maximum extent of black-tailed prairie dogs at the Charles M. Russell and UL Bend refuges 221
34. Map of lek locations for greater sage-grouse on and near the Charles M. Russell and UL Bend refuges 223
35. Map of leopard frog locations on the Charles M. Russell and UL Bend refuges. 224
36. Map of areas in Montana that are valued by hunters and anglers 227
37. Graph of the total employment index for Montana and counties surrounding the Charles M. Russell and UL Bend refuges. 242
38. Chart of agriculture employment in the six counties surrounding the Charles M. Russell and UL Bend refuges 245
39. Chart of trends in gross revenues from agriculture in the area surrounding the Charles M. Russell and UL Bend refuges 246
40. Chart of the breakdown of gross revenues from agriculture for the six counties surrounding the Charles M. Russell and UL Bend refuges 247
41. Chart of the cattle inventory for the six counties surrounding the Charles M. Russell and UL Bend refuges 248
42. Chart of animal unit months by agency for the six counties surrounding the Charles M. Russell and UL Bend refuges 249
43. Chart of the visibility of roads from proposed wilderness units in the Charles M. Russell and UL Bend refuges by CCP alternative 240
44. Chart of the visibility of roads refugewide by CCP alternative for the Charles M. Russell and UL Bend refuges 241
45. Graph of the proportion of the Charles M. Russell and UL Bend refuges within the corresponding travel time of the nearest road, by CCP alternative 304
46. Graph of the proportion of the Charles M. Russell and UL Bend refuges to the nearest road at 30 minutes 305
47. Map of accessibility by foot to the Charles M. Russell and UL Bend refuges under CCP alternative A. 305

Appendix Figure

A. Map of the wilderness review areas for the Charles M. Russell and UL Bend refuges. 383

Summary

Brett Billings/USFWS

Low clouds hang over the Missouri river on the Charles M. Russell National Wildlife Refuge.

Encompassing nearly 1.1 million acres including Fort Peck Reservoir and the UL Bend National Wildlife Refuge, Charles M. Russell National Wildlife Refuge is one of the largest refuges in the lower 48 States. This refuge in north-central Montana extends west about 125 air miles along the Missouri River from Fort Peck Dam to the refuge's western edge at the boundary of the Upper Missouri River Breaks National Monument. A portion of the Missouri River along the refuge's western boundary is part of Upper Missouri National Wild and Scenic River. This expansive refuge covers portions of six counties: Fergus, Petroleum, Garfield, McCone, Valley, and Phillips.

Refuge habitat includes native prairie, forested coulees, river bottoms, and badlands. Wildlife is as diverse as the topography and includes Rocky Mountain elk, mule deer, white-tailed deer, pronghorn, Rocky Mountain bighorn sheep, sharp-tailed grouse, prairie dogs, and more than 236 species of birds.

More than 250,000 visitors participate in a variety of wildlife-dependent recreational activities every year. In particular, the refuge is renowned for its outstanding hunting opportunities. Other visitors enjoy viewing and photographing wildlife along the refuge's extensive network of roads. The Fort Peck Interpretive Center showcases an aquarium of native and game fish, other wildlife, and several casts of dinosaur fossils including a *Tyrannosaurus rex*. Still others enjoy fishing along the Missouri River or on Fort Peck Reservoir.

The U.S. Fish and Wildlife Service (Service) has developed this draft comprehensive conservation plan and environmental impact statement (draft CCP and EIS) to provide alternatives and identify consequences for the management and use of the Charles M. Russell National Wildlife Refuge and the UL Bend National Wildlife Refuge. The alternatives are the result of extensive public input and working closely with several cooperating agencies: U.S. Army Corps of Engineers; Bureau of Land Management; Montana Department of Fish, Wildlife, and Parks (MFWP); Montana Department of Natural Resources and Conservation; counties of Fergus, Petroleum, Garfield, McCone, Valley, and Phillips; and Missouri River Conservation Districts Council. Other tribal governments, governmental agencies, nongovernmental organizations, businesses, and private citizens contributed substantial input to the plan.

Refuge Background

In 1805, Meriwether Lewis and William Clark first detailed accounts of the abundant wildlife resources they found in the area now known as Charles M. Russell National Wildlife Refuge (Moulton 2002). One hundred-thirty years later, Olaus J. Murie, a renowned wildlife biologist for the U.S. Biological Survey, made the first biological assessment of plant and wildlife species for the proposed Fort Peck Migratory Bird Refuge (Murie 1935).

The refuge was established in 1936 as the Fort Peck Game Range for sustaining large numbers of sharp-tailed grouse, pronghorn, and other wildlife. In 1963, it was designated as the Charles M. Russell National Wildlife Range in honor of famous western painter Charlie Russell, and this "range" became a "refuge" in 1976. UL Bend National Wildlife Refuge was established in 1969 and lies within the boundary of Charles M. Russell National Wildlife Refuge; these two Refuge System units are managed cohesively as one refuge. As part of the National Wildlife Refuge System, the refuge is managed for wildlife conservation above all else. UL Bend National Wildlife Refuge contains the 20,819-acre UL Bend Wilderness, and Charles M. Russell National Wildlife Refuge has 15 proposed wilderness units totaling 155,288 acres.

© Cornell Lab of Ornithology

The Bullock's oriole is a "sentinel species" (one of the first to respond to changed conditions) for the refuge's river bottoms.

Purpose and Need for the Plan

The purpose of this draft CCP and EIS is to identify actions necessary to accomplish the purposes of the refuges, identify the role the refuges will play in support of the mission of the National Wildlife Refuge System and to provide long-term guidance for management of refuge programs and activities. The CCP is needed

- to communicate with the public and other partners in efforts to carry out the mission of the National Wildlife Refuge System;
- to provide a clear statement of direction for management of the refuge;
- to provide neighbors, visitors, and government officials with an understanding of the Service's management actions on and around the refuge;
- to ensure that the Service's management actions are consistent with the mandates of the National Wildlife Refuge Improvement Act of 1997;
- to ensure that management of the refuge considers other Federal, State, and county plans;
- to provide a basis for development of budget requests for the operation, maintenance, and capital improvement needs of the refuge.

The Service is committed to sustaining the Nation's fish and wildlife resources together through the combined efforts of governments, businesses, and private citizens.

National Wildlife Refuge System

Like all national wildlife refuges, Charles M. Russell and UL Bend refuges are administered under the National Wildlife Refuge System Administration Act of 1966, as amended in 1997.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Refuge Purposes

Each national wildlife refuge is managed to fulfill the mission of the National Wildlife Refuge System, as well as the specific purposes for which that refuge was established.

The purpose for a national wildlife refuge comes from one or more authorities—law, proclamation, executive order, agreement, or other document—that establish or expand a refuge. In 1936, Charles M. Russell National Wildlife Refuge was established by Executive Order 7509 for the following purpose:

> "That the natural forage resources therein shall be first utilized for the purpose of sustaining in a healthy condition a maximum of four hundred thousand (400,000) sharp-tailed grouse, and one thousand five hundred (1,500) antelope, the primary species, and such nonpredatory secondary species in such numbers as may be necessary to maintain a balanced wildlife population, but in no case shall the consumption of the forage by the combined population of

the wildlife species be allowed to increase the burden of the range dedicated to the primary species: Provided further, That all the forage resources within this range or preserve shall be available, except as herein otherwise provided with respect to wildlife, for domestic livestock ... And provided further, That land within the exterior limits of the area herein described ... may be utilized for public grazing purposes only to the extent as may be determined by the said Secretary (Agriculture) to be compatible with the utilization of said lands for the purposes for which they were acquired."

UL Bend National Wildlife Refuge was established in 1969 "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d, Migratory Bird Conservation Act).

Other lands within both refuges subsequently have been acquired under a variety of transfer and acquisition authorities or have different designations, giving the refuges more than one purpose.

Public Involvement

In fall 2007, the Service initiated the public scoping for this project with the publication of a public involvement summary and a planning update that described the CCP process and anticipated schedule (FWS 2007a). The Service published a notice of intent to prepare the draft CCP and EIS in the Federal Register on December 4, 2007. Since then, the Service has conducted 14 public meetings during scoping and development of the draft alternatives, mailed four planning updates, posted information on the web page for the CCP, and coordinated with Federal, State, and local agencies, and Native American tribes.

Significant Issues

The scoping process identified many qualities of the refuge along with issues and recommendations. Based on this information as well as guidance from the Improvement Act, National Environmental Policy Act, and planning policy, the Service identified seven significant issues to address in the draft CCP and EIS:

- Habitat and wildlife
- Water resources
- Public use and access
- Wilderness
- Socioeconomics
- Partnerships and collaboration
- Cultural values, traditions, and resources

USFWS

The scoping process identified the qualities of the refuge and issues of concern.

HABITAT and WILDLIFE

The draft CCP and EIS addresses the following habitat and wildlife issues:

- The use and role of wildfire, livestock grazing (including water resources needed to support livestock), hunting, fencing, and other management tools for the preservation and restoration of habitat conditions on the refuge.
- Habitat and wildlife management in the context of the larger landscape that includes adjacent private, State, tribal, and Federal lands.
- Species reintroductions and management of species that could move onto the refuge: American bison, gray wolf, grizzly bear, and Rocky Mountain bighorn sheep.
- Special consideration of threatened and endangered species and species of concern.
- Invasive species and noxious weed management including the management tools used to combat invasive species.
- Predator management.

WATER RESOURCES

Wildlife populations, both on and off the refuge, are affected by water quality and access to water. Livestock grazing has degraded habitat, particularly near water sources. Furthermore, stock watering ponds can affect stream flow, fish, and riparian areas conditions. The draft CCP and EIS addresses the following important water issues:

- Water quality and quantity
- Water development
- Missouri River riparian ecosystem
- Water rights

PUBLIC USE and ACCESS

The Service allows the public uses of hunting, fishing, wildlife observation, photography, interpretation, and environmental education. In addition, the Service supports these uses by providing associated access and facilities such as roads, motorized access, and camping. The draft CCP and EIS addresses the following public use and access issues:

- Priority public uses—hunting, fishing, wildlife observation, photography, interpretation, and environmental education.
- Motorized and nonmotorized access and law enforcement.
- Roads including number, location, types, and maintenance.
- Nonpriority uses such as camping and bicycling.
- Facilities, programs, and infrastructure to support public uses and access.
- Permitted uses such as livestock grazing or other commercial recreation or uses.

WILDERNESS

Planning policy requires refuges to review special designation areas such as wilderness and address the potential for any new designations. Concurrent with the comprehensive conservation planning and environmental analysis process, the Service is conducting a wilderness review and will make final recommendations in the final environmental impact statement. The draft CCP and EIS addresses the following wilderness issues:

- Existing proposed wilderness units—consolidation, addition, or reduction.
- Identification of potential for any new designations.
- Access, infrastructure, and use of management tools.

SOCIOECONOMICS

It is important to manage refuge resources and public use in ways that protect the resources, that are financially responsible, and that are integrated with the economic viability of the surrounding communities. The draft CCP and EIS addresses the following socioeconomics issues:

- Benefits of the refuge and promotion of refuge values.
- Range of alternatives and effects of those alternatives on the local economy and community.

PARTNERSHIPS and COLLABORATION

Because of the long, narrow extent of the refuge boundary, the subsequent amount and variety of adjacent land uses not only affect, but also are interrelated with, refuge resources. Therefore, it is crucial for the Service to collaborate with refuge neighbors and to establish partnerships with interested agencies and groups. Wildlife populations and movements are greatly affected by conditions both outside and inside the refuge. Similarly, invasive species are one of the biggest threats facing State, Federal, and private landowners. Changes in the ownership of private lands adjacent to the refuge may change conditions for habitat, wildlife, and public access. Privately owned mineral rights, future energy development, and rights-of-way influence the future conditions and use of the refuge and adjacent lands. The draft CCP and EIS addresses the following partnership and collaboration issues:

- Adjacent land management related to habitat, wildlife, and public use
- Consultation and coordination with Federal, State, and local partners
- Climate change and development of minerals, including recommendations for reducing effects on refuge resources
- Priorities for future land acquisition

CULTURAL VALUES, TRADITIONS, and RESOURCES

The refuge has significant archaeological resources and rich prehistoric and historic values to the local and regional community. The western traditions and practices of livestock grazing have affected the lives of ranchers and their families for many generations. Of unique value are the significant paleontological resources (fossilized plants and animals). The draft CCP and EIS addresses the following cultural, traditions, and resource issues:

- Refuge values and qualities
- Land management designations
- Traditions and lifestyles
- Cultural and paleontological resources

USFWS

Dotted Gayfeather

Vision

The Service developed a vision for the refuge at the beginning of the planning process. The vision describes the focus of refuge management and portrays a picture of the refuge in 15 years.

Charles M. Russell National Wildlife Refuge's expansive badlands, cottonwood river bottoms, old-growth forested coulees, sagebrush steppes, and mixed-grass prairies appear out of the sea that is the northern Great Plains.

Encompassing more than a million acres, the refuge affords visitors solitude, serenity, and unique opportunities to experience natural settings and wildlife similar to what Native Americans and, later, Lewis and Clark observed.

The diversity of plant and animal communities found on the refuge stretch from the high prairie through the rugged breaks, along the Missouri River, and across Fort Peck Reservoir. The refuge is an outstanding example of a functioning, intact landscape in an ever-changing West.

Working together with our neighbors and partners, the Service employs adaptive management rooted in science to protect and improve the biological integrity, biological diversity, and environmental health of the refuge's wildlife and habitat resources.

Goals

The Service developed eight goals for the refuge based on the Improvement Act, the refuge purposes, and information developed during planning. The goals direct work toward achieving the vision and purposes of the refuge and outline approaches for managing refuge resources.

HABITAT and WILDLIFE MANAGEMENT

Conserve, restore, and improve the biological integrity, environmental health, and ecological diversity of the refuge's plant and animal communities of the Missouri River breaks and surrounding prairies to support healthy populations of native plants and wildlife. Working with others, reduce and control the spread of nondesirable, nonnative, invasive plant and aquatic species for the benefit of native communities on and off the refuge.

THREATENED and ENDANGERED SPECIES and SPECIES OF CONCERN

Contribute to the identification, preservation, and recovery of threatened and endangered species and species of concern that occur or have historically occurred in the northern Great Plains.

RESEARCH and SCIENCE

Advance the understanding of natural resources, ecological processes, and the effectiveness of management actions in the northern Great Plains through compatible scientific investigations, monitoring, and applied research.

FIRE MANAGEMENT

Manage wildland fire using a management response that promotes fire's natural role in shaping the landscape while protecting values at risk.

PUBLIC USE and EDUCATION

Provide all visitors quality education, recreation, and outreach opportunities that are appropriate and compatible with the purpose and goals of the refuge and the mission of the National Wildlife Refuge System while maintaining the remote and primitive experience unique to Charles M. Russell National Wildlife Refuge.

WILDERNESS

Conserve, improve, and promote the wilderness quality and associated natural processes of designated and proposed wilderness areas within Charles M. Russell National Wildlife Refuge for all generations.

CULTURAL and PALEONTOLOGICAL RESOURCES

Identify, value, and preserve the significant paleontological and cultural resources of Charles M. Russell National Wildlife Refuge to connect refuge staff, visitors, and the community to the area's prehistoric and historic past.

REFUGE OPERATIONS and PARTNERSHIPS

Through effective communication and innovative use of technology and resources, the refuge uses funding, personnel, partnerships, and volunteer programs for the benefit of natural resources while recognizing the social and economic connection of the refuge to adjacent communities.

© Rick and Susie Graetz

A range of alternatives was identified for managing the 1.1 million-acre refuge.

Alternatives

Following the initial scoping process in 2007 and 2008, the Service held meetings and workshops with the cooperating agencies and the public and identified a reasonable range of preliminary alternatives. The Service carried forward the following four alternatives and analyzed them in detail in this environmental impact statement:

- Alternative A–No Action
- Alternative B–Wildlife Population Emphasis
- Alternative C–Public Use and Economic Use Emphasis
- Alternative D–Ecological Processes Emphasis (Proposed Action)

These alternatives examine different ways for providing permanent protection and restoration of fish, wildlife, plants, habitats, and other resources and for providing opportunities for the public to engage in compatible wildlife-dependent recreation. Each alternative incorporates specific actions intended to achieve the goals. However, the no-action alternative represents the current, unchanged refuge management and may not meet every aspect of every goal. The no-action alternative provides a basis for comparison of the action alternatives B–D.

ELEMENTS COMMON to all ALTERNATIVES

The Service will manage the 20,819-acre UL Bend Wilderness as a class 1 air shed. Roads in proposed wilderness units will remain closed except for roads that provide access to private land within the refuge.

The Service will manage public use to provide opportunities for a variety of wildlife-dependent recreation and programs.

ALTERNATIVE A–NO ACTION

Few changes would occur in the management of existing wildlife populations and habitat. Wildlife-dependent public uses and economic uses would continue at current levels. Key actions of alternative A include the following:

- There would be a continued emphasis on big game management, annual livestock grazing, use of fencing for pastures, invasive species control, and water development. Habitat would continue to be managed in the 65 habitat units that were established by Bureau of Land Management for grazing purposes. Prescriptive grazing would be implemented gradually as units became available and habitat evaluations were completed.
- Big game would be managed to achieve target levels in the 1986 environmental impact statement record of decision: 160 bighorn sheep, 10 mule deer per square mile, and 2.5 elk per square mile. This would include a more restrictive rifle season for mule deer in some State hunting districts as compared with the State season.
- Select stock ponds would be maintained and rehabilitated. Riparian habitat would be restored where possible and standard watershed management practices would be enforced. Water rights would be adjudicated and defined.
- Access would be allowed on 670 miles of refuge roads.
- About 155,288 acres of proposed wilderness within 15 units of the Charles M. Russell refuge would be managed in accordance with Service policy.

ALTERNATIVE B–WILDLIFE POPULATION EMPHASIS

The Service would manage the landscape, in cooperation with our partners, to emphasize the abundance of wildlife populations using balanced natural ecological processes such as fire and herbivory by wild ungulates and responsible synthetic methods such as farming and tree planting. Wildlife-dependent public use would be encouraged, and economic uses would be limited when they compete for habitat resources. Key actions of alternative B include the following:

- The Service would actively manage and manipulate habitat, thus creating a diverse plant community of highly productive wildlife food and cover plants. The management emphasis would be on habitat for target species of wildlife in separate parts of the refuge. The Service would consolidate the 65 habitat units. Subsequently, the refuge staff would write new habitat management plans based on field station boundaries and habitat evaluation for target species. The Service would work with others to develop methods to monitor and evaluate target species and habitat needs.
- Desired habitat conditions may be created using natural ecological processes (such as fire, grazing by wildlife, or flooding) or through management practices (such as prescriptive livestock grazing, agricultural plantings or managed fire).
- An aggressive approach to reduction of invasive plants in the river bottoms would be based on funding and other staffing priorities. Work would include use of prescribed fire, spraying with herbicides, and planting of wildlife food crops to clear invasive plants. In addition, the Service would collaborate with others to combat invasive plants in shoreline habitat. Where feasible and combined with research, the Service would restore the functioning condition of riparian areas and preserve fire refugia (places where fire rarely burns).
- Through cooperation and collaboration with the MFWP and adjoining landowners, the Service would use wildlife- and habitat-based objectives and strategies that consider natural densities, social structures, and population dynamics at the landscape level. The Service and cooperators would mutually agree on population levels that can be tolerated by adjoining landowners and provide quality recreational experiences without negatively affecting habitat or other wildlife. The Service would collaborate with others to manage wildlife to benefit all species in and around the refuge; actions could include conservation easements or other incentives.
- The Service would identify habitat suitable for bighorn sheep and establish new populations based on the MFWP's modeling and transplant criteria. The Service would work with MFWP to provide quality hunting opportunities as a management tool that maintains both sustainable populations of big game and habitat for nongame species.
- In managing the hunting program, the Service would seek to benefit wildlife populations and promote harvest experiences that are not always achieved on other public lands. An example would be providing opportunities to hunt big game animals with all age classes represented (i.e., mule deer in the 8- to 10-year class).
- The Service would close about 106 miles of road and would work with partners to develop a travel plan and secure access to the refuge through other lands. Nonmotorized access would be promoted, but the Service would consider allowing motorized access on existing roads only for game retrieval and restricting access on a seasonal basis to sensitive areas by the river and roads.
- Opportunities for expanding hunting programs would be considered to encourage and facilitate young hunters and mobility-impaired hunters. Limited hunts for furbearers or other predators would be considered only if monitoring verified that population levels could be sustained.
- The Service would expand the acreage of proposed wilderness by 25,037 acres in six existing units.

USFWS

The alternatives address the management of big game such as mule deer.

ALTERNATIVE C–PUBLIC USE and ECONOMIC USE EMPHASIS

The Service would manage the landscape, in cooperation with our partners, to emphasize and promote the maximum, compatible, wildlife-dependent public use and economic uses while protecting wildlife populations and habitats to the extent possible. Damaging effects on wildlife habitats would be minimized while using a variety of management tools to enhance and

diversify public and economic opportunities. Key actions of alternative C include the following:

- In addition to the habitat elements in alternative A, the Service would generally manage habitats to provide more opportunities for wildlife-dependent recreation. In places, the refuge staff would manage for plant communities that could necessitate a compromise between providing wildlife food and cover and livestock forage needs. Where needed, fencing and water gaps would be used to manage livestock use and prevent further degradation of riparian habitat. Camping areas would be managed to limit expansion and further degradation of riparian habitat.
- Through collaboration with MFWP and others, the Service would maintain a balance between numbers of big game and livestock to sustain habitats and populations of big game and sharp-tailed grouse. Similar balancing could be necessary when managing populations of nongame or migratory birds and livestock needs. For example, it could be necessary to balance prairie dog needs with public and economic uses such as livestock grazing or with needs of other wildlife.
- Working with MFWP, the Service would expand and maximize the following hunting opportunities: (1) programs to include new species and traditional or niche (primitive weapon) hunting; (2) mule deer season; (3) predator hunting; (4) trapping; and (5) opportunities for young hunters.
- Refuge access would be managed to benefit public and economic uses. The Service would improve access to boat ramps and consider establishing new roads in some areas and seasonally closing other areas, such as those around Fort Peck, to protect habitat and to provide for a diversity of experience.
- The Service would recommend eliminating four proposed wilderness units of about 35,881 acres in the East Beauchamp Creek, West Beauchamp Creek, East Hell Creek, and Burnt Lodge units.

USFWS

The alternatives address a variety of public uses including hunting and access.

USFWS

The alternatives address several recommendations on proposed wilderness areas and the use of handcarts.

ALTERNATIVE D–ECOLOGICAL PROCESSES EMPHASIS (Proposed Action)

In cooperation with our partners, the Service would use natural, dynamic, ecological processes and management activities in a balanced, responsible manner to restore and maintain the biological diversity, biological integrity, and environmental health of the refuge. Once natural processes are restored, a more passive approach (less human assistance) would be favored. There would be quality wildlife-dependent public uses and experiences. Economic uses would be limited when they are injurious to ecological processes. Key actions of alternative D include the following:

- Where feasible, the Service would apply management practices that mimic and restore natural processes on the refuge, managing for a diversity of plant species in upland and riparian areas. This would include a concerted manipulation of habitats or wildlife populations (using prescribed fire and grazing and hunting) through coordinated objectives. Management would evolve toward more passive approaches—allowing natural processes such as fire, grazing, and flooding—to occur with less human assistance or funding.

- The Service would maintain plant diversity and health using fire in combination with wild ungulate herbivory (wildlife feeding on plants) or prescriptive livestock grazing, or both, to ensure the viability of populations of sentinel plants (those plant species that decline first when management practices are injurious; see appendix F).
- In collaboration with MFWP and others, the Service would maintain the health and diversity of all species' populations including game, nongame, and migratory bird species by restoring and maintaining balanced, self-sustaining populations. This could include manipulating livestock grazing and wildlife numbers, or both, if habitat monitoring determined conditions were declining or plant species were being affected by overuse. Predators would be managed to benefit the ecological integrity of the refuge. Limited hunting for mountain lion or other furbearers or predators would be considered only after monitoring verified that population levels could be sustained with a hunt.
- The Service would cooperate with MFWP to provide hunting experiences that maintain game species at levels that sustain ecological health but that also provide opportunities not found on other public lands. For example, the Service and MFWP would manage for natural sex and age ratios of big game species and provide reasonable opportunities for hunting success in a remote setting.
- Refuge access would be managed to benefit natural processes and habitat. The Service would evaluate roads and implement permanent or seasonal road closures on 23 miles of road as needed to encourage free movement of animals, permit prescribed fire activities, harvest wild ungulates, or allow other activities that contribute to ecological health.
- In addition to the wilderness elements in alternative A, the Service would recommend expanding six of the proposed wilderness units—a total of 18,559 acres in the Antelope Creek, Crooked Creek, Alkali Creek, Wagon Coulee, West Hell Creek, and Sheep Creek units—and eliminating three units for a reduction of 26,744 acres in the East Beauchamp Creek, West Beauchamp Creek, and East Hell Creek units. This would accommodate more public access in some areas and increase protection of wilderness values in other areas.

USFWS

The use of prescribed fire and grazing by wild ungulates and livestock is addressed in the draft CCP and EIS.

OBJECTIVES and STRATEGIES

Based on the vision and goals for the refuge, the Service has developed objectives and strategies for each alternative. An objective is a general statement about what the Service wants to achieve on the refuge, while a strategy is a specific action or tool that is used to achieve an objective. Because each alternative has a different emphasis, objectives vary by alternative. The following summarizes key objective topics addressed for each alternative in the draft CCP and EIS:

- Management of four broad categories of vegetation found on the refuge: uplands, river bottoms, riparian areas, and shoreline vegetation.
- Use of fire (both prescribed and wildfire), grazing by wildlife and livestock, restoration, predation, and hunting in managing refuge's uplands, river bottoms, riparian areas, and shoreline.
- Managing for climate change and controlling invasive species.
- Management of big game; furbearers; small predators; threatened and endangered species or species of concern; and other fish, reptiles, amphibians, mammals, and birds.
- Public uses including hunting, fishing, wildlife observation, photography, and interpretation. Management of commercial outfitting, recreation acres, and public access.
- Management of wilderness, other special area designations; protection of significant cultural and paleontological resources.
- Refuge operations and partnerships.

© Judy Wantulok

The affected environment in the draft CCP and EIS describes the characteristics of resources at the refuge, including the sage-grouse.

Affected Environment

The draft CCP and EIS describes the characteristics and resources of the refuge and how existing or past management or other influences have affected these resources. The affected environment addresses the physical, biological, and social aspects of the refuge that could be affected by management under the four alternatives. These aspects include the physical and biological environment, special management areas, visitor services, cultural and paleontological resources, and the socioeconomic environment. The Service used published and unpublished data, as noted in the bibliography, to quantify what is known about the refuge.

Environmental Consequences

The alternatives for refuge management would provide a variety of positive effects (benefits) and negative effects (impacts) to resources at Charles M. Russell National Wildlife Refuge and UL Bend National Wildlife Refuge. Some of the greatest benefits would come from consolidating habitat units and managing the upland vegetation to create a mosaic of habitats using prescribed fire, naturally occurring wildfires, and prescriptive grazing to support a diversity of species and improve the overall health of the refuge. The Service would restore numerous former agricultural river bottoms by reducing invasive plant infestations and planting native species. Another significant benefit would be the improved function and quality of riparian areas for wildlife using prescriptive grazing, possible water impoundment removal or modification, and restoration projects.

The greatest impact to refuge resources would be the continuation of current fire suppression strategies and constant grazing pressure over large portions of the refuge under alternative A. While the overall economic effects of any alternative would be positive, implementation of new grazing and habitat management approaches in alternatives B or D would result in impacts to individual livestock permittees. From a habitat perspective, action alternatives (B, C, and D) would benefit upland and riparian habitats, with alternatives B and D resulting in moderate to major long-term benefits to both habitat and wildlife. These and other effects, including a description of the context, intensity, and duration are described in detail in Chapter 5–Environmental Consequences of the draft CCP and EIS. The degree of effect was quantified using known numeric or modeled estimates or where extensive monitoring or

research provided the information. Where sufficient numeric information was not available, qualitative or relative assessments were made using scientific literature or professional field experience.

USFWS

The 670 miles of roads that crisscross the refuge result in effects to the physical, biological, and public environment.

PHYSICAL ENVIRONMENT

The use of prescribed fire in any alternative would generally result in short-term negligible impacts on air quality, visual resources, and soils. The effects of large wildfires on these resources would be major under alternative A and have minor to moderate effects under alternatives B, C, and D.

Livestock grazing in some areas would result in moderate to major impacts on soils under alternatives A and C, while prescriptive grazing in alternatives B and D would reduce those effects over the long term. The aesthetic effects of livestock grazing and prescribed fire on visual resources for some refuge visitors would be negligible to minor under alternatives A and C, with alternatives B and D having moderate benefits.

The overall effects of motorized use on soundscapes would be negligible to minor under all alternatives.

BIOLOGICAL ENVIRONMENT

The continuation of current management of uplands under alternative A would have minor short-term impacts, with moderate to major long-term impacts. The localized effects of alternative B on upland habitat would be variable but overall would result in moderate long-term benefits. Increased prescriptive grazing and balanced ungulate use under alternative C would result in minor long-term benefits. Efforts to restore natural processes under alternative D would result in major long-term benefits to uplands.

Ongoing habitat protection and water impoundment removal or improvement would benefit riparian areas and wetlands. Over the long term, these benefits would be minor under alternative A, moderate under alternative B, minor to moderate under alternative C, and moderate to major under alternative D. In all alternatives, localized moderate impacts from grazing on riparian habitat would persist in some areas. While the approaches and timeframe would vary, river bottom restoration in all alternatives would result in minor to moderate long-term benefits. Effects of the alternatives on shoreline habitat would be negligible.

While the big game management emphases and approaches would vary, all alternatives would benefit big game populations. Over the long term, these benefits would be minor under alternative A, minor to moderate under alternative B, and moderate under alternatives C and D. As the Service is required to manage for the benefit of special status species, alternative A, with no specific objectives, would have negligible effects. More active management of threatened and endangered species and species of concern under the action alternatives (B–D) would have moderate to major long-term benefits to those species.

Continued management of furbearers and small predators would have negligible effects. Alternative B would have major long-term benefits to furbearers and small predators due to reintroductions, while alternative C would have minor to major impacts due to increased harvest. The effects of alternative D would be negligible.

Under alternative A, continued impacts to bird habitat would generally offset the benefits of protection and enhancement efforts, resulting in negligible effects. Habitat protection and management efforts in the action alternatives (B–D) would benefit birds on the refuge. These long-term benefits would be moderate to major under alternatives B and D, and minor under alternative C. In all alternatives, moderate to major localized impacts would continue to occur in some areas due to grazing.

USFWS

Implementation of the action alternatives (B–D) would benefit riparian areas, although the amount would vary by alternative.

Continued habitat degradation under alternative A would have minor incremental impacts on small mammals, amphibians, reptiles, and fish, while habitat improvements under the action alternatives would benefit those species. Benefits would be moderate under alternative B, minor under alternative C, and moderate to major under alternative D.

SPECIAL MANAGEMENT AREAS

Alternative A would keep the current and proposed wilderness configurations. Expansion of proposed wilderness units under alternative B would result in minor benefits, while reduced units in alternative C would have minor impacts. Although alternative D would reduce the overall area of proposed wilderness, it would have an overall minor beneficial effect due to consolidated units that are more logical and efficient for management. None of the alternatives would affect the designation or management of other special management areas.

VISITOR SERVICES

Continuation of current hunting opportunities and management under alternative A would have negligible effects, while the action alternatives (B–D) would have varying benefits to hunting. Expanded hunting opportunities under alternative B would have negligible to minor benefits, while an expanded emphasis on hunting opportunities and harvest under alternative C would have minor to moderate benefits. The benefits of higher quality hunting opportunities under alternative D would be minor to moderate, depending on the preferences of individual hunters. None of the alternatives would affect fishing.

Alternative A would have negligible effects on wildlife observation and photography. Increases in personnel, facilities, and programs would result in negligible to minor benefits under alternative B and moderate benefits under alternatives C and D. Limited environmental education, interpretation, and outreach under alternative A would have negligible effects. Alternative B would have negligible benefits due to additional staff and program and facility improvements. Alternatives C and D would have minor benefits due to expanded staff and facilities. Effects on commercial uses would be negligible under all alternatives except for alternative C, which would have minor benefits due to additional permits and efforts to reduce conflicts.

Under alternative A, access would remain as it is currently with 670 miles of road open to visitors. Alternative B would result in minor impacts to vehicle access, with 106 miles of road closures, while the 23 miles of closed road in alternative D would have negligible impacts. The effects of specific road closures would be greater for individuals who prefer to access the refuge by those particular routes. Road improvements in alternative C would result in minor benefits.

Brett Billings/USFWS

Fishing would continue to be a popular activity under all alternatives.

CULTURAL and PALEONTOLOGICAL RESOURCES

While alternative A would have negligible effects, all of the action alternatives (B–D) would have negligible to minor benefits on cultural and paleontological resources due to improved resource identification, protection, law enforcement, and interpretation.

SOCIOECONOMIC ENVIRONMENT

The regional economic impacts of refuge management activities, including local economic output and jobs, would be negligible under alternatives A and B. Alternatives C and D would result in minor benefits: alternative C would generate $3.9 million in local output and 48 additional jobs, and alternative D would generate $2.1 million in local output and 25 additional jobs.

As the refuge currently supplies less than 1 percent of total animal unit months in the six-county area, any changes in grazing management would have negligible economic effects. However, refuge management changes would affect individual livestock permittees. The impacts on permittees would be negligible to minor under alternatives A and C and potentially moderate to major impacts under alternatives B and D.

What Happens Next

The draft CCP and EIS will be available for a 60-day public review. The Service may change the alternatives, the impact analysis, or other features as a result of the comments received during the review. The Service will then select a preferred alternative for management of the refuge. The selected alternative's goals, objectives, and strategies will become the primary components of a stand-alone CCP.

Revision of the draft document will produce the final CCP and EIS, which will identify the preferred alternative. The Service's final decision will be documented in a record of decision that is published in the Federal Register, no sooner than 30 days after filing the final CCP and EIS with the U.S. Environmental Protection Agency and distributing it to the public. The Service will begin to implement the final CCP immediately on publication of the decision in the Federal Register. Selected management activities and projects will be implemented as funds become available. The final plan does not constitute a commitment for funding, and future budgets could influence implementation priorities.

Abbreviations

AUM	animal unit month
BLM	Bureau of Land Management
CCP	comprehensive conservation plan
CFR	Code of Federal Regulations
DNRC	Montana Department of Natural Resources and Conservation
DOI	U.S. Department of the Interior
EIS	environmental impact statement
Enhancement Act	Title VIII of the Water Resources Development Act of 2000
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
GS	General Schedule (employment type)
HDP	height-density plot
HMP	Habitat Management Plan
IMPLAN	Impact Analysis for Planning
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
MFWP	Montana Department of Fish, Wildlife, and Parks
NRCS	Natural Resources Conservation Service
Refuge System	National Wildlife Refuge System
region 6	Mountain–Prairie Region of the U.S. Fish and Wildlife Service
RLGIS	refuge land Geographic Information System
Service	U.S. Fish and Wildlife Service
TEA–21	1998 Transportation Equity Act for the 21st Century
TES	threatened and endangered species
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFS	USDA Forest Service
USGS	U.S. Geological Survey
WG	wage grade (employment type)

Definitions of these and other terms are in the glossary, located after chapter 5.

1—Introduction

The U.S. Fish and Wildlife Service (Service) has developed this draft comprehensive conservation plan (CCP) and environmental impact statement (EIS) to provide alternatives and identify consequences for the management and use of Charles M. Russell National Wildlife Refuge and UL Bend National Wildlife Refuge, located in north-central Montana. Located within the boundary of the Charles M. Russell refuge, UL Bend is, in essence, a refuge within a refuge (see vicinity map in figure 1). The Service manages these refuges as one refuge. Together, they encompass an area of 1.1 million acres that span about 125 air miles along the Missouri River, from the Fort Peck Dam west to the boundary with the Upper Missouri River Breaks National Monument. Throughout this document, the two refuges are referred to as "the refuge" unless individually named.

In preparing this document, the Service complied with the National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd et seq.), also known as the Improvement Act and Part 602 (National Wildlife Refuge System Planning) of the Fish and Wildlife Service Manual (FWS 2000c). Additionally, the actions described meet the requirements of the National Environmental Policy Act of 1969.

Wildlife conservation is the first priority in managing national wildlife refuges. Public uses, specifically wildlife-dependent recreational uses, are allowed and encouraged as long as they are compatible with the refuge's purposes.

This draft CCP and EIS discusses program levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning purposes. Once finalized, the CCP will specify the necessary actions to achieve the vision and goals of the refuge. The plan will guide the management, programs, and actions for 15 years after CCP approval.

The Service has formulated four draft alternatives that are the result of extensive public input and working closely with agencies and local governments that have close ties to the refuge. The core planning team of representatives from several Service programs prepared this draft CCP and EIS (refer to Appendix A–Preparers and Contributors). In addition, the following cooperating agencies participated on the planning team:

- U.S. Army Corps of Engineers (USACE)
- Bureau of Land Management (BLM)
- Montana Fish, Wildlife and Parks (MFWP)
- Montana Department of Natural Resources and Conservation (DNRC)
- Counties of Fergus, Petroleum, Garfield, McCone, Valley, and Phillips
- Missouri River Conservation Districts Council, representing the six conservation districts adjacent to the refuge

About 276 bird species, including the burrowing owl, have been recorded on the refuge.

Figure 1. Vicinity map for the Charles M. Russell and UL Bend refuges.

Public involvement in the planning process is discussed in 1.6–The Planning Process (below) and in detail in Appendix B–Public Involvement.

After reviewing a wide range of management needs and public comments during two public comment periods (scoping and draft alternatives), the planning team developed four sets of alternatives, objectives, and strategies for management of the refuge. Details on the no-action alternative and three action alternatives and are in Chapter 3–Alternatives, and the predicted effects of the alternatives are described in Chapter 5–Environmental Consequences. The Service has identified one alternative as the proposed action.

1.1 Purpose and Need for Action

The purpose of this draft CCP and EIS is to identify the role the refuge will play in support of the mission of the National Wildlife Refuge System (Refuge System) and to provide long-term guidance for management of refuge programs and activities. The CCP is needed

- to communicate with the public and other partners in efforts to carry out the mission of the Refuge System;
- to provide a clear statement of direction for management of the refuge;
- to provide neighbors, visitors, and government officials with an understanding of the Service's management actions on and around the refuge;
- to ensure that the Service's management actions are consistent with the mandates of the Improvement Act;
- to ensure that management of the refuge considers other Federal, State, and local government plans;
- to provide a basis for development of budget requests for the operation, maintenance, and capital improvement needs of the refuge.

The Service is committed to sustaining the Nation's fish and wildlife resources together through the combined efforts of governments, businesses, and private citizens.

DECISION to BE MADE

The regional director of region 6 of the Service will make the final decision on the selection of a preferred alternative for the CCP. The regional director's decision will be based on the legal responsibility of the Service including the mission of the Service and the Refuge System, other legal and policy mandates, the purposes of Charles M. Russell and UL Bend refuges, and the vision and goals in this draft CCP. In addition, the regional director will consider public

input from the cooperating agencies, Native American tribes, and the public about the draft CCP and EIS. Other considerations are land uses in the surrounding area and other parts of the ecosystem, the environmental effects of the alternatives, and future budget projections.

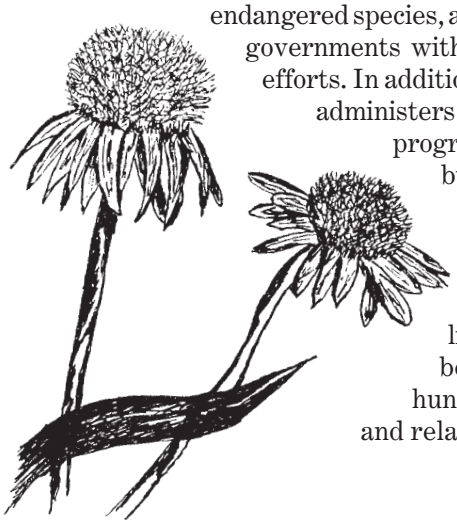
The Service's final decision will be documented in a record of decision that is published in the Federal Register, no sooner than 30 days after filing the final CCP and EIS with the U.S. Environmental Protection Agency and distributing it to the public. The Service will begin to carry out the final CCP immediately on publication of the decision in the Federal Register.

1.2 The U.S. Fish and Wildlife Service and the Refuge System

The Service is the principal Federal agency responsible for fish, wildlife, and plant conservation. The Refuge System is one of the Service's major programs.

U.S. FISH and WILDLIFE SERVICE

The Service was established in the Department of the Interior in 1940, through the consolidation of bureaus then operating in several Federal departments. The primary precursor agency was the Bureau of Biological Survey in the U.S. Department of Agriculture. Today, the Service enforces Federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores vital wildlife habitat, protects and recovers endangered species, and helps other governments with conservation efforts. In addition, the Service administers a Federal aid program that distributes hundreds of millions of dollars to States for fish and wildlife restoration, boating access, hunter education, and related programs.



Our mission is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

Service Activities in Montana

Service activities in Montana contribute to the State's economy, ecosystems, and education programs. The following list describes the Service's presence and activities:

- Manages two national fish hatcheries, one fish health center, one fish technology center, four ecological services field offices, and one fish and wildlife management assistance office (FWS 2009a)
- Manages 23 national wildlife refuges encompassing 1,214,890 acres (1.29 percent of the State) (FWS 2008a)
- Manages five wetland management districts (FWS 2008a)
- Manages 184,462 acres of fee-title waterfowl production areas (FWS 2008a)
- Manages 235,219 acres under lease or easement (FWS 2008a)
- In 2008, provided almost $9.5 million to MFWP for sport fish restoration and $8.24 million for wildlife restoration and hunter education (FWS 2009h)
- For more than 20 years, the Service's Partners for Fish and Wildlife program has helped private landowners restore about 30,000 wetland acres on 2,167 sites; 343,314 upland acres on 321 sites, and 1,220 miles of river and stream channel habitat (FWS 2008b)
- In 2008, paid Montana counties $488,543 under the Refuge Revenue Sharing Act for use in schools and roads (FWS 2009d)

NATIONAL WILDLIFE REFUGE SYSTEM

In 1903, President Theodore Roosevelt designated the 5.5-acre Pelican Island in Florida as the Nation's first wildlife refuge for the protection of brown pelicans and other native, nesting birds. This was the first time the Federal Government had set aside land for wildlife. This small but significant designation was the beginning of the National Wildlife Refuge System.

One hundred years later, the Refuge System has become the largest collection of lands in the world specifically managed for wildlife, encompassing more than 550 units that total 150 million acres (FWS 2009e). Today, there is at least one refuge in every State and in five U.S. territories and Commonwealths.

In 1997, the Improvement Act established a clear mission for the Refuge System.

> *The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.*

The Improvement Act (or associated regulations) states that each national wildlife refuge shall be managed

- to "fulfill the mission of the System, as well as the specific purposes for which that refuge was established"
- to consider "wildlife conservation … [as] the singular National Wildlife Refuge System mission" (Final Compatibility Regulations Pursuant to the National Wildlife Refuge System Improvement Act of 1997)
- to "ensure that the biological integrity, diversity, and environmental health of the System are maintained"
- to fulfill the requirements of preparing "a comprehensive conservation plan … for each refuge within 15 years after the date of enactment of the … Act" and of ensuring opportunities for "public involvement in the preparation and revision of [these] plans"
- to recognize that "compatible wildlife-dependent recreation [fishing, hunting, wildlife observation and photography, and environmental education and interpretation] is a legitimate and appropriate general public use of the System"
- to retain the authority of a refuge manager to "make … the compatibility determination" after exercising "sound professional judgement … regarding wildlife conservation and uses of the National Wildlife Refuge System" (Final Compatibility Regulations Pursuant to the National Wildlife Refuge System Improvement Act of 1997)

Following passage of the Improvement Act, the Service started carrying out the direction of the new legislation including the preparation of CCPs for all national wildlife refuges and wetland management districts. Consistent with the Improvement Act, the Service prepares CCPs in conjunction with public involvement. Each refuge and district is required to complete its first CCP within the 15-year schedule, by 2012.

People and the Refuge System

The nation's fish and wildlife heritage contributes to the quality of American lives and is an integral part of the country's greatness. Wildlife and wild places have always given people special opportunities to have fun, relax, and appreciate the natural world.

Wildlife recreation contributes millions of dollars to local economies, whether through bird watching, fishing, hunting, photography, or other wildlife pursuits. Nearly 35 million people visited national wildlife refuges in 2006 (Carver and Caudill 2007), mostly to observe wildlife in their natural habitats. Visitors experience nature trails, auto tours, interpretive programs, and hunting and fishing opportunities. Local communities that surround the refuges and districts generate significant economic benefits. Economists report that Refuge System visitors contribute more than $1.7 billion annually to local economies (Carver and Caudill 2007). These figures do not include Alaska or the Pacific Island refuges, which together hosted more than 2 million visitors in 2006.

Compatible Refuge Uses

Lands within the Refuge System are different from multiple-use Federal lands. Refuge System lands are closed to all public uses unless specifically and legally opened. A refuge use is not allowed unless the Service determines the use to be appropriate and compatible (FWS 2000a). A compatible use is one that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the refuge. Sound professional judgment is defined as a decision that is consistent with the principles of fish and wildlife management and administration, the available science and resources, and adherence to law.

A compatibility determination is the written documentation that a proposed or existing use of a national wildlife refuge is or is not a compatible use. The determination is completed, signed, and dated by the refuge manager with the concurrence of the assistant regional director for the Refuge System. Compatibility determinations are typically completed as part of the process for a CCP or step-down management plan. Once a final compatibility determination is made, it is not subject to administrative appeal.

The Improvement Act states that six priority uses—hunting, fishing, wildlife observation, photography, interpretation, and environmental education—should receive consideration in planning and management over other public uses. All facilities and activities associated with recreational uses, or where there is an economic benefit associated with a use, such as livestock grazing or commercial recreation, require compatibility determinations. However, refuge management activities such as prescribed fire or

invasive plant control do not require compatibility determinations.

The draft compatibility determinations for the refuge are in appendix C and are available for public review and comment as part of the draft CCP and EIS.

1.3 National and Regional Mandates

The Service manages Refuge System units to achieve the mission and goals of the Refuge System, along with the designated purposes of the refuges and districts as described in establishing legislation, executive orders, or other establishing documents. Key concepts and guidance for the Refuge System are in the National Wildlife Refuge System Administration Act of 1966, as amended by the Improvement Act (16 United States Code [U.S.C.] 668dd et seq.) and further detailed in Title 50 of the Code of Federal Regulations (CFR) and the Fish and Wildlife Service Manual.

Brief descriptions of the laws and executive orders that may affect the development or implementation of this CCP are in Appendix D–Key Legislation and Policy. Service policy for the planning process and management of refuges and districts is in the Fish and Wildlife Service Manual and the Refuge Manual.

1.4 Refuge Contributions to National and Regional Plans

Refuge resources contribute to the planning and conservation efforts, both regional and national, listed below.

FULFILLING the PROMISE

A 1999 report, Fulfilling the Promise—The National Wildlife Refuge System (FWS 1999a), was the culmination of a yearlong process by teams of Service employees to evaluate the Refuge System nationwide. This report was the focus of the first national Refuge System conference (in 1998)—attended by refuge managers, other Service employees, and representatives from leading conservation organizations. The report contains 42 recommendations packaged with three vision statements dealing with wildlife and habitat, people, and leadership. The outcome of that effort continues to influence CCP planning both nationally and locally.

BIRD CONSERVATION

During the past few decades, there has been growing interest in conserving birds and their habitats. This has led to the development of partnership-based bird conservation initiatives that have produced international, national, and regional conservation plans. The North American Bird Conservation Initiative Committee was started in 1999. This coalition of government agencies, private organizations, and bird initiative groups in the United States, Canada, and Mexico is working to advance and integrate bird conservation efforts. The primary conservation planning initiatives follow: Partners In Flight North American Landbird Conservation Plan, North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan. The refuge's role is described below for the Partners in Flight plan and the North American Waterfowl Management Plan.

Phil Norton/USFWS

Yellow-headed blackbirds nest on the refuge.

Partners in Flight

The Partners in Flight program began in 1990 with the recognition of declining population levels of many migratory bird species. The program's primary goal is to provide for the long-term health of bird life in North America. Priorities include the following: (1) prevent the rarest species from going extinct; (2) prevent uncommon species from descending into threatened status; and (3) "keep common birds common" (Partners in Flight 2009).

For planning purposes, Partners in Flight splits North America into seven groupings of birds by ecological area, avifaunal biomes, and 37 conservation regions (see figure 2). The refuge lies within Bird Conservation Region 17–Badlands and Prairies (North American Bird Conservation Initiative 2009). Region 17 is a semi-arid plain dominated by mixed-grass prairie. Importantly, this region provides habitat for some of the healthiest populations of high-priority dry-grassland bird species on the continent including mountain plover, McCown's longspur, and long-billed curlew. As discussed in chapter 4, (section 4.3 under Birds), many of these species are found on the refuge.

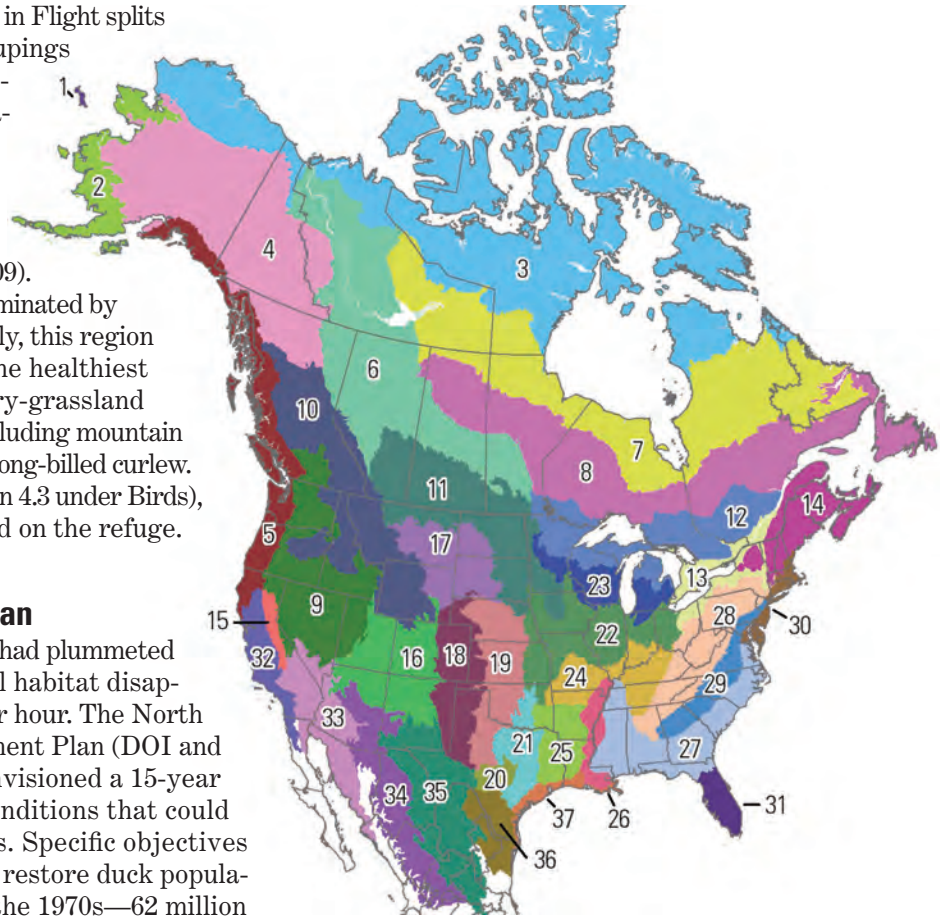


Figure 2. Map of the bird conservation regions in North America.

North American Waterfowl Management Plan

By 1985, waterfowl populations had plummeted to record lows, with waterfowl habitat disappearing at a rate of 60 acres per hour. The North American Waterfowl Management Plan (DOI and Environment Canada 1986) envisioned a 15-year effort to achieve landscape conditions that could sustain waterfowl populations. Specific objectives of the plan are to increase and restore duck populations to the average levels of the 1970s—62 million breeding ducks and a fall flight of 100 million birds.

Recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation to help recover a shared resource, the United States and Canadian governments developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. Mexico signed the plan in 1994. The plan is innovative because of its international scope plus its implementation at the regional level.

The success of the waterfowl management plan depends on the strength of partnerships called joint ventures, which involve Federal, State, provincial, tribal, and local governments; businesses; conservation organizations; and individual citizens. Joint ventures are regional, self-directed partnerships that carry out science-based conservation through community participation. Joint ventures develop implementation plans that focus on areas of concern identified in the plan. The refuge is part of the Northern Great Plains Joint Venture (FWS 2009a).

RECOVERY PLANS for THREATENED and ENDANGERED SPECIES

Where federally listed threatened or endangered species occur at the Charles M. Russell and UL Bend refuges, the refuge staff adheres to the management goals and strategies in the recovery plans. The list of threatened and endangered species at the refuge changes as species are listed or delisted or as listed species are discovered on refuge lands.

Currently, the refuge follows the recovery and management plans for black-footed ferret, pallid sturgeon, piping plover, and least tern. In 1994, the Service released black-footed ferrets into prairie dog towns on the refuge. Since their release, the ferrets have suffered from canine distemper and starvation due to the devastation of their main food source—prairie dogs—caused by the sylvatic plague (refer to Chapter 4–Affected Environment).

STATE COMPREHENSIVE FISH and WILDLIFE CONSERVATION STRATEGY

Documented declines of wildlife populations have occurred nationwide over the past several decades. As an ambitious endeavor to take an active hand in keeping species from becoming threatened or endangered, Congress created the State Wildlife Grant program in 2001. This program provides States and territories with Federal money to support wildlife conservation.

Under this program, a State develops a Comprehensive Fish and Wildlife Conservation Strategy that defines an integrated approach to the stewardship of all wildlife species, with emphasis on species of concern and habitats at risk. The goal is to shift focus from single-species management and highly specific individual efforts to a geographically based, landscape-oriented, conservation effort. The Service approves each State's conservation strategy and administers the State Wildlife Grant funding.

Montana's focus has been on game animals and their habitats from the early years of fish and wildlife management, and hunters and anglers have provided most of MFWP's funding. The MFWP intends to keep its focus on important game species and maintains that conserving particular types of habitat will benefit a variety of game and nongame species. With Montana's Comprehensive Fish and Wildlife Conservation Strategy and State Wildlife Grant money in place, MFWP believes that managing fish and wildlife more comprehensively is a natural progression in the effective conservation of Montana's remarkable fish and wildlife resources (MFWP 2005b).

Although game species are included in Montana's conservation strategy, the priority is species and their related habitats "in greatest conservation need." This means identifying focus areas or community types that are significantly degraded or declining, federally listed species and other declining populations, and areas where important distribution and occurrence information needed to assess the status of individuals and groups of species are lacking.

The planning team reviewed Montana's Comprehensive Fish and Wildlife Conservation Strategy and used the information during the development of the draft CCP and EIS (MFWP 2005). Implementation of the draft CCP's habitat goals and objectives would support the goals and objectives of the State conservation strategy.

1.5 Strategic Habitat Conservation

In the face of escalating challenges such as land use conversion, invasive species, water scarcity, and complex issues that have been amplified by accelerating climate change, the Service has evolved from its ecosystem approach of thinking about conservation to developing a broader vision.

A cooperative effort by the Service and U.S. Geological Survey (USGS) culminated in a report by the National Ecological Assessment Team (USGS 2006). The report outlines a unifying adaptive resource management approach for conservation at a landscape scale, the entire range of a priority species or suite of species. This is strategic habitat conservation—a way of thinking and doing business by incorporating biological goals for priority species populations, making strategic decisions about the work needed, and constantly reassessing.

Since 2006, the Service has taken significant steps to turn this vision into reality and has defined a framework of 22 geographic areas. Experts from the Service and USGS developed this framework through an aggregation of bird conservation regions (figure 2). The Charles M. Russell and UL Bend refuges lie in the Plains and Prairie Potholes Geographic Area (figure 3). Key issues in this geographic area are conservation of paddlefish, pallid sturgeon, waterfowl, shorebirds, grassland birds, and black-footed ferret.

The Service is using the framework as the basis to locate the first generation of landscape conservation cooperatives. These cooperatives are conservation-science partnerships between the Service and other Federal agencies, States, tribes, nongovernmental organizations, universities, and others. Designed as fundamental units for planning and science, the cooperatives have the capacity to help the Service carry out the elements of strategic habitat conservation—biological planning, conservation design and delivery, and monitoring and research. Coordinated planning and scientific information will strengthen the Service's strategic response to accelerating climate change.

CLIMATE CHANGE

The Service expects that accelerating climate change will affect the Nation's fish, wildlife, and plant resources in profound ways. While many species will continue to thrive, some may decline and in some instances go extinct. Others will survive in the wild only through direct and continuous intervention by managers. In 2009, the Service drafted a strategic plan to address climate change for the next 50 years. The draft strategic plan employs three key strategies: adaptation, mitigation, and engagement. In addition, the plan acknowledges that no single organization or agency can address climate change without allying itself with others in partnerships across the Nation and around the world (FWS 2009f). This draft strategic plan is an integral part of the Department of the Interior's strategy for addressing climate change as expressed in Secretarial Order 3289 (DOI 2009).

The Service will use the following guiding principles from the draft strategic plan (FWS 2009f) in responding to climate change:

- *Priority Setting*—Continually evaluate priorities and approaches, make difficult choices, take calculated risks, and adapt to climate change.

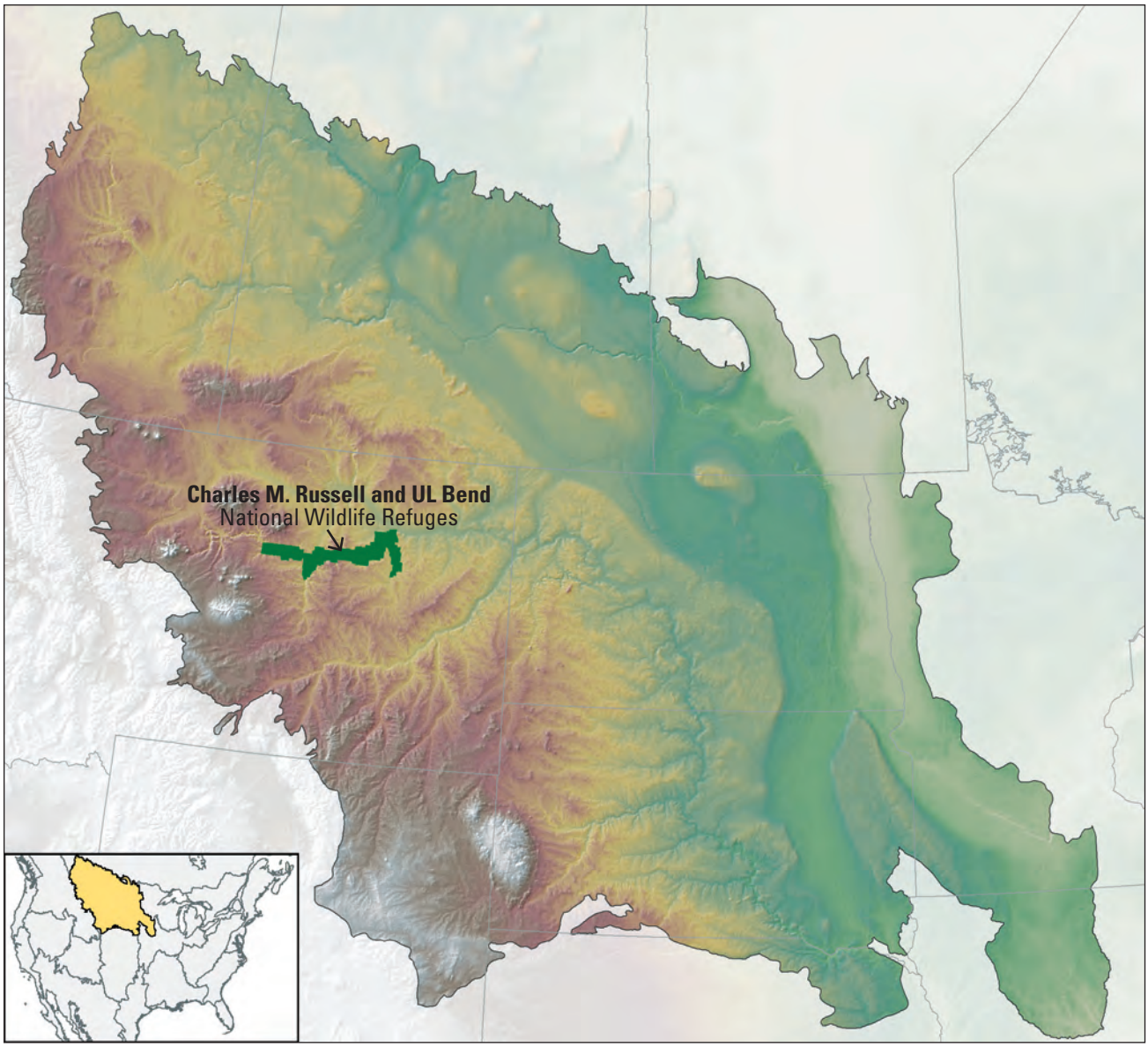


Figure 3. Map of the Plains and Prairie Potholes Geographic Area.

- *Partnership*—Commit to a new spirit of coordination, collaboration, and interdependence with others.
- *Best Science*—Reflect scientific excellence, professionalism, and integrity in all the Service's work.
- *Landscape Conservation*—Emphasize the conservation of habitats within sustainable landscapes, applying the Service's strategic habitat conservation framework.
- T*echnical Capacity*—Assemble and use state-of-the-art technical capacity to meet the climate change challenge.
- *Global Approach*—Be a leader in national and international efforts to meet the climate change challenge.

1.6 Planning Process

In 2000, the Service issued its Refuge System planning policy (FWS 2000c). The resulting requirements and guidance for refuge and district plans—including CCPs and step-down management plans—ensure that planning efforts comply with the Improvement Act. The planning policy sets out the steps of the CCP and environmental analysis process (see figure 4).

The Service began the pre-planning step for the refuge's CCP in June 2007 with the establishment of a core planning team comprised of Service personnel from the refuge and region 6. Appendix A–Preparers and Contributors lists the planning team members, cooperating agency members, contributors, and consultants for this planning process.

The core team is responsible for the analysis, writing, and production of the draft and final versions of the CCP and EIS. Together with the entire refuge staff, the core team developed a preliminary vision and set of goals for the refuge. The cooperating agencies (refer to 1.7–Public Involvement) are part of the larger planning team, which has met throughout the process to develop and review the alternatives and to review drafts of the CCP and EIS.

While developing the draft CCP and EIS, the planning team collected available information about the resources of the refuge and surrounding area. This information is summarized in Chapter 4–Affected Environment and served as baseline information for analyzing the predicted effects of alternatives documented in Chapter 5–Environmental Consequences. Table 1 lists these and many other planning activities that have occurred to date.

1.7 Public Involvement

Public scoping began in October and November 2007 with the publication of a public involvement summary and a planning update that described the CCP process and anticipated schedule (FWS 2007a). The Service published a notice of intent to prepare the draft CCP and EIS in the Federal Register on December 4, 2007. Since then, the Service has conducted 14 public meetings during scoping and development of the draft alternatives, mailed four planning updates, posted information on the CCP web page, and coordinated with Federal, State, and local agencies, and Native American tribes.

An important consideration in the development of this plan—including the vision, goals, objectives and strategies—is the opinions, perspectives, and values of all interested citizens, agencies, and organized groups. While there are no requirements to base management decisions on public opinion, the Service values and considers input from the public. As detailed in Appendix B–Public Involvement, the Service has consulted with Native American tribes and actively involved Federal and State agencies, local governments, organizations, and private citizens throughout the planning process.

COOPERATING AGENCIES

The Service sent letters of notification about the planning process including an invitation to participate on the planning team to the both MFWP and DNRC. The Service also notified the Montana State Historic Preservation Office and the six counties (Fergus, Garfield, McCone, Petroleum, Phillips, and Valley).

Figure 4. The process for comprehensive conservation planning and environmental analysis.

In September 2007, Service staff met with representatives from the conservation districts and the counties to inform them of the CCP and EIS process, answer any questions about the project, and gather any issues or concerns.

The Service received formal letters requesting cooperating agency status from the six counties, the Missouri River Conservation Districts Council, and the Garfield County Conservation District. The Service granted the six counties cooperating agency status, and two representatives attend the planning team meetings on the counties' behalf. The Service also granted the six conservation districts that surround the refuge cooperating status, and one representative attends meetings on the districts' behalf.

Table 1. Planning process summary for the CCP for the Charles M. Russell and UL Bend refuges.

Date	*Planning Activity*	*Outcome*
June 2007	Initial site meeting	Finalization of planning team. Identification of refuge purposes and initial list of issues and qualities. Development of the CCP overview and mailing list.
October 9–12, 2007	Kickoff meeting and workshop for vision and goals	Update of the list of issues and qualities. Identification of needed biological information and maps. Draft of vision and goals. Process for public scoping.
October 7, 2007	Public Involvement Summary	Report of the planned public involvement process for use as a handout and posting to the CCP web page.
Fall 2007	Scoping	Notification or briefing about the CCP development to State of Montana, Native American tribes, agencies, county commissioners, conservation districts, and organizations.
November 14, 2007	Planning team kickoff	Initial meeting with refuge staff and the planning team.
December 4, 2008	Notice of intent in the Federal Register	Notice of intent to develop a CCP and EIS and a request for comments published in the Federal Register (scoping comments accepted until February 29, 2008).
January 2008	Planning Update 1	Announcement of dates, location, and format of public meetings; and description of the draft vision and goals. Distribution of update to the mailing list and posting to the CCP web page.
January 28–30, 2008 February 4–6, 21, 2008	Public scoping meetings	People in six adjacent communities informed about the refuge and CCP development.
April 2008	Scoping report	Documentation of public comments from the comment period and identification of significant issues. Posting of report to the CCP web page.
April 29–May 1, 2008	Planning team meeting for draft alternatives	Development, discussion, and revision of draft alternatives with refuge staff and the planning team.
May 2008	Planning Update 2	Summary of issues identified during the scoping process. Distribution of update to the mailing list and posting to the CCP web page.
August 6, 2008	Draft alternatives	Release to the public of four draft alternatives. Posting of draft alternatives to the CCP web page.
August 2008	Planning update 3	Summary of four alternatives and schedule for the alternative workshops. Distribution of update to the mailing list and posting to the CCP web page.
September 2–4, 15–17, 2008	Public workshops for draft alternatives	Input about the draft alternatives from people in six communities.
January 2009	Planning Update 4	Summary of comments received on the draft alternatives. Distribution of the update to the mailing list and posting to the CCP web page.
January 27–29, 2009	Workshop for biological objectives and strategies	Development of biological objectives and strategies for each alternative.

Table 1. Planning process summary for the CCP for the Charles M. Russell and UL Bend refuges.

Date	*Planning Activity*	*Outcome*
February 24–26, 2009	Workshop for public use objectives and strategies	Development of public use objectives and strategies for each alternative.
March 18, 2009	Meeting with MFWP for wildlife objectives	Identification of potential outcomes for the objectives for big game and wildlife reintroductions.
May 12, 2009	Transportation meeting	Development of information on road data and the transportation aspects of the draft alternatives.
March 2009–March 2010	Draft CCP and EIS	Initial development of the draft CCP and EIS.
July 2009	Tribal consultation	Consultation with the Fort Peck Tribes and Fort Belknap Tribes about the CCP and EIS process.
April 2010	Internal review of the draft CCP and EIS	Review of the draft plan by other Service programs and cooperating agencies.
June 2010	Review meeting	Met with cooperating agencies to review comments on the internal review document.

TRIBAL COORDINATION

The Service sent letters of notification about the planning process including an invitation to participate on the planning team to the following tribes: Arapahoe Business Council, Chippewa Cree Tribe, Crow Tribal Council, Fort Belknap Tribal Council, Fort Peck Tribal Council, and Northern Cheyenne Tribe. The Service has continued to communicate with the tribes and encourage participation in the CCP process. The Service formally consulted with the Fort Belknap Tribes and Fort Peck Tribes in July 2009.

INVOLVEMENT of INTERESTED GROUPS and the PUBLIC

Many interested groups and private citizens have participated in the CCP process by attending public meetings, submitting comments, or obtaining information about the plan from the CCP web page or other outreach methods.

1.8 Significant Issues to Address

The scoping process identified many qualities of the refuge along with issues and recommendations. Based on this information as well as guidance from the Improvement Act, National Environmental Policy Act, and planning policy, the Service identified seven significant issues to address in the draft CCP and EIS:

- Habitat and wildlife
- Water resources
- Public use and access
- Wilderness
- Socioeconomics
- Partnerships and collaboration
- Cultural values, traditions, and resources

The planning team considered every comment received during the public scoping process. These comments were grouped into related topics and subtopics as described in the scoping report published on the CCP web page in April 2008 (FWS 2008c). Significant issues are those that are within the Service's jurisdiction, that suggest different actions or alternatives, and that will influence the Service's decision.

HABITAT and WILDLIFE

The refuge encompasses more than a million acres of expansive badlands (arid lands dissected by steep, eroded slopes), riparian areas, old growth forested coulees (ravines), sagebrush steppes (level, shrub land plains), and mixed-grass prairie in north-central Montana. This draft CCP and EIS addresses the following aspects of the habitat and wildlife issue:

- The use and role of wildfire, livestock grazing (including water resources needed to support livestock), hunting, fencing, and other management tools for the preservation and restoration of habitat conditions on the refuge
- Habitat and wildlife management in the context of the larger landscape that includes adjacent private, State, tribal, and Federal lands
- Species reintroductions or management of species that could move onto the refuge: American bison, gray wolf, grizzly bear, and Rocky Mountain bighorn sheep
- Special consideration of threatened and endangered species and species of concern

- Invasive species and noxious weed management including the management tools used to combat invasive species
- Predator management

WATER RESOURCES

Wildlife populations, both on and off the refuge, are affected by water quality and access to water. Livestock grazing has degraded habitat, particularly near water sources. Furthermore, stock watering ponds can affect stream flow, fish, and riparian areas conditions. The draft CCP and EIS addresses these important aspects of the water resources issue:

- Water quality and quantity
- Water development
- Missouri River riparian ecosystem
- Water rights

PUBLIC USE and ACCESS

The refuge is one of the most visited refuges in the Refuge System, with 233,081 recreational visits in 2006 (Carver and Caudill 2007), and it is the main core of a larger regional area that provides many outdoor recreation opportunities and access. The most popular activity is hunting. Large populations of wild ungulates (elk, deer, and pronghorn) offer renowned hunting opportunities that attract local, regional, out-of-state, and international visitors. The refuge provides uncrowded, solitary experiences not afforded on other public lands, and many areas require skills in self-reliance and backcountry travel. However, about 80 percent of the refuge is accessible by more than 680 miles of road (mostly two-track and gravel roads), and there are 135 miles of lake and river access for visitors to participate in a variety of activities.

The Service allows the public uses of hunting, fishing, wildlife observation, photography, interpretation, and environmental education. In addition, the Service supports these uses by providing associated access and facilities such as roads, motorized access, and camping. This draft CCP and EIS addresses the following important aspects of the public use and access issue:

- Priority public uses—hunting, fishing, wildlife observation, photography, interpretation, and environmental education
- Motorized and nonmotorized access and law enforcement
- Roads including number, location, types, and maintenance
- Nonpriority uses such as camping and bicycling
- Facilities, programs, and infrastructure to support public uses and access
- Permitted uses such as other commercial recreation, livestock grazing, or other uses

WILDERNESS

There is one federally designated wilderness within the refuge boundaries—UL Bend Wilderness is about 20,819 acres. In addition, there are 15 units of proposed wilderness (155,288 acres). These units are awaiting congressional action on formal inclusion into the National Wilderness Preservation System. It is Service policy to manage proposed wilderness units as though they were designated wilderness (FWS 2008d).

Planning policy requires refuges to review special designation areas such as wilderness and address the potential for any new designations. Concurrent with the CCP and EIS process, the Service is conducting a wilderness review (refer to Appendix E–Wilderness Review and Summary) and will make final recommendations in the final EIS. This draft CCP and EIS addresses the following aspects of the wilderness issue:

- Existing proposed wilderness units—consolidation, addition, or reduction
- Identification of potential for any new designations
- Access, infrastructure, and use of management tools

SOCIOECONOMICS

It is important to manage refuge resources and public use in ways that protect the resources, that are financially responsible, and that are integrated with the economic viability of the surrounding communities. This draft CCP and EIS addresses the following aspects of the socioeconomics issue:

- Benefits of the refuge and promotion of refuge values
- Range of alternatives and effects of those alternatives on the local economy and community

PARTNERSHIPS and COLLABORATION

Because of the long, narrow extent of the refuge boundary, the subsequent amount and variety of adjacent land uses not only affect, but also are interrelated with, refuge resources. Therefore, it is crucial for the Service to collaborate with refuge neighbors and to establish partnerships with interested agen-

Yellowcress

cies, stakeholders, and other organizations. Wildlife populations and movements are greatly affected by conditions both outside and inside the refuge. Similarly, invasive species are one of the biggest threats facing State, Federal, and private landowners. Reduced budgets require collaboration between the Service and others to leverage money for combating invasive plants and managing wildlife on lands within and adjacent to the refuge. Changes in the ownership of private lands adjacent to the refuge may change conditions for habitat, wildlife, and public access. Privately owned mineral rights, future energy development, and rights-of-way influence the future conditions and use of the refuge and adjacent lands. This draft CCP and EIS addresses the following important aspects of the partnerships and collaboration issue:

- Adjacent land management related to habitat, wildlife, and public use
- Consultation and coordination with Federal, State, and local partners
- Climate change and development of minerals, including recommendations for reducing effects on refuge resources
- Priorities for future land acquisition

CULTURAL VALUES, TRADITIONS, and RESOURCES

The refuge, second largest in the lower 48 States, contains unique qualities that are valued on a national, regional, and local level (refer to Chapter 2–Refuge History and Vision). Montana's glaciated plains in and around the refuge support rich and diverse wildlife populations. In addition to its wildlife value, the geology and landforms have created valued scenery and backcountry areas: the Upper Missouri National Wild and Scenic River is along the refuge's western boundary, the refuge is part of the Missouri Breaks National Back Country Byway, and large areas are designated or proposed for the National Wilderness Preservation System. During scoping, many people described the refuge's qualities as rugged, isolated, and offering outstanding opportunities for solitude, hunting, fishing, and other public uses.

The refuge has significant archaeological resources and rich prehistoric and historic values to the local and regional community from when Native Americans hunted the lands to the area's documentation by the Lewis and Clark expedition. The western traditions and practices of livestock grazing have affected the lives of ranchers and their families for many generations. Of unique value for a refuge, Charles M. Russell and UL Bend refuges have significant paleontological resources (fossilized plants and animals).

This draft CCP and EIS addresses the following aspects of the resource and cultural values issue:

- Refuge values and qualities
- Land management designations
- Traditions and lifestyles
- Cultural and paleontological resources

1.9 Issues Not Addressed

The Service considered several issues that were identified by the public during scoping and alternatives development and did not select them for detailed analysis in this draft CCP and EIS. In accordance with requirements of the National Environmental Policy Act, the Service has identified and eliminated from detailed study the topics or issues that are not significant or are out of the scope of this planning process. These issues and the rationale for not selecting them as significant issues are briefly described below.

ENHANCEMENT ACT

Title VIII of the Water Resources Development Act of 2000 is known as the Enhancement Act. The act authorized the Secretary of the Army, working with the Secretary of the Interior, to identify cabin sites suitable for sale to current lessees. The Enhancement Act also directed the performance of necessary environmental and real estate activities to dispose of these cabin sites at fair market value. Money from the sale of the cabin sites will be deposited in the Montana Fish and Wildlife Conservation Trust for use in acquiring other lands with greater wildlife and public value for the refuge. The actions outlined in the Enhancement Act, including the time limits imposed in the act, are outside the scope of this planning process. The Service does not have control over the sale of the cabins.

EXERCISE of PRIVATE PROPERTY RIGHTS for MINERAL EXTRACTION

The draft CCP and EIS does not address the rights of private property owners to exercise their rights to extract minerals on State or private lands within or adjacent to the refuge.

FORT PECK LAKE LEVELS

Fort Peck Lake is the Nation's fifth-largest constructed reservoir and backs up from the dam for about 134 river miles to the west and south. At maximum pool levels, the lake surface area is about 245,000 acres (USACE 2009). The Fort Peck Project was authorized for flood control, navigation, hydropower,

wildlife, recreation, municipal and industrial water supply, and irrigation. Management of Fort Peck Lake is under the authority of USACE; therefore, determination of water levels on Fort Peck Lake is outside the scope of this Service planning process.

LIVESTOCK GRAZING FEES, TRANSFER of GRAZING PERMITS, and ANIMAL UNIT MONTHS

Grazing Fee Rates

Service guidance on grazing including the process for determining rates of charge is provided in the Refuge Manual (6 RM 9) (FWS 1982). Neither the Public Rangelands Improvement Act of 1978, the Federal Land Policy and Management Act of 1976, nor the Taylor Grazing Act apply to the Service's management of grazing lands within the refuge. For region 6, grazing fee rates are based on the U.S. Department of Agriculture (USDA) Statistics Board publication, Grazing Fee Rates for Cattle by Selected States and Regions (USDA 2008). The USDA fee structure is adjusted each year based on data available. Region 6 uses the annual published USDA rate as the base rate of charge with increases in the yearly fee allowed by $1.00 per AUM until the base rate is reached. The refuge began adjusting to fair market value for grazing rates in 1994 per national Service guidance. The grazing fee rates for the refuge are the same rates for refuges across Montana. Grazing fees are not addressed in the draft CCP and EIS.

Transfer of Grazing Privileges

Unlike other public lands such as BLM lands, the Improvement Act does not provide for the transfer of grazing permits. The transfer of grazing privileges on the refuge follows current policies, which have guided permit transfers associated with ranch sales. Grazing is considered a secondary use on a national wildlife refuge and must be compatible with the purposes of the refuge. Therefore, the draft CCP and EIS does not address this topic further.

Increase Animal Unit Months

The 1986 record of decision for the final EIS for resource management for the refuge (FWS 1986) called for a substantial decrease in the number of AUMs of livestock grazing. This decision was subsequently implemented and is the basis of the no-action alternative described in chapter 3. This draft CCP and EIS will not readdress the 1986 record of decision regarding the maximum number of AUMs that could be grazed (refer to Chapter 2–Refuge History and Vision for more information including past litigation). Instead, this draft CCP and EIS addresses how livestock grazing would be used as a management tool to meet specific goals and objectives for managing habitat and wildlife, which are described in the Improvement Act and the Service's planning policy.

REFUGE REVENUE-SHARING PAYMENTS and PAYMENTS in LIEU of TAXES

Since 1935, the Service has made revenue-sharing payments for refuge land under its administration to counties under the Refuge Revenue Sharing Act of 1935 (16 U.S.C. 715s), which has been revised several times. These payments are not the same as other Federal revenue-sharing measures such as Payments in Lieu of Taxes, which applies to lands administered by USACE and by other Department of the Interior agencies such as BLM. When there is not enough money to cover the payments, Congress is authorized to appropriate money to make up the deficit; however, payments to a county are reduced when Congress fails to appropriate the money. These are issues of considerable concern for the six counties, but the refuge has no control over these payments and, as such, they are outside the scope of this draft CCP and EIS.

ROADS under REVISED STATUTE 2477 and PETITIONED ROADS

Several of the adjacent counties asked that Revised Statute 2477 roads or county-petitioned roads be recognized as legally valid roads in the planning process. Section 2477 of the Revised Statutes emerged from Section 8 of the Mining Act of 1866 to promote public highway construction through the large, unsettled western territories. Revised Statute 2477 was repealed on October 21, 1976, by the Federal Land and Policy and Management Act (43 U.S.C.§ 932). Because this act did not terminate valid existing rights-of-way, the existence and extent of many Revised Statute 2477 claims remains an issue today. Determining the validity of any Revised Statute 2477 claim is outside the scope of the CCP and EIS process because the Service has no control over determining the legal validity of roads.

Similarly, one or more of the adjacent counties have identified roads within the refuge that they believe were legally petitioned as county roads recorded before refuge establishment. Some of these roads follow near or on the same alignment as current refuge roads. Other roads, often never more than a two-track trail, were closed long ago. Some of these roads are in the UL Bend Wilderness or are within USACE's primary jurisdiction. Like Revised Statute 2477 claims, determining or recognizing the legal validity of these rights-of-way is outside the scope of the draft CCP and EIS.

MILITARY OVERFLIGHTS

The refuge is located beneath the Hays Military Operations Area. This airspace operations area overlies a large portion of north-central Montana at altitudes ranging from 300 feet above ground level, up to 18,000 feet above mean sea level. The Federal Aviation Administration has the responsibility to plan, manage, and control the structure and use of all airspace over the United States, including the Hays Military Operations Area. Furthermore, the Improvement Act specifically exempted overflights above a refuge from compatibility requirements (FWS 2000a). Therefore, the Hays Military Operations Area is outside the scope of this planning process.

1.10 Scope of the Document

This planning process considers different geographic designations—the decision area and primary analysis area—as depicted in figure 5.

DECISION AREA

The decision area is the area within the designated boundaries for the Charles M. Russell and UL Bend National Wildlife Refuges (figure 5; refer to chapter 2 for a complete description of the refuge). Where USACE holds primary jurisdiction and the refuge has secondary jurisdiction (refer to chapters 2 and 3), a memorandum of understanding provides guidance on how habitat and wildlife resources are managed.

ANALYSIS AREA

The analysis area (figure 5) includes the decision area and areas outside of the decision area where most of the direct, indirect, or cumulative effects could occur as a result of implementing the alternatives. The analysis area includes the area used in the socioeconomic analysis (section 4.8 in chapter 4; section 5.10 in chapter 5). Additionally, the foreseeable activities in this area that could result in cumulative impacts are described in detail in chapter 3 under section 3.9.

INSERT FIG. 5
11x17

FIG. 5

blank back

2—Refuge History and Vision

USFWS

The topography on the refuge is varied and diverse.

This chapter explains the history, purpose, and special values of the Charles M. Russell and UL Bend National Wildlife Refuges, as well the development of the vision and goals for the CCP planning process. These refuges are part of a complex of refuges managed from the headquarters station in Lewistown, Montana. Because the UL Bend refuge lies within the boundary area of the Charles M. Russell refuge, essentially they are managed as one unit even though they were established through different authorities and for different purposes. Several other refuges and a wetland management district are part of the refuge complex but are not part of this draft CCP and EIS.

Every refuge has a purpose for which it was established. This purpose is the foundation on which to build all refuge programs, from biology and public use to maintenance and facilities. Refuge purposes are found in the legislative acts or administrative orders that authorize either the transfer or acquisition of land for a refuge. An individual refuge may contain lands that have been acquired under a variety of transfer and acquisition authorities, giving a refuge more than one purpose. This is true for Charles M. Russell National Wildlife Refuge and UL Bend National Wildlife Refuge; table 2 lists the significant land authorizations for the refuges. The goals, objectives, and strategies in the draft CCP (refer to Chapter 3–Alternatives) are intended to support the purposes for which both refuges were established.

2.1 Establishment, Acquisition, and Management History

Although the UL Bend National Wildlife Refuge is within the boundary of the Charles M. Russell National Wildlife Refuge, they were established through different authorities as shown in table 2. This section first describes each refuge separately, and then summarizes the existing management of the refuges as one unit.

Table 2. History of significant land authorizations for the Charles M. Russell and UL Bend refuges.

Date	*Authority*	*Number*	*Subject*
12/12/1933	Executive order	6491	Lands withdrawn for Fort Peck Dam (USACE)
05/09/1934	Executive order	6707	Lands withdrawn for Fort Peck Dam (USACE)
09/11/1934	Executive order	6841	Lands withdrawn for Fort Peck Dam (USACE)
04/03/1936	Executive order	7331	Lands withdrawn for Fort Peck Dam (USACE)
12/11/1936	Executive order	7509	Fort Peck Game Range established; jurisdiction transferred from USACE to what is now the U.S. Fish and Wildlife Service; superseded Executive Order 6910 that provided for prevention of injury to public livestock grazing lands through overgrazing and soil deterioration
04/13/1942	Executive order	9132	Lands withdrawn for Fort Peck Dam (USACE)
02/25/1963	Public land order	2951	Name changed to Charles M. Russell National Wildlife Range
03/25/1969	Public land order	4588	UL Bend National Wildlife Refuge designated and Executive Order 7509 withdrawn; established by the Migratory Bird Conservation Commission on February 7, 1967
05/15/1970	Public land order	4826	Mineral entry withdrawn for UL Bend National Wildlife Refuge
04/25/1975	Public land order	5498	Jurisdiction of certain lands transferred to BLM
04/12/1976	Public law	94–486	Modification of the Wild and Scenic Rivers Act applied a scenic designation to the river and its bank within Charles M. Russell National Wildlife Range as part of the Upper Missouri River National Wild and Scenic River
10/19/1976	Public law	94–557	UL Bend Wilderness designated in portions of UL Bend National Wildlife Refuge; size eventually modified to about 20,819 acres
04/25/1978	Public land order	5635	Public Land Order 5498 revoked and name changed to Charles M. Russell National Wildlife Refuge under administration of the Refuge System
09/28/1993	Public land order	6997	Mineral estate withdrawn within Charles M. Russell National Wildlife Refuge for 20 years
12/08/1993	Wildlife order	183	General Services Agency transfer of 6,020 acres from USACE to the Service for wildlife conservation

CHARLES M. RUSSELL NATIONAL WILDLIFE REFUGE

Encompassing nearly 1.1 million acres including Fort Peck Reservoir and the UL Bend refuge, Charles M. Russell National Wildlife Refuge is the second largest refuge within the lower 48 States (see figure 6). This refuge in north-central Montana extends west about 125 air miles along the Missouri River from Fort Peck Dam to the refuge's western edge at the boundary of the Upper Missouri River Breaks National Monument (BLM-administered). The refuge spans six counties: Fergus, Garfield, McCone, Petroleum, Phillips, and Valley. Habitat includes native prairie, forested coulees (ravines), river bottoms, and badlands (arid lands dissected by steep, eroded slopes). Wildlife is as diverse as the topography and includes Rocky Mountain elk, mule deer, white-tailed deer, pronghorn, Rocky Mountain bighorn sheep, sharp-tailed grouse, prairie dogs, and more than 236 species of birds (refer to the refuge species list in appendix F). A portion of the Missouri River along the refuge's western boundary is part of Upper Missouri River National Wild and Scenic River.

Establishment and Acquisition

In May of 1805, Meriwether Lewis and William Clark first detailed accounts of the abundant wildlife resources they found in the area now known as Charles M. Russell National Wildlife Refuge during their Corps of Discovery journey of the Missouri River (Moulton 2002). One hundred-thirty years later in August 1935, Olaus Murie—a biologist for the Bureau of Biological Survey (now the U.S. Fish and Wildlife Service)—traveled to the Fort Peck area to do a biological assessment. He documented his findings in a report about the Fort Peck Migratory Bird Refuge (Murie 1935). Of interest in Murie's comprehensive assessment of the topography, soils, vegetation, wildlife, and grazing, was his notation on

back of Figure 6 west

INSERT 11x17
Figure 6 west

INSERT 11x17
Figure 6 east

back of Figure 6 east

sharp-tailed grouse and the importance of shrubs to its distribution and abundance. He estimated that 25,000–40,000 grouse could be sustained on the refuge. Murie observed:

> "The sharp-tailed grouse was given careful study since this is the most important bird affected by the plans for the refuge. We found that this is true sharp-tailed range. Of course, as in the case of big game animals, the winter period is the critical one and we studied the factors concerned in this phase of its life history. In the winter, these grouse spend much time in the Missouri River bottoms but live also in the rough breaks, especially at the heads of numerous draws. Their distribution is of course largely determined by the food supply. It is known that in winter they feed extensively on buffalo berry, snowberry, and rosehips."

Brett Billings/USFWS

The protection of sharp-tailed grouse was specifically identified in the establishing legislation for the refuge.

USFWS

Pronghorn

In 1936, President Franklin D. Roosevelt established the Fort Peck Game Range through Executive Order 7509. The area was set aside for the preservation of wildlife, specifically sharp-tailed grouse, pronghorn, and other wildlife. Beyond the wildlife priorities, resources are to be made available for domestic livestock providing it is compatible with the uses for which the lands were acquired. The executive order detailed the purposes of the game range:

> "That the natural forage resources therein shall be first utilized for the purpose of sustaining in a healthy condition a maximum of four hundred thousand (400,000) sharp-tailed grouse, and one thousand five hundred (1,500) antelope, the primary species, and such nonpredatory secondary species in such numbers as may be necessary to maintain a balanced wildlife population, but in no case shall the consumption of the forage by the combined population of the wildlife species be allowed to increase the burden of the range dedicated to the primary species: Provided further, That all the forage resources within this range or preserve shall be available, except as herein otherwise provided with respect to wildlife, for domestic livestock ... And provided further, That land within the exterior limits of the area herein described ... may be utilized for public grazing purposes only to the extent as may be determined by the said Secretary (Agriculture) to be compatible with the utilization of said lands for the purposes for which they were acquired."

It is unclear why there was a discrepancy between Murie's estimate for the number of sharp-tailed grouse that could be sustained and what appeared in the executive order. Chapter 4–Affected Environment has more information about the vegetation and wildlife found on the refuge.

Since 1936, other lands within the refuge have been acquired under a variety of transfer and acquisition authorities or have different designations (refer to table 2). Today, the Charles M. Russell refuge (not including the UL Bend refuge and Fort Peck Reservoir) is comprised of about 915,814 acres of which 739,097 acres are reserved from the public domain. The Service has sole jurisdiction on about 358,196 acres and secondary jurisdiction on the remainder where USACE has primary jurisdiction. The Federal Government has acquired another 155,973 acres where the Service has primary jurisdiction on 8,574 acres and secondary jurisdiction on the remainder. The remaining acreage has been purchased (13,698 acres), received by donation (139 acres), or is under agreement or lease (6,907 acres) (FWS 2008).

Management History

Originally, the secretaries for the Department of Agriculture (The Bureau of Biological Survey, in Agriculture, was the principle precursor agency of the Service) and the Department of the Interior administered the game range jointly. In comanag-

ing the uplands from 1936 to 1976, the Service and the BLM struggled to maintain the lands' value to wildlife while supporting a large number of livestock. With differing agency mandates and missions, the management arrangement functioned poorly (FWS 1986). The Fort Peck Game Range became the Charles M. Russell National Wildlife Range in 1963 (Public Land Order 2951) in recognition of Charlie Russell, the colorful western artist who often portrayed the refuge's landscape in his paintings (refer to table 2).

The administrative status of Charles M. Russell and all other game ranges in the Nation was changed on February 27, 1976, by the signing of Public Law 94-223 (90 Stat. 199). Commonly called the Game Range Act, this law brought to a close the joint management between the Service and BLM and vested management authority of the game range with the Service. Public Land Order 5635 (1978) changed the name of the game range to Charles M. Russell National Wildlife Refuge and clarified the administration and management of the refuge under the National Wildlife Refuge System Administration Act of 1966, subsequently amended (16 U.S.C. 668dd et seq.) (refer to table 2).

Within the uplands of the refuge lies the Missouri River and the nearly 250,000-acre Fort Peck Reservoir, established by Executive Order 6491 on December 12, 1933. Agreements exist between the Service and USACE for management of areas where the Service has secondary jurisdiction. The Service and USACE cooperatively manage the surrounding edges of the reservoir, and its associated recreational areas.

There are approximately 36,000 acres of State school trust lands (figure 5) managed by DNRC and about 41,000 acres of private inholdings (figure 5) within the refuge. The Service has an offset fire-protection agreement to allow wildfire protection strategies to be used on State lands. This agreement allows for initial attack and other actions related to the spread of wildfire to comply with DNRC's standards for fire suppression on State lands.

The refuge annual performance plan reports that 250,000 visitors, on average, come to the refuge each year. Containing some of the best elk habitat in Montana, the refuge hosts recreationists not only for hunting, but for fishing, wildlife and landscape photography, wildlife observation, hiking, camping, and much more.

In addition to the UL Bend Wilderness (described in the UL Bend refuge section below), there are 15 areas of about 155,288 acres (public domain and USACE) proposed for wilderness (FWS 1974b). These 15 separate units along the Missouri River and Fort Peck Reservoir (see figure 7 in chapter 3) are awaiting congressional action on their formal inclusion in the National Wilderness Preservation System. In the meantime, these areas are managed in accordance with the Service's wilderness policy (FWS 2008d). More details about wilderness are in Chapter 4–Affected Environment and Appendix E–Wilderness Review and Summary.

UL BEND NATIONAL WILDLIFE REFUGE

UL Bend National Wildlife Refuge is located north of the Missouri River about 50 miles south of Malta, Montana, in Phillips County (see the topographic base map of the refuge in figure 6). Bison, elk, deer, and pronghorn historically used the crossing at this huge bend in the Missouri River, and the abundance of game attracted Native Americans including the Assiniboine, Gros Ventre, and the Blackfeet. Explorer Meriwether Lewis noted the following in his journal on May 21, 1805 (Moulton 2002):

> "The Missouri in its course downward makes a suddon and extensive bend toward the south, to receive the Muscle shell river, the point of country thus formed tho' high is still much lower than that surrounding it, thus forming a valley of wavey country which extends itself for a great distance in a Northerly direction; the soil is fertile, produces a fine turf of low grass and some herbs, also immence quantities of the Prickley pear, without a stick of timber of any description."

In 1896, Oren and Will Bachues established a ranch in the "Big Bend of the Missouri River." The place became known as UL Bend after the ranch's stock brand (FWS 1974c).

Establishment and Acquisition

The refuge was established through the Migratory Bird Conservation Commission on February 7, 1967. On March 25, 1969, Public Land Order 4588 designated the UL Bend National Wildlife Refuge on about 39,456 acres (revoking Executive Order 7509 on those lands). The order defined the refuge's purpose: "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (Migratory Bird Conservation Act, 16 U.S.C. 715d). Although it was primarily established for development and management of waterfowl, other wildlife including the endangered black-footed ferret, elk, deer, pronghorn, migratory birds, and other prairie species use refuge habitat.

Today, the UL Bend refuge contains about 56,050 acres (FWS 2008a). Of this land base, 36,576 acres are reserved from public domain, where the Service has sole or primary jurisdiction on 29,678 acres and secondary jurisdiction on 6,897 acres. About 9,226 acres were acquired by another Federal agency, where the Service has primary jurisdiction on about

Google Earth

The bend in the Missouri River at its confluence with the Mussellshell River.

1,300 acres and secondary jurisdiction on the remainder. Another 9,688 acres have been purchased, and another 560 acres are under easement or lease (FWS 2008a). Following passage of the Wilderness Act of 1964, there was a wilderness study of lands (FWS 1974c). In 1976, Public Law 94-557 (90 Stat 2633–4) designated about 20,890 acres in the refuge as the UL Bend Wilderness (refer to table 2). This acreage was later modified to its current size of about 20,819 acres (see figure 7 in chapter 3). More details about wilderness are in Chapter 4–Affected Environment and Appendix E–Wilderness Review and Summary.

Management History

Early development plans called for the construction of a series of dikes in the interior of the refuge to convert uplands to aquatic habitat for waterfowl. Some attempts were made toward this development but these were never completed, and the plans were abandoned.

EXISTING MANAGEMENT

For nearly 25 years, the Service has managed the refuge under a resource management plan that was developed through an EIS and approved in a record of decision signed April 1986 (FWS 1985, 1986). In addition to identifying specific habitat and wildlife objectives, the record of decision called for a sizeable reduction in annual livestock grazing. While implementation of the 1986 record of decision has helped to improve habitat for wildlife, many problems and issues still exist (refer to Chapter 4–Affected Environment). The refuge has 65 habitat units and one concern is that many of these units are not meeting the habitat objectives set forth in the 1985 EIS. Due to a host of issues such as drought, climate change, grazing by wildlife and livestock, invasive species, and altered fire regimes, the uplands have seen a decline in desirable species such as forbs and shrubs. Some riparian areas are functioning in poor condition, and invasive species are of concern. There have been court challenges to the Service's management of the refuge both before and after the 1986 record of decision, and these decisions have influenced refuge management as described below.

Schwenke v. Secretary of the Interior, 720 F.2d 571 (Ninth Circuit, 1983): The Ninth Circuit Court of Appeals addressed the issue of whether grazing or wildlife conservation had priority of forage resources at the Charles M. Russell refuge. The lower court had found that conservation and grazing were of coequal priority and that grazing on refuge land should be administered under the Taylor Grazing Act. On appeal, the Ninth Circuit Court held that, under Executive Order 7509, wildlife has a limited priority to the refuge's forage resources. Beyond Executive Order 7509's wildlife population limits (400,000 sharp-tailed grouse, 1,500 pronghorn, and "non-predatory secondary species in such numbers as may be necessary to maintain a balanced wild-

life population") wildlife and grazing livestock have coequal priority to the refuge's forage resources. The court also held that amendments to the National Wildlife Refuge Administration Act of 1966 (Public law 89-669; 80 Stat. 927; codified as amended at 16 U.S.C. Sec. 668dd [1976]) shifted administration of national wildlife refuges from being under the Taylor Grazing Act to the National Wildlife Refuge Administration Act of 1966 (commonly known as the Wildlife Refuge Act).

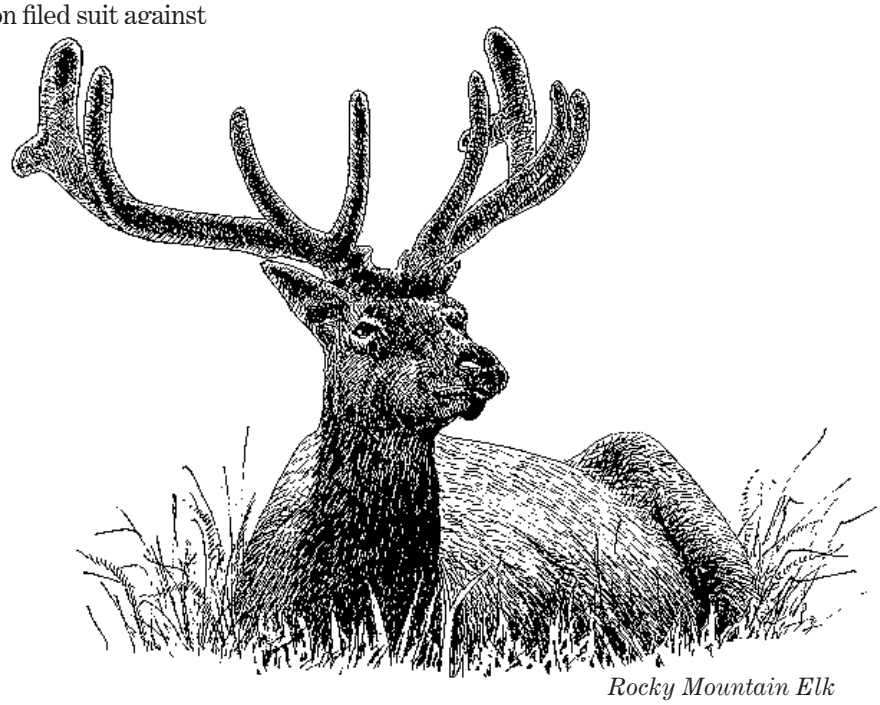
James Kirkland v. Department of the Interior (1996): The plaintiff (Kirkland) challenged an administrative decision when the Service did not renew his grazing permit. The district court found the Service's decision to be a rational decision and not arbitrary and capricious. A grazing permit is not a property right on the Charles M. Russell refuge, and grazing is administered under the National Wildlife Refuge Administration Act of 1966 and not the Taylor Grazing Act. The defendant (Department of the Interior [U.S. Fish and Wildlife Service]) repeatedly notified Kirkland of violations of his grazing permit. Kirkland received due process when the Service complied with Title 50 CFR 25.45 and the described appeal process.

Silver Dollar Grazing Association v. U.S. Fish and Wildlife Service, No. 07-35612, (Ninth Circuit, January 13, 2009): The Ninth Circuit Court of Appeals held that the Service may analyze habitat as a proxy for wildlife populations rather than taking an actual inventory of the populations and that the Service's failure to follow monitoring guidelines in a habitat management plan (HMP) was not arbitrary and capricious. The Silver Dollar Grazing Association filed suit against the Service for allegedly violating the National Environmental Policy Act and the Silver Dollar HMP. The grazing association alleged that prescriptive grazing would harm the environment and that initiating prescriptive grazing before conducting a wildlife population survey violated Executive Order 7509. The district court granted summary judgment for the Service, and the Silver Dollar Grazing Association appealed. The Ninth Circuit Court of Appeals dismissed the suit because Silver Dollar failed to provide evidence that prescriptive grazing would harm the environment. Furthermore, without evidence of a specific, personally suffered injury, the grazing association lacked standing to sue.

2.2 Special Values

Early in the planning process, the planning team and public identified many outstanding qualities and values of the refuge. Refuge qualities are the characteristics and features of the refuge that make it special, valuable for wildlife and people, and worthy of refuge status. Qualities can be unique biological values, as well as something as simple as a quiet place to see a variety of birds and enjoy nature. The following summarizes some of the qualities that make the Charles M. Russell and UL Bend refuges unique and valued:

- The refuge encompasses a large landscape containing diverse species that not only occur today but also are historic residents of the land.
- The refuge is part of a large block of undeveloped land that includes adjacent Federal, State, and private lands.
- The UL Bend refuge contains high-quality wintering habitat for sage-grouse.
- There is great potential for improving important habitat for sharp-tailed grouse.
- The riparian corridor through the refuge is one of the last natural free-flowing remnants of the Missouri River where natural processes like flooding and cottonwood regeneration still occur.
- The Missouri River breaks provide excellent habitat for both Rocky Mountain elk and mule deer.



Rocky Mountain Elk

- The refuge supports a premier elk population consisting of good herd population dynamics and good herd structure with diverse age classes.
- The refuge supports the only black-footed ferret population in Montana.
- There is a large amount of public land, such as the BLM land, within the vicinity and buffering the refuge.
- Multiple wilderness designations provide habitat protection and provide opportunities to experience the remoteness of the landscape.
- Multiple land designations within and adjacent to the refuge complement the refuge: Wild and Scenic River designation within the refuge and the adjacent Upper Missouri River Breaks National Monument managed by BLM, UL Bend Wilderness and proposed wilderness, and the Missouri Breaks National Back Country Byway.
- The refuge is home to several threatened and endangered species including birds of concern such as the piping plover, mountain plover, and sage-grouse. Other species such as the black-tailed prairie dog and many reptile species are found on the refuge.
- The refuge is host to more than 150 homesteaded river bottoms. There are more than 300 known archeological sites, mostly Native American.
- There are important paleontological resources associated with the Hell Creek Formation found on the refuge. The refuge also contains fossils from the Early Tertiary Tullock Formation of the Fort Union Group showing the transition from the "Age of Reptiles" to the rise of mammals (Bug Creek).
- The large landscape offers the opportunity for a remote recreational experience of a landscape and wildlife not available elsewhere.
- The refuge attracts numerous recreationists including Montanans from every county and multiple out-of-state recreationists.
- The refuge provides a large outdoor laboratory for potential research and science investigation by graduate students, with the opportunity to provide biological data to refuge staff.
- The refuge offers opportunities for wildfire research including understanding how fires shape the landscape and affect species.
- There are multiple opportunities to use natural-ignition wildfire for habitat management at the landscape scale.
- With much of the refuge being accessible either within 1 mile of a road or by the river, it allows for ample access; however, due to its remoteness and rugged terrain, the refuge provides many opportunities to experience wilderness and solitude.

2.3 Vision

The Service developed a vision for the refuge at the beginning of the planning process. The vision describes the focus of refuge management and portrays a picture of the refuge in 15 years.

Charles M. Russell National Wildlife Refuge's expansive badlands, cottonwood river bottoms, old-growth forested coulees, sagebrush steppes, and mixed-grass prairies appear out of the sea that is the northern Great Plains. Encompassing more than a million acres, the refuge affords visitors solitude, serenity, and unique opportunities to experience natural settings and wildlife similar to what Native Americans and, later, Lewis and Clark observed. The diversity of plant and animal communities found on the refuge stretch from the high prairie through the rugged breaks, along the Missouri River, and across Fort Peck Reservoir. The refuge is an outstanding example of a functioning, intact landscape in an ever-changing West. Working together with our neighbors and partners, the Service employs adaptive management rooted in science to protect and improve the biological integrity, biological diversity, and environmental health of the refuge's wildlife and habitat resources.

2.4 Goals

The Service developed eight goals for the refuge based on the Improvement Act, the refuge purposes, and information developed during planning. The goals direct work toward achieving the vision and purposes of the refuge and outline approaches for managing refuge resources.

GOAL for HABITAT and WILDLIFE MANAGEMENT

Conserve, restore, and improve the biological integrity, environmental health, and ecological diversity of the refuge's plant and animal communities of the Missouri River breaks and surrounding prairies to support healthy populations of native plants and wildlife. Working with others, reduce and control the spread of nondesirable, nonnative, invasive plant and aquatic species for the benefit of native communities on and off the refuge.

GOAL for THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN

Contribute to the identification, preservation, and recovery of threatened and endangered species and species of concern that occur or have historically occurred in the northern Great Plains.

GOAL for RESEARCH and SCIENCE

Advance the understanding of natural resources, ecological processes, and the effectiveness of management actions in the northern Great Plains through compatible scientific investigations, monitoring, and applied research.

GOAL for FIRE MANAGEMENT

Manage wildland fire using a management response that promotes fire's natural role in shaping the landscape while protecting values at risk.

GOAL for PUBLIC USE and EDUCATION

Provide all visitors quality education, recreation, and outreach opportunities that are appropriate and compatible with the purpose and goals of the refuge and the mission of the Refuge System while maintaining the remote and primitive experience unique to Charles M. Russell National Wildlife Refuge.

GOAL for WILDERNESS

Conserve, improve, and promote the wilderness quality and associated natural processes of designated and proposed wilderness within Charles M. Russell National Wildlife Refuge for all generations.

GOAL for CULTURAL and PALEONTOLOGICAL RESOURCES

Identify, value, and preserve the significant paleontological and cultural resources of Charles M. Russell National Wildlife Refuge to connect refuge staff, visitors, and the community to the area's prehistoric and historic past.

GOAL for REFUGE OPERATIONS and PARTNERSHIPS

Through effective communication and innovative use of technology and resources, the refuge uses funding, personnel, partnerships, and volunteer programs for the benefit of natural resources while recognizing the social and economic connection of the refuge to adjacent communities.

3—Alternatives

This chapter describes the management alternatives for the Charles M. Russell and UL Bend National Wildlife Refuges. Alternatives are different approaches to management designed to achieve the refuge purposes, vision, and goals; the mission of the Refuge System; and the mission of the Fish and Wildlife Service. Alternatives are formulated to address significant issues, concerns, and problems identified by the Service, cooperating agencies, interested groups, tribal governments, and the public during public scoping and throughout the development of the draft plan. Chapter 1 contains descriptions of these issues.

USFWS

Draft alternatives were presented to the public in the fall of 2008.

3.1 Criteria for Alternatives Development

Following the initial scoping process in fall 2007 and early 2008, the Service held meetings and workshops with the cooperating agencies and the public and identified a reasonable range of preliminary alternatives. Some ideas were eventually eliminated, and those are discussed under section 3.10–Elements Considered but Eliminated from Further Consideration. The Service carried forward the following four alternatives and analyzed them in detail in this EIS:

- Alternative A–No Action
- Alternative B–Wildlife Population Emphasis
- Alternative C–Public Use and Economic Use Emphasis
- Alternative D–Ecological Processes Emphasis (Proposed Action)

These alternatives examine different ways for providing permanent protection and restoration of fish, wildlife, plants, habitats, and other resources and for providing opportunities for the public to engage in compatible wildlife-dependent recreation. Each alternative incorporates specific actions intended to achieve the goals described in chapter 2. However, the no-action alternative A represents the current, unchanged refuge management and may not meet every aspect of every goal. The no-action alternative provides a basis for comparison of the action alternatives B, C, and D.

3.2 Elements Common to all Alternatives

Key elements of refuge management will be included in the final CCP regardless of the alternative selected. For example, the Service will comply with all applicable laws, regulations, and policies for management activities that could affect refuge resources such as soil, water, air, threatened and endangered species, and archaeological and historical resources. These activities include subsurface mineral reservations and management of utility lines, easements, contaminants, and invasive species. A list of key legislation and policies that the Service adheres to is in Appendix D–Key Legislation and Policy. Specific elements common to alternatives follow:

- Significant cultural and paleontological resources will be protected and managed. Individual projects may require additional consultation with the State of Montana's Historic Preservation Office, Tribal Historic Preservation Offices, and other interested parties.
- A number of special regulations for public access on the refuge will continue to apply. Many of these are identified at the beginning of the access discus-

sion under Public Use and Education in section 3.8. The Service will continue to allow for access to private inholdings or State lands. Although the amount or type of access would vary by alternative, the Service will develop a step-down management plan for transportation based on the alternative selected for the final CCP.

- The Service will continue to collect grazing fees in accordance with the region 6 grazing policy.
- The Service will collaborate with USACE in accordance with established agreements. As an example, operation of the Fort Peck Interpretive Center and Museum is a cooperative effort between USACE, the Service, and Fort Peck Paleontology Incorporated.
- The UL Bend Wilderness and all proposed wilderness will be protected in accordance with the 1964 Wilderness Act and the Service's Wilderness Stewardship Policy (FWS 2008d).
- All wildfire suppression and prescribed fire activities will be carried out under an approved fire management plan.
- The Service will carry out actions in the CCP through cooperation and collaboration with Federal, State, tribal, and local governments; nongovernmental organizations; and adjacent private landowners. Section 3.11 describes existing and potential partnerships.
- Through a reciprocal agreement between the Service and DNRC, the Service would aggressively suppress all wildfires that occur on State school-section lands within the boundary of the refuge. The Service would continue to issue special use permits for grazing on the State school sections that recognize those AUMs allotted.
- The control of invasive weeds and integrated pest management will be done using a variety of tools such as biological and mechanical controls, grazing, and herbicides. The Service will continue to update invasive species mapping, use the Service's weed strike team, and work in partnership with others to reduce weed infestations.
- Artesian wells will be capped to prevent depletion of groundwater.
- Several refuge permittees have grazing permits that include Service lands, BLM, and DNRC lands. The implementation of prescriptive grazing on Service lands may impact the ability of permittees to continue to graze DNRC lands within the refuge boundary. It is not the intent of the Service to impact the DNRC's ability to meet their obligation of generating revenue for local schools. The Service will work with local DNRC land managers to allow permittees continued access for grazing DNRC lands. If current permittees of DNRC lands do not want to retain their permits, the Service will work within current budget constraints to obtain leases that benefit refuge management activities.
- The Service would cooperate with partners to provide comparable accessible opportunities for all.

3.3 Structure of Alternative Descriptions

Each alternative is designed to clearly address the goals described in chapter 2; therefore, the alternatives are organized by the following goal headings:

- Habitat and Wildlife Management
- Threatened and Endangered Species and Species of Concern
- Research and Science
- Fire Management
- Public Use and Education
- Wilderness
- Cultural and Paleontological Resources
- Refuge Operations and Partnerships

Sections 3.4–3.7 summarize alternatives A–D, respectively, that the Service developed to achieve the refuge vision and goals and to address the significant issues. There is a no-action, or current management, alternative (A) and three action alternatives (B–D). The Service has identified alternative D as the proposed action. These alternative summaries describe the overall focus of each alternative along with its key management elements. In addition, there is a map of each alternative showing management elements that could be visually represented.

To easily compare the alternatives by topic, section 3.8 contains the detailed actions by which the goals would be achieved. Each goal title is followed by the related objectives for each of the four alternatives. The timeframe to accomplish each objective refers to the number of years after the Service approves the final CCP. Detailed rationale explains how and why each objective would help meet the goal under the specific emphasis of the associated alternative. Additionally, there are strategies listed for achieving each objective. Comparing the objectives and strategies by goal, instead of separating out the topics by alternative, makes it easier to compare the differences between specific objectives without having to flip back through numerous pages. Table 7 in section 3.15 at the end of this chapter is a summary of the actions for each alternative. Table 56 at the end of chapter 5 summarizes the consequences of these actions.

3.4 Summary of Alternative A

(No Action)

Few changes would occur in managing existing wildlife populations and habitat. Wildlife-dependent public and economic uses would continue at current levels. Figure 7 depicts the management of resources and public use for alternative A.

HABITAT and WILDLIFE MANAGEMENT, THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN, RESEARCH and SCIENCE, and FIRE MANAGEMENT

Goals for the topics above are intricately linked in managing habitat, wildlife, and water resources. The elements below reflect these relationships for alternative A.

Habitat

There would be a continued emphasis on big game management, annual livestock grazing, use of fencing for pastures, and invasive species control. Habitats would continue to be managed in the 65 habitat units that were established by BLM for grazing purposes, and residual cover on these units would be measured. Some small bottomland or riparian area restoration projects would occur. Monitoring of habitat would continue at existing levels: (1) residual cover; and (2) sentinel plants (plant species that vanish first when natural ecological processes are out of balance) in areas throughout the refuge.

Livestock Grazing. Livestock would be kept out of most riparian areas with fencing. There would be a gradual move to prescriptive grazing only when units became available or habitat evaluations are completed and when prescriptive grazing is identified as necessary to meet wildlife or habitat objectives.

Wildfire. The current habitat management regime would be maintained mostly through a wildfire suppression program with little use of prescribed fire.

Invasive Species. The existing control programs for invasive species would continue. Actions include mapping; using biological controls, chemical spraying, and weed wash stations; and requiring horse users to use weed-seed–free hay.

Climate Change. Following Service policy and guidelines on climate change initiatives, the Service would carry out the following actions: (1) maintain a wind turbine; (2) continue recycling; (3) increase energy efficiency and adopt other ways to reduce the carbon footprint; and (4) consider what conditions precipitated by climate change the refuge may deal with such as increased drought, longer fire seasons, hotter fires, loss or increase of plant and wildlife species, change in migration patterns, and relocation of species.

Water Resources

Select stock ponds would be maintained and rehabilitated. Riparian habitat would be restored where possible and standard watershed management practices would be enforced. Water rights would be adjudicated and defined.

Wildlife

Inventory and monitoring of wildlife would continue at existing levels: (1) wildlife surveys of Rocky Mountain elk, mule deer, Rocky Mountain bighorn sheep, black-footed ferret, and raptors; (2) lek locations for grouse; (3) black-tailed prairie dog mapping; and (4) mourning dove counts.

Big game would be managed to achieve target levels in the 1986 EIS record of decision: and 2.5 elk per square mile, 10 mule deer per square mile, and 160 bighorn sheep. This includes a more restrictive rifle season for mule deer in some State hunting districts as compared to the State season.

Predator control coordinated by the U.S. Department of Agriculture (Wildlife Services) would occur on a limited basis, but mountain lion hunting and predator hunting or trapping would not be allowed. Limited coyote hunting would be allowed from mid-October through March 1.

Threatened and Endangered Species and Species of Concern

The black-footed ferret recovery effort would continue including releasing animals, intensive monitoring, and disease and habitat management.

PUBLIC USE and EDUCATION

The Service would continue managing public uses to provide for a variety of wildlife-dependent opportunities and programs.

Hunting

Hunting programs would continue for wild ungulates (elk, deer, and pronghorn), upland birds, waterfowl, and coyote (limited hunting). Shooting of nongame species, trapping, and shed-antler hunting would all be prohibited. All other wildlife would be protected. The Service would cooperate with USACE on providing deer hunting opportunities for persons with disabilities. Facilities such as the accessible hunting blind would be maintained or upgraded.

Fishing

State regulations would apply. The Service would continue to allow fishing to be regulated by MFWP.

Wildlife Observation, Photography, Interpretation, Environmental Education, and Outreach

Limited programs would be offered and include the educational bus tour, school visits, and refuge personnel at the fair booth. Facilities such as the auto tour route, elk-viewing area, and other kiosks would be maintained. Seasonal refuge personnel would staff the interpretive center at Fort Peck Field Station.

Access

About 670 miles of road and trails would remain open with limited, seasonal closure of some roads when necessary. The following activities would be allowed: all-terrain vehicle use on public roads providing they are licensed, biking on numbered roads including seasonally closed roads, horseback riding, and public planes that could land only on water or ice as determined by USACE and the refuge's aircraft landing plan. Camping would be allowed throughout the refuge, and vehicle access would be allowed to campsites within 100 yards of a road.

Recreation Sites

The Service would work with USACE on management of boat ramps (about nine ramps have access to water).

Commercial Recreation

Eleven outfitting permits would continue to be offered for hunting, and unregulated commercial fishing and guided fishing would continue to be allowed. Commercial outfitting for coyote hunting would be prohibited. [Note: USACE has primary jurisdiction over Fort Peck Lake and is the lead agency in managing commercial activities on the lake and other USACE-managed lands.]

WILDERNESS

The Service would continue to manage the 20,819-acre UL Bend Wilderness (see figure 7) in the UL Bend refuge as a class 1 air shed. About 155,288 acres of proposed wilderness within 15 units of the Charles M. Russell refuge (see figure 7) would be managed in accordance with Service policy. Roads in proposed wilderness units would remain closed except for roads that provide access to private lands within the refuge. Within 2 years, the Service would finalize the study of all units that meet the wilderness criteria (refer to Appendix E–Wilderness Review and Summary) and submit final recommendations to the Service directorate and Secretary of the Department of the Interior. The study would include an evaluation of the appropriateness of all minimum tools, including hand carts, for use in wilderness.

CULTURAL and PALEONTOLOGICAL RESOURCES

Cultural resources are sites, buildings, structures, and objects that are the result of human activities and that are more than 50 years old. They include prehistoric, historic, and architectural sites; artifacts; historical records; and traditional cultural properties including traditional use areas for Native Americans that may or may not have material evidence. Paleontological resources include fossils of both animals and plants.

Cultural Resources

Cultural resources would be identified, and significant resources would be protected in accordance with the National Historic Preservation Act and other relevant laws. Some old homesteads would continue to be maintained, but others would not. Known gravesites would be protected and the cultural resource inventory would be maintained. The Service would maintain closures of roads through sensitive areas. A refuge history brochure would be provided.

Paleontological Resources

The Service would continue to issue permits to institutions that investigate paleontological resources from a scientific perspective. Permits would not be issued for recreational paleontology requests that do not follow a scientific study design. All permits would continue to meet compatibility requirements and the regulations for the Paleontology Resource Protection Act.

REFUGE OPERATIONS and PARTNERSHIPS

The vision and goals would be met through commensurate refuge operations and the refuge's collaboration with many partners.

Refuge Operations

The refuge relies on personnel, equipment, and facilities to carry out both the day-to-day operations along with the long-term programs.

Personnel. Personnel would be maintained at current levels.

Equipment and Facilities. Equipment and facilities would be maintained a current levels. (Same as B.)

Land Acquisition. The Service would cooperate with USACE to transfer jurisdiction of lands not needed by USACE to meet its legal mandates.

Minerals. Mineral withdrawal on all refuge land would continue, and the Service would work to renew these withdrawals. The Service would adhere to legal obligations for rights-of-way, including those

back of Figure 7 west

INSERT 11x17
Figure 7 west

INSERT 11x17
Figure 7 east

back of Figure 7 east

for oil and gas extraction, for access to private and State lands.

Partnerships and Collaboration

The Service would maintain existing partnerships with Federal and State agencies, counties, conservation districts, adjacent private landowners, local communities, and others.

3.5 Summary of Alternative B (Wildlife Population Emphasis)

The Service would manage the landscape, in cooperation with our partners, to emphasize the abundance of wildlife populations using (1) balanced natural ecological processes such as fire and herbivory (grazing and browsing) by wild ungulates, and (2) responsible synthetic methods such as farming practices or tree planting. Wildlife-dependent public uses would be encouraged, and economic uses would be limited when they compete for habitat resources. Figure 8 depicts the management of resources and public use for alternative B.

HABITAT and WILDLIFE MANAGEMENT, THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN, RESEARCH and SCIENCE, and FIRE MANAGEMENT

Goals for the topics above are intricately linked in managing habitat, wildlife, and water resources. The elements below reflect these relationships for alternative B.

Habitat

The Service would actively manage and manipulate habitat, thus creating a diverse plant community of highly productive wildlife food and cover plants. The management emphasis would be on habitat for specific target species of wildlife in separate parts of the refuge, largely based on the species recommendations in Olaus Murie's 1935 biological assessment. Murie talked about the refuge's habitat potential to support a variety of wildlife species such as elk, bighorn sheep, and bison to name a few. The Service would consolidate the 65 habitat units; subsequently, the refuge staff would write new HMPs based on field station boundaries and habitat evaluation and management for each target species. The Service would work with others to develop methods to monitor and evaluate target species and habitat needs.

Desired habitat conditions may be created using natural ecological processes (such as fire, grazing by wildlife, or flooding) or through management practices (such as agricultural plantings and managed fire). For example, the dense understory of juniper, ponderosa pine, and Douglas-fir in forested coulees (ravines) could be thinned, which would lessen the likelihood of wildfire moving into the overstory and possibly eliminating mature forest stands.

An aggressive approach to reduction of invasive plants in the river bottoms would be based on priorities. Work would include using prescribed fire, spraying with herbicides, and planting wildlife food crops to clear invasive plants. In addition, the Service would collaborate with others to combat invasive plants in shoreline habitat. Mechanical means could be used to improve shoreline habitat for fish, birds, or other wildlife. Where feasible and combined with research, the Service would restore the functioning condition of riparian areas and preserve fire refugia (places where fire rarely burns).

Livestock Grazing. The Service would carry out a prescriptive grazing regime—designating the use of livestock grazing with written directions to achieve specific desired outcomes—across most of the refuge. Within 4–7 years, a prescriptive livestock-grazing plan would be developed for 50–75 percent of the refuge. Interior fencing would be removed if necessary. The refuge boundary would be fenced to exclude common pastures and allow the Service to conduct management treatments for achieving the habitat objectives. The use of exclosures and prescriptive grazing would be increased where needed to exclude livestock from river bottoms or other riparian areas with the exception of developed water gaps if determined to be appropriate and compatible with habitat management objectives.

Wildfire. The Service would increase the use of prescribed fire—any fire ignited by management actions to meet specific objectives. Increased monitoring would be used to measure and understand the implications of prescriptive livestock grazing and prescribed fire.

The Service would work with USACE and other partners to address the wildland-urban interface at the Pines Recreation Area and other USACE recreation areas. Wildfire would be used to protect, maintain, and enhance resources and, where possible, be allowed to function in its natural ecological role.

Invasive Species. There would be an increased effort to reduce invasive plants by converting former croplands that are now infested with invasive plants (more than 3,000 acres) to food plots for wildlife. The Service would emphasize visitor awareness about invasive plants and invasive aquatic wildlife, such as the zebra mussel, through education along with increasing the weed-seed–free requirements for out-

fitters or permittees and increasing enforcement if necessary.

Climate Change. Based on climate change predictions and following Service and departmental policies and initiatives, the Service would identify (1) species of plants that are likely to be first to decline, (2) animals that are associated with these plant species including insects, birds, and mammals, and (3) species of plants and animals that could increase. Additionally, the Service would design science-based, long-term monitoring protocols to document changes in plant and animal composition or health due to climate change. The Service would coordinate with adjoining agencies and partners to immediately alleviate declines, if needed, using tools such as prescriptive grazing, prescribed fire, or flooding. The Service would cooperate on national and international projects to maintain biological diversity, integrity, and environmental health on a global basis.

In addition to the climate change elements in alternative A, the Service would do the following: (1) replace all vehicles with more fuel-efficient vehicles; (2) upgrade offices to "green" standards; (3) consider installing solar panels or small wind turbines for offices and field stations; (4) provide more recycling bins; (5) encourage more teleconferencing instead of meetings; (6) encourage staff to be more energy efficient (such as turning off lights, recycling, and turning down heat); and (7) study and promote the carbon sequestration benefits of the refuge.

(Same as C and D.)

Water Resources

In addition to the water resources elements in alternative A, the Service would work to restore water quality for fish and wildlife habitats and populations by addressing soil erosion from overgrazing, roads, or other sources (such as contamination from recreational or economic uses including human use of camping areas or excessive livestock use of streams). There would be efforts to retain ground cover throughout the refuge to increase groundwater flow into streams and to reduce runoff and soil erosion, thus protecting riparian corridors.

The Service would acquire water rights associated with the purchase of inholdings and would obtain senior upstream water rights only when approached by a landowner or current water-right holder.

Wildlife

Through cooperation and collaboration with MFWP and adjoining landowners, the Service would use wildlife- and habitat-based objectives and strategies that consider natural densities, social structures, and population dynamics at the landscape level. The Service and these cooperators would mutually agree on population levels that can be tolerated by adjoining landowners and provide for quality recreational experiences without negatively affecting habitat or other wildlife species. The Service would collaborate with others to manage wildlife to benefit all species in and around the refuge. Actions would include using hunting to improve habitat, developing conservation easements, or other incentives to benefit species diversity and ecological integrity.

Reintroductions. The Service would identify habitat suitable for Rocky Mountain bighorn sheep and establish new populations based on modeling and MFWP transplant criteria. The Service would seek to restore and increase native fish populations in the Missouri River and its tributaries and in artificially developed impoundments (existing or new).

Threatened and Endangered Species and Species of Concern

The Service would protect or enhance populations of threatened and endangered species such as the black-footed ferret, nongame species such as the black-tailed prairie dog, and bird species or other species of management concern through research, disease management, population augmentation, or habitat manipulation.

The Service would develop management plans for the gray wolf and for the grizzly bear, in accordance with Federal and State regulations and plans to address potential immigration of these species to the refuge. With approved MFWP management plans and in cooperation with MFWP and others, the Service would consider reintroduction of additional black-footed ferrets, swift foxes, black-tailed prairie dogs, pallid sturgeons, and bighorn sheep into the landscape. Predators would be managed as an important component of the wildlife community, and predator management by the U.S. Department of Agriculture would be eliminated.

PUBLIC USE and EDUCATION

In addition to the elements for public use and education in alternative A, the Service would encourage the wildlife-dependent opportunities and elements described below. The Service would not allow new secondary recreational uses unless they facilitate one of the wildlife-dependent recreational uses.

Hunting

The Service would work with others to provide opportunities for quality hunting as a management tool that maintains both sustainable populations of big game and improves habitat for nongame species.

Fishing

The Service would work with others to provide opportunities for quality fishing that maintain both sustainable populations of game and nongame fish.

back of Figure 8 west

INSERT 11x17
Figure 8 west

INSERT 11x17
Figure 8 east

back of Figure 8 east

Wildlife Observation, Photography, Interpretation, Environmental Education, and Outreach

Environmental education and interpretation programs would be created based on wildlife biology and habitat requirements. The Service would work with additional partners to expand interpretive and educational opportunities and update the signage, website, and other interpretive media and facilities as needed. More opportunities would be provided for persons with disabilities where needed. The Service would collaborate with others to develop a science center at Sand Creek Field Station.

Access

The Service would manage access to benefit and increase wildlife populations and promote harvest opportunities. The Service would close about 106 miles of road and some access. The Service would work with partners (Federal and State agencies, counties, and others) to develop a travel plan and secure access to the refuge through other lands. Nonmotorized access would be promoted, but the Service would consider allowing motorized access on existing roads only for game retrieval and restricting access on a seasonal basis to sensitive areas by river and road. All-terrain vehicle use would be monitored on numbered trails and managed if there was documented disturbance of wildlife or visitors. The Service would monitor boat use and determine if disturbance is an issue, and then the Service would work with cooperators and users to identify solutions for limiting disturbance to wildlife along the river corridor.

Recreation Sites

Vehicular camping would be managed to fit the associated use, for example, paddlefish fishing lends itself to concentrated camping versus big game hunting and dispersed camping. Backcountry camping would be permitted. The Service would ensure that camping does not severely affect surrounding habitat.

Commercial Recreation

The Service would collaborate with USACE to permit commercial fishing operations, including fishing tournaments, through USACE's permit process. Additional commercial backcountry-outfitting permits would be developed for hunting to accomplish habitat and wildlife objectives.

WILDERNESS

In addition to the wilderness elements in alternative A, the Service would evaluate the proposed wilderness units to determine if they still meet the wilderness criteria identified in the Wilderness Act and Service policy. The Service would make recommendations on any modifications including additions or deletions for Service, Department, and congressional approval. The Service would potentially increase the amount of proposed wilderness by about 25,037 acres to enhance management capabilities and habitat manipulation.

CULTURAL and PALEONTOLOGICAL RESOURCES

Cultural resources and paleontological resources would be protected as identified in alternative A.

Cultural Resources

In addition to the protection elements in alternative A, the Service would create a sensitivity model for cultural resource locations and conduct surveys in areas with a moderate or high potential for resources. A comprehensive cultural resource overview and step-down plan would be completed. Oral histories would be collected to help understand and interpret the history of some of the structures on the refuge. Opportunities to work with partners to fund and implement preservation projects would be explored, and any artifact collections would be located and properly curated. There would be increased protection of cultural and paleontological sites through law enforcement and public education.

(Same as D.)

Paleontological Resources

For paleontological resources, elements would be similar to alternative A, except the refuge would develop a step-down plan with Montana State University and USACE for these resources. The number of education permits for universities for excavation of paleontological resources could be decreased if necessary to increase protection.

REFUGE OPERATIONS and PARTNERSHIPS

The vision and goals would be met through commensurate refuge operations and the refuge's collaboration with many partners.

Refuge Operations

The refuge relies on personnel, equipment, and facilities to carry out both the day-to-day operations along with the long-term programs.

Personnel. In addition to elements in alternative A, the Service would increase staff to include an outdoor recreation planner, an additional full-time law enforcement officer, and a fire technician at the Fort Peck Field Station.

Equipment and Facilities. Same as A.

Land Acquisition. In addition to elements in alternative A, the Service would acquire inholdings from willing sellers and facilitate the exchange of State lands within the refuge boundary where feasible.

(Same as C.)

Minerals. In addition to elements in alternative A, the Service would seek permanent withdrawal of all minerals, including oil and gas and other leasable and saleable minerals on all refuge lands and future acquisitions.

Partnerships and Collaboration

In addition to partnerships and collaboration elements in alternative A, the Service would review the refuge's partnerships and adapt them as needed based on new management direction. Staff would coordinate with USACE on lands that could be transferred to the Service for primary jurisdiction. The Service would continue to explore opportunities to collaborate with partners on wildfire suppression, use of prescribed fire, and habitat manipulation. Staff would seek additional partnerships and funding to support endeavors such as increased control of invasive species or for initiation of a friends group. For a full list of existing and potential partners, refer to section 3.11–Partnerships.

Land exchange with the State, BLM, private landowners, or nongovernmental organizations would be explored when exchange opportunities became available.

(Same as C.)

3.6 Summary of Alternative C

(Public Use and Economic Use Emphasis)

The Service would manage the landscape, in cooperation with our partners, to emphasize and promote the maximum, compatible, wildlife-dependent public uses and economic uses while protecting wildlife populations and habitats to the extent possible. Damaging effects on wildlife habitats would be minimized while using a variety of management tools to enhance and diversify public and economic opportunities. Figure 9 depicts the management of resources and public use for alternative C.

HABITAT and WILDLIFE MANAGEMENT, THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN, RESEARCH and SCIENCE, and FIRE MANAGEMENT

Goals for the topics above are intricately linked in managing habitat, wildlife, and water resources. The elements below reflect these relationships for alternative C.

Habitat

In addition to the habitat elements in alternative A, the Service would generally manage habitats to provide more opportunities for wildlife-dependent recreation. In places, the refuge staff would manage for plant communities that could necessitate a compromise between providing wildlife food and cover and livestock forage needs. Where needed, fencing and water gaps would be used to manage livestock use and prevent further degradation of riparian habitat. Camping areas would be managed to limit expansion and further degradation of riparian habitat. Similar to alternative A, the Service would monitor residual cover to measure forage availability.

Livestock Grazing. The Service would gradually move to a prescriptive livestock-grazing program when current grazing permits become available due to a ranch changing ownership (this would not include generational transfer). If monitoring revealed that populations of the first-to-decline grazing or browsing sentinel plant species (refer to appendix F) were not viable, a balanced reduction in permitted livestock numbers and in wild ungulate numbers would occur. Similarly, prescribed fire would be used to enhance wildlife habitat and improve forage for livestock.

Wildfire. The Service would work with DNRC to make forage available on the refuge to replace forage on State lands that is reduced due to use of prescribed fire in a burn unit containing refuge land and State land. Aggressive initial attack would be used in identified habitat units to minimize economic loss from wildfire. Fire (both prescribed fire and wildfire) would be used as a mechanism for natural succession in habitat units. To minimize fuel loading, additional use of prescriptive grazing could be necessary.

Invasive Species. Similar elements as for alternatives B and D. The Service would work with partners to increase efforts to reduce the acreage of invasive species and measure trends of other species not currently classified as noxious.

Climate Change. Same as B and D.

Water Resources

In addition to elements in alternative A, the Service would allow for natural and constructed water sources for livestock use and public fishing and hunting. Future water developments would be allowed on a site-specific basis and consideration of effects (positive and negative) to all resources. The Service would adhere to any other regulatory or permitting requirements and would balance water-quality restoration with public use and economic needs.

back of Figure 9 west

INSERT 11x17
Figure 9 west

INSERT 11x17
Figure 9 east

back of Figure 9 west

Wildlife

Through collaboration with MFWP and others, the Service would maintain a balance between numbers of big game (elk, deer, and pronghorn) and livestock to sustain habitats and populations of big game and sharp-tailed grouse. Similar balancing could be necessary when managing for nongame or migratory bird populations and livestock needs. For example, it could be necessary to balance prairie dog populations and habitat needs with public and economic uses like livestock grazing or with other wildlife population needs.

The staff would work with partners to increase fish populations in the Missouri River and its tributaries and in artificially developed impoundments or to create new impoundments for fish populations and livestock water.

At the landscape level, the emphasis would be on public and economic uses, and the Service would work with others to identify and secure public access to the refuge, manage all ungulate species to benefit all wildlife species, and work to promote private conservation easements.

Reintroductions. Suitable habitat for Rocky Mountain bighorn sheep would be identified, and a new population would be established in accordance with suitability models and MFWP transplant criteria.

Threatened and Endangered Species and Species of Concern

Threatened and endangered species would be protected, but there would be less intensive manipulation of habitat for those species. Similar to alternative B, a wolf and a grizzly bear management plan would be developed in accordance with Federal and State regulations and plans to address potential immigration of these species to the refuge.

PUBLIC USE and EDUCATION

The Service would emphasize and maximize opportunities for wildlife-dependent use, as described below.

Hunting

Working with MFWP to improve habitat, the Service would maximize hunting opportunities by expanding (1) programs to include new species and traditional or niche (primitive weapon) hunting, (2) the mule deer season, and (3) predator hunting. Additionally, there would be an expanded program offering opportunities to young people to go hunting. Trapping could be allowed.

Fishing

Increased fishing access would be provided to areas that are no longer accessible due to the changing level of Fort Peck Lake. The Service would consider permitting vehicular access to shorelines for ice fishing in the winter. Additional fishing opportunities would be created by stocking stock select reservoirs and holding fishing events for young people and fishing groups.

Wildlife Observation, Photography, Interpretation, Environmental Education, and Outreach

The Service would create programs based on popular activities such as hunting, fishing, birding, camping, photography, and all other wildlife-dependent activities. Curriculum-based activities would focus on threatened and endangered species, reintroduced species, restoration activities, and aquatic species including invasive aquatic species.

New areas for wildlife viewing would be identified, and ecotourism opportunities would be increased. The Service would work with partners to develop an interpretive center at Sand Creek Field Station, construct an interpretive trail near the Sand Arroyo area, and increase the interpretation of paleontological resources.

To encourage more children to visit the refuge, the refuge would consider sponsoring geocaching (a hobby in which objects are hidden outdoors for people to find using Global Positioning System [GPS] positions posted on the Internet). In addition, programs for troubled youths would be increased.

Access

Refuge access would be managed to benefit public and economic uses. The Service would consider expanding access (establishing new roads or trails) in some areas along with seasonally closing other areas, such as those around Fort Peck, to protect habitat and to provide for a diversity of experience. Access to boat ramps would be improved. The Service would promote nonmotorized access but would consider allowing motorized access on existing seasonally closed roads for game retrieval only. The Service would evaluate creating more trails that are open for bicycle use. Working within existing policies, livestock permittees would be allowed to manage infrastructure and stock within habitat units, or the Service would consider designating administrative use-only roads for livestock management where appropriate and allowed by policy and laws.

Recreation Sites

The Service would collaborate with other agencies to provide facilities and services that enable people of all abilities to enjoy the education and recreation opportunities at the refuge.

New campsites and campgrounds would be considered, if needed. For example, the Service would evaluate the need for designated horse camps or campsites along the lake.

Commercial Recreation

Commercial recreation would be permitted if it contributes to the refuge purposes or the mission of the Refuge System. The Service would increase opportunities for appropriate and compatible commercial recreation such as promotion of ecotourism tours and experiences on the refuge. Outfitting permits would be increased, and the Service would ensure this does not negatively affect public hunting. The Service would coordinate with USACE on commercial activities occurring on Fort Peck Lake and the Missouri River where USACE has primary jurisdiction.

WILDERNESS

In addition to the wilderness elements in alternative A, the Service would evaluate and make recommendations about whether the proposed wilderness units still meet the wilderness criteria. The Service would recommend eliminating four proposed wilderness units of about 35,881 acres in the East Beauchamp Creek, West Beauchamp Creek, East Hell Creek, and Burnt Lodge units.

CULTURAL and PALEONTOLOGICAL RESOURCES

Cultural resources and paleontological resources would be protected as identified in alternative A.

Cultural Resources

In addition to elements in alternatives A, B, and D, the Service would increase education-oriented ecotourism opportunities (nonconsumptive). The refuge staff would develop brochures and kiosks that interpret cultural resources and work with others to identify or stabilize cultural resources. There would be more use of interpretive signs, but archaeological sites would not be identified.

Paleontological Resources

The Service would increase educational opportunities and permits for universities. Documentaries and classes would be promoted. The Service would consider the purchase of inholdings for protection.

REFUGE OPERATIONS and PARTNERSHIPS

The vision and goals would be met through proportionate refuge operations and the refuge's collaboration with many partners.

Refuge Operations

The refuge relies on personnel, equipment, and facilities to carry out both the day-to-day operations along with the long-term programs.

Personnel. In addition to elements in alternative A, the Service would increase personnel to include an outdoor recreation planner at each of the Fort Peck and Lewistown field stations, a full-time law enforcement officer at Fort Peck Field Station, a manager at the UL Bend refuge, two maintenance employees, and a fire specialist on the east end of the refuge.

(Same as D.)

Equipment and Facilities. In addition to elements in alternative A, the Service would expand facilities at Jordan Field Station and provide more office space at Jordan and Sand Creek field stations. A bunkhouse would be built at Fort Peck Field Station and an interpretive center at Sand Creek Field Station.

Land Acquisition. Same as B.

Minerals. Same as B.

Partnerships and Collaboration

Same as B.

3.7 Summary of Alternative D

(Ecological Processes Emphasis, Proposed Action)

In cooperation with our partners, the Service would use natural, dynamic ecological processes and management activities in a balanced, responsible manner to restore and maintain the biological diversity, biological integrity, and environmental health of the refuge. Once natural processes are restored, a more passive approach (less human assistance) would be favored. There would be quality wildlife-dependent public uses and experiences. Economic uses would be limited when they are injurious to ecological processes. Figure 10 depicts the management of resources and public use for alternative D.

HABITAT and WILDLIFE MANAGEMENT, THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN, RESEARCH and SCIENCE, and FIRE MANAGEMENT

Goals for the topics above are intricately linked in managing habitat, wildlife, and water resources. The elements below reflect these relationships for alternative D.

Habitat

Where feasible, the Service would apply management practices that mimic and restore natural processes on the refuge, managing for a diversity of plant species in upland and riparian areas. Initially, this would include a concerted manipulation of habitats or wild-

back of Figure 10 west

INSERT 11x17
Figure 10 west

INSERT 11x17
Figure 10 east

back of Figure 10 east

life populations (prescribed fire and grazing and hunting) through coordinated objectives. Eventually, the Service would favor more passive approaches using fire, grazing, or flooding, which require less manipulation and funding.

The Service would maintain plant diversity and health using fire in combination with wild ungulate herbivory (wildlife feeding on plants) or prescriptive livestock grazing, or both. The objective would be to ensure viable populations of sentinel plant species (refer to appendix F), which are those plant species that decline first when management practices are injurious.

Livestock Grazing. The Service would remove interior fences to facilitate management of environmental processes including patch burning and long-distance movement of animals. Generational transfer of permits would continue; however, grazing would be on a prescriptive basis. In sensitive areas like river bottoms, fencing would be used to exclude livestock except at designated water gaps (areas where livestock can access water).

Wildfire. The Service would restore the natural fire regime through an increased use of prescribed fire to increase the viability of fire-dependent plant species. The Service would burn patches of varying size and within the historical fire-return intervals on a rotational basis. This technique would create a mosaic of habitats that (1) restores heterogeneity (more natural diversity in species) within landscapes, (2) preserves fire refugia (areas where fires occur very infrequently or not at all) and associated plant species, (3) enhances food resources for wildlife, (4) ensures biological diversity and integrity and environmental health, and (5) promotes ecological resilience. Furthermore, some areas could need intensive manipulation with mechanical and hand restoration tools. The Service would minimize the use of fire in other areas to protect species of concern like the greater sage-grouse.

The Service would work with partners to address wildland-urban interface areas at the Pines Recreation Area and other USACE recreation areas. In adherence with an approved fire management plan and using historical fire frequency data and current fire conditions, the Service would evaluate each wildfire to determine the management response and whether the wildfire could be used in the patch-burning program.

Invasive Species. Similar to elements in alternatives A, B, and C, the Service would work with many partners to combat invasive plants and encourage growth of native vegetation. When feasible, the Service would also work with USACE and others on habitat enhancement to benefit plovers, terns, or other species of Federal and State concern along the shoreline. The biological potential and economical feasibility of using additional biological control measures would be evaluated for safety and effectiveness as a way to reduce the use of chemical controls for treatment of invasive plant infestations.

Climate Change. Same as B and C.

Research

Research and monitoring would be designed to understand the interaction between fire, grazing, plant response, wildlife populations, and other ecological factors. The Service would adopt an active approach to using livestock grazing as a management tool by shifting from traditional annually permitted grazing to a prescriptive grazing regime for enhancement of wildlife habitats. If monitoring revealed that adequate populations of sentinel plant species were not viable, changes in livestock permitting such as reduced AUMs or retired permits would be initiated.

Water Resources

In addition to the water resources elements in alternative A, the Service would work with others to restore or encourage natural water development within streams such as increased flow, pools, and beaver ponds to restore ecological processes. The Service would refer to riparian research and publications for guidance on improving water quality in identified areas. Additionally, the Service would assess the uses and needs of current reservoirs and remove those no longer needed for livestock or wildlife.

Wildlife

In collaboration with MFWP and others, the Service would maintain the health and diversity of all species' populations including game, nongame, and migratory bird species by restoring and maintaining balanced, self-sustaining populations. This could include manipulating livestock grazing and using hunting to control wildlife numbers, or both, if habitat monitoring determines conditions are declining or plant species are being affected by overuse.

The Service would review plans for the Partners in Flight program and joint ventures to identify key parameters for improving habitats to support grassland-dependent birds. Additionally, the Service would collaborate with others to prevent species from being listed, primarily through restoring biological diversity, integrity, and environmental health across the landscape.

Predator control by the U.S. Department of Agriculture (Wildlife Services) would be eliminated, and predators would be managed to benefit the ecological integrity of the refuge.

Reintroductions. Similar to wildlife elements in alternatives B and C, the Service would work collabor-

atively with MFWP and adjoining landowners to identify suitable habitat for Rocky Mountain bighorn sheep and establish new populations using modeling and transplant criteria.

At a landscape scale, the Service would work with others on ways to benefit wildlife diversity and health such as (1) promoting private conservation easements and conservation incentives to benefit species diversity or restore extirpated (eliminated) species, and (2) cooperating with MFWP to consider species reintroductions or expansion of species when there is adequate habitat to support the species.

Threatened and Endangered Species and Species of Concern

In addition to the elements for threatened and endangered species and species of concern in alternative B, populations of the black-tailed prairie dog would be expanded to maintain or increase the health and diversity of all species' populations where prairie dogs are a critical component.

PUBLIC USE and EDUCATION

The Service would emphasize quality (versus quantity) wildlife-dependent uses and experiences and secure access to the refuge, as described below.

Hunting

The Service would cooperate with MFWP to provide hunting experiences that maintain big game species and other game species at levels that sustain ecological health and improve habitat but that also provide opportunities for quality experiences including diverse male-age structures provided by appropriate population objectives. When formulating population management objectives, the Service would consider natural densities, social structures, and population dynamics at the refuge level as well as guidance found in national policies, such as the biological integrity policy. The Service would allow opportunities for limited, compatible, and appropriate hunting and trapping.

Fishing

The Service would cooperate with other agencies to enhance fishing opportunities while maintaining game species and other species.

Wildlife Observation, Photography, Interpretation, Environmental Education, and Outreach

Environmental education and interpretation programs would incorporate the Service's conservation goals in the themes, messages, and activities. The Service would provide opportunities for wildlife observation and photography across diverse habitats that show the full spectrum of plant and animal species found in the area.

Access

Refuge access would be managed to benefit natural processes and habitat. The Service would evaluate roads and initially implement permanent or seasonal road closures on about 23 miles of road as needed to encourage free movement of animals, permit prescribed fire activities, harvest wild ungulates, provide for quality wildlife-dependent recreation, or allow other activities that contribute to overall improved ecological health. The Service would consider allowing motorized access on existing seasonally closed roads for game retrieval only. If conditions warrant, other improvements or closures would be considered.

Working with USACE and other agencies, the Service would monitor boat use along the Missouri River to determine use levels and whether wildlife disturbance, particularly during hunting season, was an issue. The Service would then work with cooperators and users to manage access where needed to limit disturbance to wildlife along the river corridor. Motorized vehicle use would be monitored on numbered trails and managed if there is documented disturbance of wildlife or visitors.

Bicycles would be restricted to numbered roads only, including seasonally closed roads. The Service would provide facilities and services that enable people of all abilities to enjoy the education and recreation opportunities available on the refuge.

Recreation Sites

Facilities would be upgraded and designed to meet accessibility standards. Camping needs would be evaluated as use changes on the refuge; adaptive management (refer to figure 11 under section 3.12) would be used to address camping demand, for example, harden the frequently used sites to minimize erosion and effects on habitat. Camping would be limited to within 100 yards of numbered routes.

Commercial Recreation

The Service would only permit commercial recreation when it benefits natural ecological processes or habitats. For example, commercial activities could be allowed in roadless areas to facilitate big game harvest for meeting wildlife and habitat objectives.

WILDERNESS

In addition to the wilderness elements in alternative A, the Service would evaluate proposed wilderness units according to Service policy to determine if they still meet the wilderness criteria. The Service would recommend expanding six of the proposed wilderness units—a total of 18,559 acres in the Antelope Creek, Crooked Creek, Alkali Creek, Wagon Coulee, West Hell Creek, and Sheep Creek units—and eliminating three units for a reduction of 26,744 acres in the

East Beauchamp Creek, West Beauchamp Creek, and East Hell Creek units. This would accommodate more public access in some areas and increase protection of wilderness values in other areas.

CULTURAL and PALEONTOLOGICAL RESOURCES

Cultural resources and paleontological resources would be protected as identified in alternative A.

Cultural Resources

Same as B.

Paleontological Resources

Similar to B.

REFUGE OPERATIONS and PARTNERSHIPS

The vision and goals would be met through proportionate refuge operations and the refuge's collaboration with many partners.

Refuge Operations

The refuge relies on personnel, equipment, and facilities to carry out both the day-to-day operations along with the long-term programs.

Personnel. Same as C.

Equipment and Facilities. In addition to elements in alternative A, the Service would expand facilities at Jordan Field Station and provide more office space at Jordan and Sand Creek field stations. A bunkhouse would be built at Fort Peck Field Station. The Service would collaborate with others to develop a science and interpretive center at Sand Creek Field Station.

Land Acquisition. In addition to elements in alternatives B and C, the Service would look to facilitate the exchange of State lands within the refuge boundary where feasible.

Minerals. Same as B.

Partnerships and Collaboration

In addition to the partnerships and collaboration elements in alternatives B and C, the Service would seek ways to highlight refuge resources including the use of promotional materials.

3.8 Objectives and Strategies

As discussed in sections 3.1 and 3.3 above, the alternatives stemmed from the planning goals identified in chapter 2. This section describes the specific objectives that would achieve the goals and meet the emphasis of each alternative. Objectives are concise statements of what needs to be achieved; how much, when, and where it would be achieved; and who would be responsible. To the extent possible, each objective has been developed to be specific, measurable, achievable, results-oriented, and time-fixed (FWS 2000c). Timeframes for the objectives are based on the assumption that implementation will begin following the record of decision for the final CCP and will occur over 15 years.

Objectives provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating success in meeting the goals. Strategies are specific tools or techniques used to carry out the objectives. An explanation, or rationale, for each objective describes how and why the objective's actions are important to achieving the associated goal in conjunction with the alternative's emphasis.

Each goal title is listed below, followed by the associated objectives, rationale, and strategies for each of the four alternatives A–D. Where an objective or strategy is similar or the same as for another alternative, this has been noted and for conciseness it is generally not repeated.

R.A. Howard/USDA–NRCS PLANTS Database

Redosier Dogwood

OBJECTIVES for GOALS

Habitat and Wildlife Management, Threatened and Endangered Species and Species of Concern, Research and Science, and Fire Management

The above goals are intricately linked in managing habitat, wildlife, and water resources; therefore, the objectives for all these goals are grouped in this section under three topics—habitat, wildlife, and threatened and endangered species and species of concern.

- The habitat objectives are split into four vegetation categories: upland, river bottom, riparian area and wetland, and shoreline. There are additional objectives for the major factors that influence habitat: invasive species, prescribed fire, wildfire, and climate change.
- While the habitat objectives would benefit most wildlife on the refuge, the following categories of wildlife were identified based on scoping comments and have specific objectives: big game (elk, deer, pronghorn, Rocky Mountain bighorn sheep, and mountain lion), furbearers, bison, birds, gray wolf, and other wildlife (invertebrates, amphibians, reptiles, fish, and small mammals).
- Objectives for threatened and endangered species and species of concern are for the following species: black-footed ferret, least tern, pallid sturgeon, piping plover, grizzly bear, gray wolf, black-tailed prairie dog, greater sage-grouse, mountain plover, burrowing owl, sicklefin chub, sturgeon chub, and northern leopard frog.

HABITAT–UPLAND

Each species of wildlife that uses the uplands has unique habitat needs. Their requirements for food, water, and protection are different. Ecological processes (disturbances) affect each species' habitat. The major disturbances that occur in the uplands are herbivory (ungulate grazing) and fire. Uplands exist in alternate states depending largely on the frequency and intensity of herbivory and fire.

Objectives for Upland Habitat, Alternative A

In large part, existing habitat objectives and strategies are based on the decisions resulting from the record of decision on the 1986 resource management plan and EIS for the refuge (FWS 1986). Although many actions have been carried out, under alternative A the upland habitat would be managed according to direction set by this earlier plan. The 1986 plan blended objectives and strategies, and these were separated to the extent practical to more closely follow the below format used in current CCPs. Rationale statements were pulled from the 1986 plan or are based on direction stemming from the plan.

Upland A1. Over 15 years, continue to manage refuge habitats in the 65 habitat units (see figure 16 in chapter 4) that were originally established by BLM for grazing purposes and that were based on habitat management plans (HMPs) developed in the early 1990s.

Rationale for Upland A1. Each HMP describes wildlife habitat issues and provides specific management actions—such as grazing seasons of use, prescribed fire, planting, and rest—to correct problems from grazing if necessary. These actions would continue to be coordinated with BLM in joint pastures; the plans recognized that BLM and the Service have different management objectives for livestock grazing (FWS 1986).

Upland A2. By 2013, increase the quantity and quality of deciduous shrubs using prescribed fire on about 1,900 acres and on a total of 7,700 acres by 2028.

Upland A3. By 2013, plant shrubs on about 100 acres and on a total of 500 acres by 2028.

Upland A4. Over 15 years, continue planting shrubs on about 25–30 acres per year.

Rationale for Upland A2–A4. Habitat analysis indicates that deciduous shrub species are declining in both in abundance and vigor on the refuge, and historical accounts indicate shrubs were once more abundant than current conditions. HMPs would determine the best means of reestablishing shrubs in each habitat unit; management actions would require adjustments in grazing, prescribed fire, and planting, in that order. Shrubs would be planted to reestablish a seed source for natural revegetation, and it is estimated that this would involve about 25 acres per year depending on the success of grazing adjustments and prescribed fire. Following prescribed fire or planting, grazing would not be allowed until plants are successfully established.

Upland A5. Over 15 years, continue a gradual move toward prescriptive grazing. Make the transition only when units become available through sale of a ranch to a third party or habitat evaluations are completed, or both, and when prescriptive grazing is identified as necessary to meet wildlife or habitat objectives.

Upland A6. Over 15 years, use grazing at current levels to maintain existing plant communities at desired habitat conditions at light livestock grazing levels.

Upland A7. Over 15 years, implement a monitoring program to determine if additional changes in graz-

USFWS

Refuge staff monitor plants on the refuge.

ing would need to be implemented on specific areas not responding to upland management.

Rationale for Upland A5–A7. The specified number of AUMs is based on what would have been permitted in 2009 if all grazing permittees exercised their full permitted AUMs. Since implementation of the 1986 record of decision, several ranches have sold. Furthermore, livestock grazing permits do not transfer with the sale of a ranch (FWS 1982; *Schwenke v. Secretary of the Interior*, 720 F.2d 571, Ninth Circuit Court of Appeals, 1983).

The 1986 record of decision called for livestock grazing to be substantially reduced to improve habitat conditions for wildlife. Each habitat unit (see figure 16 in chapter 4) was examined in terms of existing range conditions, slope, water, and soil limitations. Concurrently, the Service evaluated wildlife habitat conditions by habitat unit and noted deficiencies. In most areas where evaluation demonstrated existing livestock-wildlife conflicts, limitations of slope, water, and soil were the reason for the necessary grazing change. In the remaining areas, grazing adjustments allowed the achievement of applicable wildlife objectives. This process determined that light grazing (0–35 percent utilization) coupled with various seasons of use would achieve the diversity of habitat conditions mandated by the refuge goals and objectives. Most livestock grazing would continue on a seasonal basis (winter, spring, summer, fall, or combination of seasons), although spring turn-in dates would be later and grazing would be reduced to light stocking levels. Early spring use would be eliminated.

The use of livestock grazing as a management tool would provide habitat conditions to benefit particular wildlife species. In years of below-average forage production due to drought, fire, insects, or other natural causes, grazing permits might be suspended in whole or in part to minimize damage to range and wildlife resources.

Upland A8. By 2013, fence at least one habitat unit. Fence other portions of the boundary if problems arise with unauthorized livestock use. Construct only a limited amount of interior fencing.

Rationale for Upland A8. About 425 miles of fence have been constructed between 1986 and 2009, and additional fence may be required. Fence would be constructed where necessary to achieve objectives; the location of fences would be determined after consultation among the concerned parties.

Strategies for Upland A1–8. Many of these strategies are the tools selected in the record of decision from the 1986 EIS.

- Construct fences where necessary to achieve agency objectives, with locations to be determined after consultation among the concerned parties from when the HMPs were written.

- Construct fences in the best and most practical locations.
- Construct boundary fence to be 42 inches high and 3-strand with 12 inches between wires; in areas where pronghorn would likely encounter fences, place the bottom wire 18 inches above the ground and use smooth wire.
- Potentially locate new water facilities or implement grazing systems designed to meet objectives for both the Service and BLM in suitable common pastures.
- Upgrade habitat evaluation criteria as information becomes available.
- Continue inventorying and monitoring wildlife and habitat at existing levels including monitoring of residual cover and sentinel plants.
- Establish sampling techniques to monitor at prescribed intervals the long-term changes in wildlife habitat and range conditions. Use different treatments for habitat if evaluations indicate that wildlife objectives were not met.
- Phase out cooperative farming and haying along bottomlands of the Missouri River. Use lure cropping (planting crops to draw elk to those areas) on the refuge's west end to decrease elk depredation on adjoining private croplands. Install about 6 miles of fence (900 acres) to protect selected riparian areas from livestock and enhance shrub reproduction.
- Acquire several priority land parcels totaling about 2,000 acres by willing-seller basis only. Acquire additional land in pronghorn range.
- Eliminate sheep grazing on the refuge unless needed on a prescriptive basis to manipulate vegetation.
- Continued to emphasize big game management, annual livestock grazing, fencing, invasive species control, and water development.

Objectives for Upland Habitat, Alternative B

The Service would manage the upland grassland-shrub mosaic and conifer-grassland mosaic with prescriptive grazing and prescribed fire. The management emphasis would be on single target species in separate uplands of the refuge, largely based on the recommendations of Olaus Murie's original biological assessment (refer to chapter 4). Management criteria would focus on the food, protection, and water needs of each target species. Where needed, using artificial food resources would be provided to promote wildlife populations.

Upland B1. Within 3 years, develop new HMPs for target plant and wildlife species (primarily elk, pronghorn, and sharp-tailed grouse) that are defined in Olaus Murie's 1935 biological assessment (refer to chapter 4). Base the HMPs on habitat units that are ecologically similar. Develop specific habitat evaluation and management plans for each target species.

Upland B2. Within 3 years, in cooperation with universities, the Natural Resources Conservation Service (NRCS), other partner scientists and statisticians, continue to develop and modify methods to identify, inventory, and monitor target species' habitat needs and management actions.

Upland B3. Within 4–7 years, develop a prescriptive livestock-grazing plan for 50–75 percent of the refuge in all locations where boundary fences or cooperative agreements with wildlife conservation partners exist.

Upland B4. Over 15 years, fence 50–75 percent of the unfenced refuge boundary or the boundary established with wildlife conservation partners.

Upland B5. Over 15 years, evaluate the success of management treatments with population surveys or habitat surveys (height-density plots [HDPs] or sentinel plants [refer to appendix F], or both). Develop adaptive management strategies (refer to section 3.12 and figure 11) if wildlife populations or habitats are not responding as anticipated.

Upland B6. Over 15 years on 30–50 percent of the refuge, improve overall habitat conditions based on HDPs and sentinel plant monitoring where 70 percent residual cover is achieved with viable populations of sentinel plant species by managing herbivory through time and place. There would be 25–50 percent of selected populations of sentinel species that reach the height and fruit-bearing potential in locations without physical protection on all four sides of plants.

Upland B7. Within 5 years, work with range ecologists and biostatisticians to establish a protocol to assess wildlife habitat conditions. Every 7–10 years, monitor habitat health to evaluate conditions for meeting wildlife needs.

Upland B8. Over 15 years, maintain existing densities or populations of fire-intolerant big sagebrush on fire refugia (areas where fire is generally absent) to support sage-dependent species in each of the habitat units to restore shrub diversity in the shrub-steppe uplands.

Rationale for Upland B1–B8. Much of the focus for the upland objectives is based on the earliest assessment of the refuge and surrounding area. In August 1935, Olaus J. Murie, a renowned wildlife biologist for the U.S. Biological Survey (eventually the U.S. Fish and Wildlife Service), traveled to the proposed game range and filed his Report on the Fort Peck Migratory Bird Refuge (Murie 1935). This report was the first biological assessment of the existence and abundance of plants and wildlife species. Murie documented the abundance of many plants—yellow pine or ponderosa

pine, cottonwood, willow, juniper, grasses including gramma grasses, buffaloberry, and snowberry—along with wildlife species including mule deer, white-tailed deer, pronghorn, black-footed ferret, coyote, and sharp-tailed grouse. Additionally, Murie identified species (elk, bison, and Audubon bighorn sheep) for which he found evidence of earlier occupation, and he discussed whether they could or should be reintroduced. Murie's biological assessment would be used to inform the basis for the target species (plant and wildlife) emphasized under alternative B.

While several habitat units have recovered from past abuse, current monitoring has identified several units that are not meeting their stated habitat objectives as identified in 1986 EIS and associated HMPs. Alternative B would remove annual livestock grazing from the refuge in all habitat units that are fenced separately from surrounding lands. Only prescriptive grazing would be permitted. Continuing construction of the refuge boundary fence would be a priority so that all refuge lands would have the potential for best wildlife management practices. Removal of interior fencing would also be a priority due to the ending of annual grazing; interior fences would be removed from units enrolled into prescriptive grazing to facilitate the movement of all ungulates. Prescriptive grazing practices could then be applied to larger areas if needed. Fence removal and construction would be an ongoing process that would take time and would need to be prioritized. As a result, the Service estimates that only 75 percent of the refuge would convert to prescriptive grazing; however, if funding and resources permitted, more areas would be converted over 15 years.

Reducing the number of HMPs and developing HMPs along field station boundaries or units that are ecologically similar would increase efficiency in managing for a prescriptive grazing and fire regime. The habitat requirements (food, water, and cover) for each target species would be provided across large landscapes. Managing in larger habitat blocks instead of 65 fenced units would (1) allow for increased long-distance animal movement (animals move greater distances to seek the best forage due to patch burns), and (2) enable the refuge to target the differing habitat requirements (food, cover, and water) of each target species.

Wildlife population surveys and habitat surveys would indicate improving or worsening conditions for targeted wildlife populations. Additionally, surveys would provide measures of the success of habitat treatments using the HDP method and procedures developed to monitor the food, protection, and water needs of each target wildlife species. The HDP method records the height of visual obstruction of plant cover. A measuring pole is observed at points along a line transect from a set distance and angle. It provides a measure of residual cover remaining after livestock grazing has occurred.

Sentinel plants are species that are the first to decline as a result of too much or too little expression of ecological processes. Viable populations should include large collections of sentinel plants that are mature and bearing abundant fruit or seeds, young plants recently sprouted from seed, and all intermediate stages. While sentinel species would not be emphasized under this alternative, they would still be included. Service personnel are working with Oklahoma State University, WEST, Incorporated, and NRCS to develop monitoring techniques for sentinel plants. This work would identify the key sentinel plant species for fire and herbivory, evaluate various survey techniques, and develop methods for measuring changes in populations and robustness. (See a full discussion of sentinel plants under alternative D).

Strategies for Upland B1–B8

- Within 2 years, determine the habitat needs and current conditions for target wildlife species on specific sites.
- Continue to work with range ecologists and use existing knowledge from current monitoring to develop adaptive management strategies as new information is acquired.
- Continue current HDP readings and implement HDP surveys to measure residual cover within 25–50 percent of the areas currently absent of livestock.
- Within 3 years, develop new HMPs based on recommendations found in Olaus Murie's field notes. In HMPs, include effective implementation of new management strategies (such as prescriptive grazing, prescribed fire and wildfire return, habitat monitoring and enhancement, and food plots) that promote desired habitat conditions.
- Within 4–7 years, implement prescriptive grazing, prescribed fire, and habitat restoration and consider the use of artificial food resources to promote wildlife populations with emphasis on single-species management based on recommendations in Olaus Murie's original biological assessment.
- In cooperation with universities, NRCS, and other partner scientists and statisticians, continue to develop and modify methods to identify, inventory, and monitor sentinel plant species.
- Identify areas for implementing pyric herbivory (patch burning and grazing) to restore historical fire-return intervals and the fire-grazing interaction including concentrated herbivory coupled with long periods of abandonment (rest) to increase the amount and diversity of palatable plants to reduce selectivity for sentinel species.

- If monitoring for the population viability of herbivory-sensitive sentinel plant species within a unit indicates a declining population, take the following actions: (1) eliminate prescriptive livestock grazing in the unit; and (2) cooperate with MFWP to manage elk, deer, and bighorn sheep to meet objectives in the MFWP's management plans for the Missouri River Breaks. Where monitoring indicates habitat conditions and sentinel plants are stable, the Service would work with MFWP to manage for higher deer and elk populations (refer to objectives for Big Game).
- Evaluate success of habitat treatments by using HDPs and sentinel plant monitoring in permanently established trend sites to assess the population viability of all plant species and structural heterogeneity of the landscape.
- Over 15 years, remove 25–50 percent of the interior fences where prescriptive grazing is fully implemented and construct refuge boundary fences where absent, on priority basis. Potentially expand boundary fences to include partner lands that share the same objectives and strategies.
- Hire seasonal employees for fence removal and professional fence builders for boundary fence construction of remaining fences (the remaining boundary fences are located in the most difficult terrain).
- Implement prescriptive grazing across the refuge through the development and implementation of HMPs by working with BLM, DNRC, conservation districts, and permittees. Use prescriptive grazing only on Service-managed lands. Since it is possible that prescriptive grazing practices on Service lands may impact current permittees that graze BLM, DNRC, and Service lands, work with DNRC as budgets allow to mitigate any loss of revenue by assuming leases on these pastures. (Same strategy in alternatives C and D).
- Manage with MFWP the total ungulate effects collectively rather than each species alone.

Objectives for Upland Habitat, Alternative C

The Service would manage the present habitat units to improve range condition with domestic and wild ungulates as defined by NRCS ecological site condition and management guidelines.

Upland C1. Within 7 years, develop new HMPs (based on factors such as soil characteristics, historical fire occurrence, grazing, and field station boundaries) in cooperation with the NRCS. Within the HMPs, include fencing for better livestock distribution, water development, rotational grazing, and other management techniques designed to improve range condition.

Upland C2. Within 3–6 years, in cooperation with the NRCS, conduct ecological site evaluations on habitat units with boundary fences that permit control over livestock numbers and management. Continue current HDP surveys and implement surveys in 50 percent of the areas currently absent of livestock to measure residual cover.

Upland C3. Over 15 years, implement a prescriptive grazing program on up to 50 percent of the refuge by continuing the practice of holding grazing permits as ranches sell their lands to outside parties.

Upland C4. Over 15 years, develop pyric-herbivory (relying on fire and wildlife grazing interaction) programs for habitat units where boundary fences or cooperative agreements with wildlife conservation partners exist and where physical features allow for efficient use of fire as a management tool.

Upland C5. Over 15 years, coordinate the construction of boundary fences to facilitate a move to a prescriptive grazing program with the BLM, DNRC, and local ranchers.

Dave Menke/USFWS

Upland habitat is important to the lazuli bunting.

Upland C6. Over 15 years, evaluate the success of prescriptive grazing and the pyric-herbivory program with HDPs and sentinel plant monitoring in locations where the Service has the capability to manage ungulates. Measure success through a comprehensive monitoring program that evaluates changes in viability, distribution, and robustness of individual sentinel plants within established plots. Develop adaptive management changes if sentinel plants continue to decline (refer to section 3.12 and figure 11).

(Same as Upland D5.)

Upland C7. Over 15 years, improve habitat conditions, based on HDPs and sentinel plant monitoring, on 20–40 percent of the refuge. Manage habitat conditions for a minimum of 70 percent residual cover and viable populations of sentinel species where 30–60 percent of selected sentinel species populations are able to reach height and fruit-bearing potential in locations without physical protection on all four sides of plants.

Upland C8. Within 2–4 years, begin working with range ecologists and biostatisticians to develop and establish a protocol to assess the effectiveness of the sentinel species concept on select areas of the refuge absent of livestock. Every 7–10 years, monitor habitat health, heterogeneity, and ecosystem resilience (the ability to recover from disturbance or stress).

(Same as Upland D6.)

Upland C9. Over 15 years, increase both the population viability and a 1–5 percent increase in coverage by winterfat, saltbush, grey rubber rabbitbrush, and other fire-adapted sentinel species on sites with remnants of these species.

Upland C10. Over 15 years, maintain existing stands or densities of fire-intolerant big sagebrush on fire refugia to support sage-dependent wildlife species in each of the habitat units while restoring shrub diversity in the shrub-steppe uplands (such as fire refugia, sage-grouse leks, and the UL Bend refuge).

(Same as Upland D8.)

Upland C11. Over 15 years, increase both the population viability and a 1–5 percent increase in coverage by purple prairieclover, white prairieclover, dotted gayfeather, purple coneflower, stiff sunflower, and other sentinel forb species as appropriate to sites with remnants of these species across 5–10 percent of the refuge.

Rationale for Upland C1–C11. Alternative C would retain livestock in habitat units that are currently permitted to local family-ranch operations. Some highly nutritious plant species such as saltbush, white prairieclover, and golden currant are highly preferred by both livestock and wild ungulates. These same plant species are also important to pollinators, birds (for seeds and insects), and other wildlife species. Livestock and wild ungulates are competitive for sentinel plant species, the first to decline from herbivory. To preserve and restore biodiversity to the extent possible, wild ungulate numbers may need to be reduced.

HMPs would include fencing for better livestock distribution, water development, rotational grazing, and other management techniques designed to improve range condition.

As habitat units become vacant of livestock, they may be combined with other vacant or permitted units to implement a prescriptive grazing program, prescribed fire, or other habitat restoration tools to achieve excellent range condition, based primarily on the health of the grass community. Range condition would be improving if range communities were maintained at, or moving toward, an ecological site condition rating of high (NRCS 2003). Ecological sites that are similar to the historical or potential community have a higher condition rating than dissimilar sites. Ecological sites are based on soil, moisture, and vegetation potentials of different parts of the landscape.

Strategies for Upland C1–C11

- Within 3–6 years, determine the species of plants first to decline (sentinel species) due to herbivory and fire and due to lack of herbivory and fire in areas absent of livestock. Continue current HDP surveys and implement HDP surveys within 50 percent of the areas currently absent of livestock to measure residual cover.
- In cooperation with universities, NRCS, and other partner scientists and statisticians, continue to develop and monitor methods to identify, inventory, and monitor sentinel plant species.
- Over 15 years, as current habitat units become vacant of livestock, implement a prescriptive grazing program to restore the fire-grazing interaction, long-distance animal movement, long periods of abandonment, reducing selectivity for sentinel species, and increasing landscape species and structural heterogeneity.
- Improve the population viability of herbivory-sensitive sentinel plant species in three ways—ungulate number control, prescribed fire, and periods of rest.
- If monitoring for the population viability of herbivory-sensitive sentinel plant species indicates a declining population, cooperate with MFWP to manage deer, elk, and bighorn sheep to meet the objectives in the MFWP's management plans for the Missouri River Breaks.
- Manage all species of ungulates (wild and domestic) collectively and work cooperatively with others to address the effects of all ungulates rather than the effects of each species alone. Where annual

livestock grazing is permitted, compensate for the livestock forage use where and when possible by reducing the wild ungulate population levels.

- In habitat units with prescriptive livestock grazing only, manage the landscape with pyric herbivory (patch burning) to restore historical fire-return intervals and the fire-grazing interaction.
- In habitat units with prescriptive livestock grazing only, use concentrated herbivory coupled with long periods of abandonment to increase the amount and diversity of palatable plants to reduce selectivity for sentinel species.
- Evaluate success of habitat treatments (to achieve population viability of all species and structural heterogeneity of the landscape) with a focus on sentinel plant species, HDPs, and population viability analysis at permanently established trend sites.
- As HMPs for prescriptive grazing are developed for vacant habitat units, remove interior fences within the units where only prescriptive livestock grazing is permitted and construct refuge boundary fences where absent. Potentially expand boundary fences to include partner lands that share the same objectives and strategies.
- Hire seasonal employees for fence removal and professional fence builders for boundary fence construction of remaining fences (the remaining boundary fences are located in the most difficult terrain).
- Implement prescriptive grazing across the refuge through the development and implementation of HMPs by working with BLM, DNRC, conservation districts, and permittees. Use prescriptive grazing only on Service-managed lands. Since it is possible that prescriptive grazing practices on Service lands may impact current permittees that graze BLM, DNRC and Service lands, work with the DNRC as budgets allow to mitigate any loss of revenue by assuming leases on these pastures. (Same strategy in alternatives B and D).

Objectives for Upland Habitat, Alternative D

The Service would promote ecological resilience, restore the fire-grazing interaction (pyric herbivory), promote animal movement with long periods of abandonment to reduce plant species selectivity, and increase landscape species and structural heterogeneity. This alternative would address the objectives and strategies identified in the Service's Climate Change Strategic Plan (FWS 2009f).

Upland D1. Within 5 years, develop new HMPs, including inventory and monitoring plans based on soil characteristics and historical fire occurrence. Include effective implementation of new management strategies (prescriptive pyric herbivory, prescribed fire and wildfire return, and sentinel plant monitoring and enhancement) that promote desired habitat conditions and restoring ecological resilience (see the rationale below for a definition).

Upland D2. Within 6–9 years, consolidate the 65 habitat units into 3–8 units for restoration of the fire-grazing interaction (pyric herbivory), long-distance animal movement, long periods of abandonment, reduced selectivity for sentinel species, and increased landscape species and structural heterogeneity (diversity or dissimilar species within a landscape) to promote resilience and stability of ecological systems.

Upland D3. Within 6–9 years, implement a prescriptive grazing program and pyric herbivory (patch burning and grazing by wildlife) across 50–75 percent of the refuge to restore the resilience and stability of ecosystems on the refuge.

Upland D4. Over 15 years, coordinate the construction of boundary fences to facilitate moving to a prescriptive grazing program with the BLM, DNRC, and local ranchers. Work with permittees in developing the HMPs, so they can make arrangements in their operations for future grazing needs.

Upland D5. Same as Upland C6.

Upland D6. Same as Upland C8.

Upland D7. Over 15 years, increase both the population viability and a 10–15 percent increase in coverage by winterfat, saltbush, grey rubber rabbitbrush, and other fire-adapted sentinel species on sites with remnants of these species across 20–30 percent of the refuge.

Upland D8. Same as Upland C10.

Upland D9. Over 15 years, increase both the population viability and 10–15 percent increase in coverage by purple prairieclover, white prairieclover, dotted gayfeather, purple coneflower, stiff sunflower, and other sentinel forb species as appropriate to the sites with remnants of these species across 20–30 percent of the refuge to restore diversity and promote ecological resilience of highly palatable, summer-growing forbs.

Rationale for Upland D1–D9. As described under alternative B, while several existing habitat units have recovered from past abuses, there are currently several units that are not meeting their stated habitat objectives as identified in the 1986 EIS and associated HMPs. A principal focus of alternative D is the directive found in the Service's Biological Integrity, Diversity, and Environmental Health Policy (FWS 2001). Using the concepts of resilience management (Resilience Alliance 2009), the Service would strive to improve the resilience in the refuge's ecological systems. Key components of resilience management

include major ecological processes or disturbances, alternate stable states, thresholds between states, adaptive cycles, cross-scale interactions, interventions, and management.

Resilience is the ability to absorb disturbances, to be changed, and then to reorganize and still have the same identity, that is, retain the same basic structure and ways of functioning. A resilient system is forgiving of external shocks; a disturbance is unlikely to affect the whole. As resilience declines, the magnitude of a shock from which it cannot recover gets smaller. A resilient habitat: (1) sustains many species of plants and animals and a highly variable structural composition; (2) is asymmetric; (3) exemplifies biological integrity, biological diversity, and environmental health; and (4) adapts to climate change (Resilience Alliance 2009).

In contrasting stability and resilience, Holling (1973) writes, "A management approach based on resilience, on the other hand, would emphasize the need to keep options open, the need to view events in a regional rather than local context, and the need to emphasize heterogeneity. Flowing from this would be not the presumption of sufficient knowledge, but the recognition of our ignorance; not the assumption that future events are expected, but that they will be unexpected. The resilience framework can accommodate this shift of perspective, for it does not require a precise capacity to predict the future, but only a qualitative capacity to devise systems that can absorb and accommodate future events in whatever unexpected form they may take."

The following sources have more information about managing ecological resilience: Gunderson and Holling (2002), Walker and Salt (2006), Norberg and Cumming (2008), and the Resilience Alliance (2009).

As part of the actions needed to improve the resiliency of the refuge's habitats, alternative D emphasizes restoration of the environmental processes, plants, and animals that have been damaged. This alternative calls strongly for the return of the evolutionary forces of fire and herbivory (grazing by wildlife) that shaped this landscape during the past 6,000 years. Total ungulate effects and fire effects on plant communities would be measured with diagnostic species (sentinel species). A list of these sentinel species is in appendix F.

When declining trends are found or when competition for resources results in habitat damage, livestock numbers would be reduced or eliminated before wild ungulates. The Service estimates it could convert about 75 percent of the refuge to prescriptive grazing due to the need to add or eliminate fences. Much of the fencing work that remains is in rugged terrain, and the work would need to be prioritized. If funding and resources permitted, more of the refuge could convert to prescriptive grazing over 15 years. At the same time, the Service would work with grazing permittees so they can plan for and successfully adapt their operations to prescriptive grazing.

The Service would continue working with range ecologists, statisticians, other scientific disciplines from NRCS and universities, and other experts in using existing knowledge from current monitoring methods to develop adaptive management strategies as new information is acquired if habitat objectives were not met. HDP monitoring could be reduced as sentinel species management and monitoring programs are developed across the refuge. Many of the existing staff have expertise and education in range management. Monitoring for range health generally involves looking at the dominant community plants, mostly grasses, and determining if they are viable, versus the refuge's wildlife habitat monitoring program, which would include looking at select plants that are the first to decline due to too much or too little fire and grazing that comprise the community and ensuring that they are healthy, vibrant, and able to reach maturity. Successful implementation of the objectives would be defined as follows:

- Fifty percent of populations of winterfat, saltbush, grey rubber rabbitbrush, and other fire-adapted sentinel shrub species were able to reach their height and fruit-bearing potential and successfully recruit young plants into the population on uplands without physical protection during normal weather conditions.
- Fifty percent of populations of chokecherry, golden currant, redosier dogwood, green ash, silver buffaloberry, aspen, cottonwood, limber pine, and other fire-adapted sentinel species would be able to reach their height and fruit-bearing potential and successfully recruit young plants into the population in coulees and riparian areas.
- Populations of purple prairieclover, white prairieclover, dotted gayfeather, purple coneflower, stiff sunflower, Maximilian sunflower, and other sentinel forb species have increased in coverage on remnant sites by approximately 10 percent over 15 years.
- Fire-intolerant species would be maintained in areas that did not burn or where there is a low fire-interval level.

Since the demise of the bison in 1881, the fire-return interval has lengthened on the refuge, and the fires that do occur are often more intense than commonly happened historically (Frost 2008). Figure 18 in chapter 4 shows the fire frequency intervals found on the refuge. The fire-grazing interaction (which included intense herbivory after fire, long-distance movement, and years of abandonment) was replaced by constant grazing and no fire with the transition to ranches, fences, and livestock. The landscape changed from patches of diverse habitats to a more uniform

landscape as a result of constant fire suppression and annual grazing within fenced pastures (Fuhlendorf and Engle 2001). Today, many species of plants that are fire-adapted, fire-dependent, or highly palatable have been locally eliminated or reduced to remnants. In the uplands, the formerly diverse shrub-steppe community now supports extremely low populations of fire-adapted, palatable shrub species such as saltbush, winterfat, silver sagebrush, and grey rubber rabbitbrush. The landscape today is almost a monoculture of relatively unpalatable and fire-intolerant big sagebrush. In addition, highly palatable forbs such as white prairieclover are gone from most sites. Introduced plants such as Japanese brome and yellow sweetclover have prospered in this environment and have replaced native species that are more valuable. The lack of variety in management strategies has additionally reduced the heterogeneity of plant community structure.

These changes have affected wildlife populations. For example, grassland bird species have declined at a faster rate than any other guild of terrestrial birds in North America (Fuhlendorf and Engle 2001, Knopf 1994). Particularly affected are the sentinel bird species and sentinel habitats that are positioned at the ends of natural processes such as those species that live in the wake of recent fire or require long periods of no disturbance, such as Baird's sparrow. Also affected are species that require a wide diversity of vegetation structure and plant species within their home range such as sharp-tailed grouse and sage-grouse. There are similar concerns for some small mammals, invertebrates, and other wildlife groups.

Upland health would be restored on the refuge by reestablishment of historical fire-return intervals and the historical fire-grazing interaction. There would be careful control of the numbers of all ungulate species (both wild and domestic) to compensate for the overgrazing effects of the last 100–150 years. Inventory and monitoring procedures would focus on the first to decline plant species (sentinel species) that have been most severely affected. Monitoring would also include the grasses and other plants to ensure that all species' populations are viable.

Strategies for Upland D1–D9

- Within 2–4 years, fully determine the species of plants that are first to decline and the cause of the decline (refer to appendix F for the list of existing sentinel species).
- Continue to work with range ecologists and use current monitoring results, along with newly acquired information, to develop adaptive management strategies.
- In cooperation with universities, NRCS, and other partner scientists and statisticians, continue to develop and monitor methods for identification, inventory, and monitoring of sentinel plant species. Reduce HDP monitoring as sentinel plant–monitoring procedures are developed that efficiently and consistently monitor habitat conditions.
- In cooperation with the NRCS, reestablish populations of sentinel plant species on 50 percent of the sites where they have been eliminated.
- Improve the population viability of herbivory-sensitive sentinel plant species in four ways: (1) control numbers of ungulates (domestic and wild); (2) coordinate management of ungulates and fire; (3) reduce selectivity by ungulates for sentinel species (through pyric herbivory); and (4) manage for long (several-year) periods of rest or abandonment.
- When monitoring of the population viability of herbivory-sensitive sentinel plant species indicates a declining population, manage livestock grazing by reducing AUMs or the season of use or by resting areas. If sentinel plant populations continue to decline after elimination of livestock grazing, explore opportunities to promote periods of rest or abandonment for sensitive areas. If sentinels continue to decline due to herbivory pressure, work with MFWP to reduce the numbers of large ungulates throughout the Missouri River Breaks to levels lower than objectives in MFWP's management plans.
- Manage the landscape with pyric herbivory (patch burning) to restore historical fire-return intervals and the fire-grazing interaction including concentrated herbivory coupled with long periods of abandonment to increase the amount and diversity of palatable plants to reduce selectivity for sentinel species.
- Evaluate the success of habitat treatments—the population viability of all species and the structural heterogeneity of the landscape—using methods developed by universities, NRCS, the Service, or other scientists. Focus on viability analysis of sentinel plant species populations at permanent trend sites.
- As HMPs for prescriptive grazing are developed, conduct fence projects based on defined priorities to achieve removal of interior fences on about 10–25 percent of the refuge and construction of boundary fences where absent. Use practical fencing strategies in cooperation with other landowners in areas where topography is too rugged. Hire seasonal employees for fence removal and professional fence builders for boundary fence construction; the remaining boundary fences are located in the most difficult terrain.
- Implement prescriptive grazing across the refuge through the development and implementation of

HMPs by working with BLM, DNRC, conservation districts, and permittees. Use prescriptive grazing only on Service-managed lands. Since it is possible that prescriptive grazing practices on Service lands may impact current permittees that graze BLM, DNRC and Service lands, work with the DNRC as budgets allow to mitigate any loss of revenue by assuming leases on these pastures. (Same strategy in alternatives C and D).

HABITAT–RIVER BOTTOM

River bottoms are areas above high pool of the lake exclusively on the west end of the refuge and within the original floodplain of the Missouri River. These areas consist of former agricultural fields that are now infested with invasive plants. There are 17 river bottoms totaling 5,000–7,000 acres on the west end of the refuge: 2 river bottoms are undergoing restoration, and the other 15 areas have about 4,500-6,000 acres that need removal of invasive plants (refer to figure 20 in chapter 4). The plant communities left on the river bottoms have now predominately been invaded by Russian knapweed, leafy spurge, smooth brome, and quackgrass, which have very little value to wildlife.

The Service is defining restoration of the river bottoms to be a healthy native plant community consisting of plants that would have occurred on the river bottoms 150 years ago. Climax river bottom communities include but are not limited to maximilian sunflower, diamond bark willow, sand bar willow, redosier dogwood, green ash, cottonwoods, and grasses.

Objectives for River Bottom Habitat, Alternative A

Refuge staff started restoring 160 acres of bottom lands in 2005, and an additional 160-acre project is planned to start in 2009 on the west end of the refuge.

River Bottom A1. Over 15 years, continue working with partners and pursuing outside funding to restore native plants to river bottoms.

Rationale for River Bottom A1. A healthy diverse native plant community in the river bottoms would enhance wildlife diversity and populations in addition to promoting biological diversity, ecological integrity, and environmental health. Healthy stands of native plants withstand or outcompete many nonnative species and create many more niches than that of monoculture food plots or invasive plants.

Restoring river bottoms with native species would allow these areas to perform their natural ecological function of trapping sediment during floods, which promote cottonwood regeneration. In addition, these native plants provide valuable wildlife habitat for numerous species. Vibrant native species would pro-

Jeff McMillian/USDA–NRCS PLANTS Database

Maximilian Sunflower

mote resilience and resist invasive species invasions in the future.

Strategies for River Bottom A1

- Initiate five to seven small bottomland restoration projects over 15 years.
- Continue to restrict livestock from all bottomlands.

Objectives for River Bottom Habitat, Alternative B

River Bottom B1. Within 1–3 years, identify and rank according to priority and resource value all former farm fields on river bottoms that have been invaded by invasive plants for food plot potential. Develop a comprehensive plan that identifies methods and timeframes for completing each phase.

River Bottom B2. Within 2–4 years, work with NRCS and cooperators to develop treatment plans for each bottomland. The treatment plan will address equipment needs, grants and partnerships, and a farming plan. The plans will also identifying types of food plots to be planted at each site to maximize game populations.

River Bottom B3. Within 3–5 years, begin implementing the approved management plan on the first river bottom on the priority list.

River Bottom B4. Over 15 years, complete a minimum of 30–40 percent of the identified projects for invasive plant removal. If time, personnel, and funding allows, start one new river bottom per year until all identified bottoms have a food plot present.

River Bottom B5. Over 15 years, continue to monitor and spot treat all invasive plants that may become established after removal of invasive plants is completed.

Rationale for River Bottom B1–B5. In alternative B, an aggressive approach to removal of invasive plants would be implemented. Work would include burning, discrete spraying with herbicides and planted with wildlife food crops to clear invasive plants (Anderson 1985). An herbicide such as Roundup® would be used initially to kill invasive grasses such as smooth brome and quackgrass. Following this, a broadleaf herbicide could be used if needed, unless invasive grasses encroached again. When the bottoms are treated and replanted to wildlife food crops, they would attract elk, deer, upland birds, and waterfowl. Wildlife numbers should increase with food plots and therefore, allowing for more hunting opportunities.

Strategies for River Bottom B1–B5

- Plant the lower priority bottoms to nongenetically modified organism alfalfa or grain crops to remove invasive plants and provide wildlife value.
- Continue restricting domestic livestock grazing from the river bottoms.
- Continue to seek partnerships for projects already in progress to remove invasive plants in river bottoms.
- Continue to seek outside funding opportunities such as grants from The Rocky Mountain Elk Foundation and other cooperators to secure necessary funding to acquire equipment and supplies needed.
- Hire a grant writer to pursue additional funding avenues to secure funding for weed removal projects.
- Clean former river bottoms through the application of herbicides and farming. If funding permits hire a biological technician who is knowledgeable in planting crops to start work on the first river bottom on the priority list.
- Work with NRCS and cooperators using knowledge gained in prior projects and experiences to establish methods of operation.
- Coordinate work with the road maintenance staff to fix roads necessary to safely access river bottoms (some areas would have to be accessed by foot or horse).
- Initially burn areas to be planted and have the Service's weed strike team spray invasive plants. Plant areas with wildlife food crops to clear invasive plants. Native plantings could follow after invasive plants have been removed to meet national and regional priorities.
- Over 15 years, continue to monitor and spot treat all invasive plants that may become established.

Objectives for River Bottom Habitat, Alternative C

River Bottom C1. By year 4–6, identify all river bottoms in need of invasive plant removal and develop plans for each. Include use of cooperative farmers to complete invasive plant removal work using a variety of methods including seeding of native plants and possible nongenetically modified organism crops such as alfalfa or other cereal grain (Roundup® could be used initially to treat area prior to planting).

River Bottom C2. Over 15 years, complete 50–60 percent of the identified projects for invasive plant removal. These areas would be restored to healthy native plant communities that are essential for wildlife habitat and resistance to invasive plant invasions (Colorado State Parks 1998).

Rationale for River Bottom C1–C2. In alternative C, the Service would rely on partnerships with cooperative farmers to restore the river bottoms. The use of cooperative farmers would allow the Service to treat more areas in less time and with fewer refuge resources.

Cooperative farmers have the necessary equipment and knowledge. Initially, there could be an short-term increase in the use of chemicals like Roundup® to kill invasive grasses like smooth brome or quackgrass, but this would soon be eliminated so plants would not build up a resistance to it. Other herbicides like Milestone™ would be used for spot spraying. Only non-genetically modified organism crops would be allowed for planting due to the likelihood of weeds becoming resistant to treatment. The number of weed removal projects would depend on the number of local farms interested in entering into cooperative farming contracts with the refuge.

The refuge would reinstate farming on river bottoms for up to 15 years so local individuals could get an economic benefit from the crops produced while weed seeds were eliminated. A contract inspector would be hired to discuss options with contractors and ensure that the terms of the special use permit were being followed.

Wildlife and people would benefit from the reduction in invasive plants and the eventual return of a healthy native plant community.

Strategies for River Bottom C1–C2

- Continue restricting domestic livestock grazing from the river bottoms.
- Continue invasive plant removal of river bottoms already in progress.
- Solicit interested parties to farm river bottoms in need of invasive plant removal, and if funding permits hire a biological technician knowledgeable in invasive plant removal work to oversee all removal of these plants in river bottoms.
- After invasive plant removal plans are developed, solicit and identify individuals and cooperators interested in farming the river bottoms in need of invasive plant removal and develop cooperative farming contracts. Contracts would contain acceptable methods to be used for invasive plant removal of river bottoms (for example, area to be plowed on each individually identified river bottom, herbicides acceptable for use, crops that can be planted, invasive plant reduction necessary, time tables for replanting native seed mixtures, and penalties to be incurred if the contract is not fulfilled).
- Identify the native plant mixture to be planted at the end of the contract and use penalties if the contractor defaults on the contract.
- Road maintenance and repair of access roads to river bottom would occur as needed. Some of these roads may be service roads only.
- On the third year, contract holders would begin reducing the invasive plants present by spraying and/or plowing predetermined areas, and plant them with mutually agreed on crops (crops produced would be the property of the contract holder to use as that person wishes, following compatibility determination).
- Use ecological site descriptions prepared by the NRCS as a baseline for determining grass and forb planting mixture, but modify as necessary to promote sustainable big game populations. All seed mixture would be purchased by the Service and planted by a contractor or cooperator.
- On contract completion, the Service would plant native shrubs and trees and protect the new plantings from browsing with exclosures until they are able to grow out of the browse zone.
- Over 15 years, monitor and spot treat all invasive plants that may become established.

Objectives for River Bottom Habitat, Alternative D

River Bottom D1. Similar to B1, except food plots would not be used for restoration, but work could be contracted.

River Bottom D2. Within 2–4 years, work with NRCS and cooperators to develop restoration plans for each bottomland necessary to implement the comprehensive restoration plan. Treatment plans would address equipment needs, farming plan, identify native plant composition mix for planting, and grants and partnerships.

River Bottom D3. Within 3–5 years, begin implementing the approved restoration plan on the first river bottom on the priority list.

River Bottom D4. Over 15 years, develop and implement a habitat-monitoring plan to determine success of invasive plant removal efforts. Make adjustments to ensure successful native plant restoration.

River Bottom D5. Over 15 years, complete 20–30 percent of the identified restoration projects (more if funding is available). If time, personnel and funding allows, start one new river bottom project every 2 years until all are restored to healthy native plant communities.

Rationale for River Bottom D1–D5. In alternative D, the approach to removal of invasive plants in river bottoms would be slightly less aggressive than alternative B and would be more gradually implemented. This is due to the expense and time needed to establish native plants.

Native plant communities that once existed on these bottoms have been unable to reestablish themselves. This is most likely due to a lack of a viable seed source and competition from nonnative species.

Once established, the correct combination of native forbs, shrubs and grasses, such as maximilian sunflower, wild licorice, basin, wildrye, green needle-

grass, redosier dogwood, and silver buffaloberry would be highly competitive with these invaders (Riley and Wilkinson 2007). NRCS' ecological site description has a complete list of native plants that most likely occurred on these sites (NRCS 2009).

Refuge staff would continue to consult with NRCS range specialists and design a restoration program that includes prescribed fire, herbicide application, tilling and native seed planting.

Strategies for River Bottom D1–D5. Similar to B, except:

- When native forbs and grasses are reestablished, plant native shrubs in the fields and protect them from browsing by total exclosures until they are able to grow out of the browse zone. Water shrubs and trees four to six times during the first summer they are planted.

HABITAT–RIPARIAN AREA and WETLAND

Riparian habitat areas include wetland and upland vegetation associated with rivers, streams, and other drainage ways. Riparian and wetland areas provide important habitat for a variety of wildlife species, ranging from reptiles and amphibians to upland mammals and many birds. While riparian areas occupy a small proportion of the landscape, wildlife and livestock depend on these areas more than any other habitat type (Kaufman and Krueger 1984, Mosconi and Hutto 1982, Johnson et al. 1977, Ames 1977). The ability of a riparian site and its associated stream reach to perform normal riparian functions determines the health of the site. Other important functions of riparian vegetation include sediment filtering, stream bank stabilization, water storage and aquifer recharge, and dissipation of stream flows (Hansen et al. 1995). Considering the importance of riparian areas, the alternatives would be very similar in emphasizing maintenance or restoration of healthy riparian zones.

Objectives for Riparian Area and Wetland Habitat, Alternative A

Alternative A would continue managing riparian areas according to actions or directions set in the 1986 EIS even though many have already been implemented.

Riparian Area and Wetland A1. Over 15 years, continue managing migratory bird habitats (riparian areas) first for production and then for use during migration.

Riparian Area and Wetland A2. Over 15 years, continue improving and maintaining riparian habitat on the Missouri and Musselshell Rivers and other suitable riparian areas in good to excellent condition to benefit wildlife species such as elk, white-tailed deer, raccoons, beaver, waterfowl, kingbirds, mourning doves, American kestrels, ring-necked pheasants, and turkeys.

Rationale for Riparian Area and Wetland A1–A2. Keeping with the priorities and direction set by the 1986 record of decision through the HMPs, livestock grazing would be managed to promote waterfowl habitat in good or excellent condition. Livestock ponds would be maintained, and new ones constructed.

Fencing would be used to exclude livestock from the vast majority of the riparian habitats along the Missouri and Musselshell Rivers. Livestock has been excluded by fencing in a few other important riparian areas (for example, Rock Creek in Phillips County and Bobcat Creek in McCone County). Through changes in ranch ownership, management changes, and other factors, livestock grazing has been reduced or eliminated from several other habitat units and conditions in these riparian habitats are improving.

A contractor was hired in 1995–7 to evaluate riparian conditions and was hired for the 2009 season to reevaluate current riparian conditions and function and compare to previous surveys. Another contractor was hired to monitor effects of the exclosure on Rock Creek (refer to Chapter 4–Affected Environment). Restoration practices such as shrub and tree plantings were initiated in Rock Creek/Bug Creek Habitat Unit, Hawley Creek and Telegraph Creek areas. A local group of farmers and ranchers along the Lower Musselshell River hired the same contractor to design a riparian monitoring plan and gather baseline data from Mosby to the refuge at Fort Peck Reservoir. Additionally, USGS conducted a 5-year study to gage streams on the refuge (Sando et al. 2009). Montana Department of Environmental Quality conducted water quality sampling on the refuge in 2006-2007 (refer to Chapter 4–Affected Environment).

Strategies for Riparian Area and Wetland A1–A2. None.

Objectives for Riparian Area and Wetland Habitat, Alternative B

Riparian Area and Wetland B1. Within 2–4 years, implement management actions to improve health of those streams identified as in poor condition based on the survey that was conducted in 2009 by Hansen.

(Same as Riparian Area and Wetland C1 and D1).

Riparian Area and Wetland B2. Over 15 years, remove all reservoir and stock ponds that do not support species of concern (for example, northern redbelly dace and finescale dace) and adhering to any permit requirements, initiate restoration of the natural hydrology of the drainage. Determine if additional stock ponds are needed to meet requirements of target species.

(Same as Riparian Area and Wetland D2).

Riparian Area and Wetland B3. Within 4–6 years, those reservoirs and stock ponds that cannot be removed

due to species of concern should be maintained or improved for amphibian, reptile, bird, or fish use.

(Same as Riparian Area and Wetland D3).

Riparian Area and Wetland B4. Over 15 years, survey the current health of a representative sample of segments of the Missouri River using the "U.S. Lotic Wetland Health Assessment for Large River Systems" (Ecological Solutions Group 2010).

(Same as Riparian Area and Wetland C5 and D4).

Riparian Area and Wetland B5. Within 5–7 years, resurvey the current health of segments previously surveyed on the Musselshell River (Riparian Wetland and Research Program 2001) using the "U.S. Lotic Wetland Health Assessment for Large River Systems" (Ecological Solutions Group 2010).

(Same as Riparian Area and Wetland C6 and D5).

Riparian Area and Wetland B6. Over 15 years, construct wildlife-friendly fence based on highest need as determined by current river health assessments along Missouri and Musselshell Rivers where prescriptive livestock grazing will be occurring (Paige 2008).

(Same as Riparian Area and Wetland C7 and D6).

Riparian Area and Wetland B7. Over 15 years, identify locations along riverbanks in need of stabilization and revegetation and restore 50 percent of those locations. Adhere to all regulatory permitting requirements.

Riparian Area and Wetland B8. Within 7-10 years describe the habitat requirement of the target species and implement habitat and population monitoring protocol on 25–50 percent of the river. Over 15 years, further develop the program on 50–75 percent of the refuge.

Rationale for Riparian Area and Wetland B1–B8. The first priority for riparian restoration would be those sites already found to be nonfunctioning as identified by the latest riparian study completed in the summer of 2009 (Hansen 2009).

Restoration measures would vary depending on the condition and trend of the riparian-wetland habitat. Considerations should include the potential of the site; desired plant community; stabilization of streambanks and elimination of bank hoof shearing; value of site for forage production, and amount of vegetation stubble required to trap and hold sediment deposits during run-off events. For instance, if one of the objectives for a riparian-wetland area is stream bank stability, then woody vegetation vitality should be of utmost importance due to the vastly different stream bank stability protection afforded by the woody vegetation when compared to the herbaceous vegetation (Hansen 1992). Also to be considered are water quality and quantity issues, wildlife, aesthetic values, amount of time for restoration, and reduction of erosion and maintenance of soil production (Hansen 1992).

Key species vary with the potential of each site. The Riparian and Wetland Research Program developed the key to riparian and wetland sites of the refuge (1996). This reference should be utilized whenever possible. Willows and other large woody vegetation (such as trees) filter large water borne organic material and their root systems provide streambank stabilization. Sedges, rushes, grasses, and forbs capture and filter out the finer materials while their root masses help stabilize streambanks and colonize filtered sediments (Hansen 1992).

The objectives and strategies recognize the habitat value of stock ponds. Phytoplankton (algae) is consumed by zooplankton, insects, crustacean, and tadpoles that live in ponds. Larger invertebrates, amphibians, reptiles, fish and birds also will utilize a stock pond. (NRCS 2005).

Fencing would be used to exclude livestock from the vast majority of the riparian habitats along the Missouri and Musselshell Rivers. Livestock has been excluded by fencing in a few other important riparian areas (for example, Rock Creek in Phillips County and Bobcat Creek in McCone County). Through changes in ranch ownership, management changes and other factors, livestock grazing has been reduced or eliminated from several other habitat units and conditions in these riparian habitats are improving.

Strategies for Riparian Area and Wetland B1–B8

- Contract with a qualified riparian habitat consultant to resurvey riparian areas surveyed by Cook et al. (1996), Parker and Hansen (1996), Thompson and Hansen 1996 and 1997, Lower Musselshell River (2001), and Ecological Solutions Group (2009) to determine current health.
- Prioritize stream restoration using Thompson and Hansen 1999 (functioning versus nonfunctioning streams) and USGS gauge information; establish more permanent stream gauging stations on refuge; identify species of concern that are being affected by nonfunctioning streams; and identify dams on private and BLM land off refuge that have the ability to influence stream health on the refuge; Define realistic and attainable management objectives for the site or stream reach.
- Prioritize stream restoration based on water rights and/or the ability to influence stream health.
- Locate key areas for monitoring in representative portions of the riparian-wetland areas as well as in the uplands.
- Determine the amount of vegetation stubble required to trap and hold sediment deposits dur-

ing run-off events to rebuild stream banks and restore and recharge aquifers.

- Reestablish vegetation along stream banks using willow cuttings, tree revetments, perennial grasses or other stream bank stabilization planting techniques.
- Restore the refuge prairie streams by using exclosures in riparian areas, prescriptive livestock management; rehabilitating stock reservoirs that are no longer needed, and planting of riparian species, placing salt and mineral blocks, establishing or improving off-stream watering sites, installing stable access points to limit streambank trampling, requiring permittees to use riders to keep herds out of riparian areas, considering different turn-in locations, placing in-stream structures such as boulders to increase the water tables (Fitch and Adams 1998, Leonard et al. 1997, Kaufman and Krueger 1984, Ehrhart and Hansen 1997, Wyman et al. 2006).
- Restore beaver colonization of perennial and intermittent streams.
- Seasonally restrict livestock access to wetlands or limit duration and intensity of use; establish water troughs with escape ramps (troughs shouldn't be placed in locations that lead to unacceptable impacts to important upland habitats (Pilliod and Wind 2008). When livestock have to cross a stream, then a bridge, water-gap, or a streambed crossing should be constructed.
- Encourage livestock to move away from the stream through several methods such as conducting prescribed burns of uplands to regenerate desirable species or placing salt and supplemental feed in upland areas.
- Rangeland rest should be employed wherever and whenever possible.
- Incorporate applicable regulatory compliance (such as wetlands permitting) into stock pond removal efforts.
- Within stock ponds incorporate logs for amphibians and turtles to bask, egg-laying sites for fish, frogs, and salamanders, perches for birds.
- Provide a buffer of woody vegetation around a portion of constructed earthen livestock watering ponds.
- Design a monitoring plan that will evaluate the effectiveness of the management plan. Grazing management must be flexible enough to accommodate changes.
- Monitor vegetation community change in response to management actions by using the U.S. Lotic Wetland Inventory (current as of June 22, 2009) to record species canopy and habitat type or community type covers on a reach of stream and its riparian zone. Quantify such vegetative variables as invasive plants, undesirable herbaceous species, and the structure and diversity of the plant community.
- Determine site potential, existing vegetation types and desired plant community or desired future condition. Continue to exclude livestock from riparian areas if possible.
- Follow Hoitsma Ecological, Inc.'s (2006) recommendations for future riparian efforts along Telegraph Creek as well as the refuge staff's restoration efforts from 1991–3 in Rock Creek/Bug Creek Habitat Unit, and Hawley Creek.
- Supervise frequently to avoid adverse effects such as trampling damage to stream banks and excessive use.

Objectives for Riparian Area and Wetland Habitat, Alternative C

Riparian Area and Wetland C1. Same as Riparian Area and Wetland B1 and D1.

Riparian Area and Wetland C2. Within 10 years, evaluate current stock ponds and determine which ponds need to be rehabilitated or eliminated and determine if additional ponds are needed to meet NRCS range conditions across the unit. Those reservoirs and stock ponds that cannot be removed due to species of concern should be maintained or improved for fishing or livestock use (see strategies, which include pond management).

Riparian Area and Wetland C3. Within 5 years, determine the potential of selected sites (for example, the riparian-wetland plant association) and desired plant community to stabilize stream banks and eliminate bank hoof shearing.

Riparian Area and Wetland C4. Over 15 years on priority streams, raise the elevation of the present water table; improve or maintain water quality and quantity; stabilize the stream banks; establish proper stream channels, stream banks, and floodplain conditions and functions.

Riparian Area and Wetland C5. Same as Riparian Area and Wetland B4 and D4.

Riparian Area and Wetland C6. Same as Riparian Area and Wetland B5 and D5.

Riparian Area and Wetland C7. Same as Riparian Area and Wetland B6 and D6.

Riparian Area and Wetland C8. Same as Riparian Area and Wetland D7.

Rationale for Riparian Area and Wetland C1–C8. Same as B, except under alternative C, management of riparian resources is geared toward maximizing livestock grazing and recreation while still maintaining a balance

with other needs and requirements. Service resources will be allocated with the priority on improving ponds for livestock and recreation, only indirectly benefiting wildlife. With those resources, additional ponds could be established utilizing pond management. Fewer resources under large river objectives would be available for revegetation, restoration, and monitoring. Also, no resources would go towards restoring natural hydrology of first-, second-, and third-order streams.

Historical grazing by large herds of bison and other ungulates included long periods of rest after intensive disturbance such as drought, fire, and grazing. Bison did not linger in riparian areas (Van Vuren 1981, Fuhlendorf et al. in press) and did not use an area all season long. Cattle spend a disproportionate amount of time in riparian areas (5–30 times longer) (Ehrhart and Hansen 1997).

Strategies for Riparian Area and Wetland C1–C8
Same as B, plus:

- Utilization monitored annually, but progress in reaching long-term resource objectives such as stream bank stabilization, rebuilding of the streamside aquifer, and the reestablishment of beaver or fish habitat can only be determined over a longer period. Targets would be developed for riparian-wetland areas that would:
  - maintain both herbaceous species and woody species (where present) in a healthy and vigorous state and promote their ability to reproduce and maintain different age classes in the desired riparian-wetland plant community
  - leave sufficient plant residue necessary to protect stream banks during run-off events and provide for adequate sediment filtering, and dissipation of flood water energy
  - are consistent with other resource values and objectives such as for aesthetics, water quality, water quantity, and wildlife populations.
  - limit stream bank shearing and trampling to acceptable levels.
- Stock ponds with predatory largemouth bass and prey species such as bluegill, yellow perch, golden shiners, or fathead minnows. Protect population for 5 years. Stocking rates are 100 2-inch largemouth bass per acre and 500 l-inch bluegill per acre (FWS 1994).
- Use techniques in "A Guide for Building and Managing Private Fish Ponds in Montana" (MFWP 2006a) to addresses water quantity and quality, watershed and soil analysis, design and construction including: contour, depth and water exchange, excavation, revegetation; stocking; and pond management.

Objectives for Riparian Area and Wetland Habitat, Alternative D

Riparian Area and Wetland D1. Same as Riparian and Wetland B1 and C1.

Riparian Area and Wetland D2–D3. Same as Riparian and Wetland B2–B3.

Riparian Area and Wetland D4. Same as Riparian and Wetland B4 and C5.

Riparian Area and Wetland D5. Same as Riparian and Wetland B5 and C6.

Riparian Area and Wetland D6. Same as Riparian and Wetland B6 and C7.

Riparian Area and Wetland D7. Over 15 years, provide alternate water sources for cattle where requiring prescriptive grazing to accomplish habitat objectives away from riparian areas and sensitive upland sites on a priority basis.

Riparian Area and Wetland D8. Over 15 years, identify locations along riverbanks in need of stabilization and revegetation, and restore 50–75 percent of those locations.

Riparian Area and Wetland D9. Over 15 years, restore natural hydrology of five first-, second-, and third-order streams that would normally flow into the Missouri and Musselshell Rivers.

Rationale and Strategies for Riparian Area and Wetland D1–D9 *(Same as B)*

HABITAT–SHORELINE

The shoreline is a highly dynamic area that fluctuates based on current lake level. Shoreline habitat is defined as the vegetation found between current lake level and high pool elevation. This habitat type is used during periods of drought.

Objectives for Shoreline Habitat, Alternative A

No objectives were developed for the 1986 EIS for Shoreline management. Currently, the Service does not manage the shoreline but does cooperate with USACE in their efforts to treat invasive species along the shoreline.

Shoreline A1. When completed, cooperate with USACE and others in implementing the Missouri River Ecosystem Restoration Plan, which is currently being developed in addressing habitat needs for threatened and endangered species and other species along the shoreline.

(Same as Shoreline B1, C1, and D1).

Dave Menke/USFWS

The spotted sandpiper uses shoreline habitat.

Rationale for Shoreline A1. The USACE has primary jurisdiction for management of the lakeshore areas including treating saltcedar infestations; therefore, the refuge does not take the lead role in managing the shoreline. The Service would defer to the Missouri River Ecosystem Restoration Plan to guide management of this habitat and provide assistance as requested. The Service is working in cooperation with the USACE and other partners to develop the plan (USACE 2009b) to meet the habitat needs of various threatened and endangered species such as piping plover, least tern, and pallid sturgeon. Once this restoration plan is completed, refuge staff would cooperate to implement any recommendations that come out of the plan.

Continual water fluctuations and changes in shoreline exposure result in constant infestations of saltcedar along the exposed shoreline. The Service will continue to partner with the USACE in treating saltcedar both above and below the high water line. The invasive species discussion below has additional details.

(Same as B, C, and D).

Strategies for Shoreline A1 *(None)*

Objectives for Shoreline Habitat, Alternative B

Shoreline B1. Same as Shoreline A1, C1, and D1.

Shoreline B2. Over 15 years, continue to cooperate with USACE and other partners—such as nongovernmental organizations, neighboring counties, and the State of Montana—in treating a minimum of 200 acres of invasive plant species per year that colonize Fort Peck Reservoir and the Missouri River shorelines.

(Same as Shoreline A2, C2, and D2).

Rationale for Shoreline B1–B2. The actions would be similar to alternative A, but there would be more emphasis on being aggressive with treating invasive species.

Strategies for Shoreline B1–B2

- Maintain water gap structures as the shoreline recedes.
- Coordinate invasive plant control by meeting and cooperating with USACE and other partners to share information and discuss control strategies.
- Use integrated pest management and review literature for updated information on control techniques.
- Map all treatment sites.
- Monitor and re-treat areas to prevent reinfestation.
- Restore bare areas resulting from saltcedar removal to native plant cover and monitor results.
- Obtain assistance with invasive plant control and monitoring by pursuing additional funds through partnerships, grants, and invasive species programs.
- Deploy early detection and rapid response strategies to attack newly found infestations before they become large and costly initiatives.
- Within 1 year, invite all parties that have an interest in invasive plant control to pool resources and coordinate efforts at control and restoration methods.
- Over 15 years, when funds are available continue to contribute to USACE efforts at saltcedar control and cottonwood restoration.
- Over 15 years, continue to assist USACE with historical plover and tern surveys so that the survey data remains consistent.

Objectives for Shoreline Habitat, Alternative C

Shoreline C1. Same as Shoreline A1, B1, and D1.

Shoreline C2. As funding permits, cooperate with any potential partners—such as USACE, nongovernmental organizations, neighboring counties, and the State of Montana—in treating a minimum of 250 acres of invasive plant species per year that colonize Fort Peck Reservoir and Missouri River shorelines.

Rationale for Shoreline C1–C2. Same as A, except the Service would work with others to treat more areas of the shoreline.

Strategies for Shoreline C1–C2 *(Same as B)*

Objectives for Shoreline Habitat, Alternative D

Shoreline D1. Same as Shoreline A1, B1, and C1.

Shoreline D2. Same as Shoreline B2.

Rationale and Strategies for Shoreline D1–D2 *(Same as B)*

HABITAT–FIRE MANAGEMENT

Fire management and habitat management are inseparable, thus objectives for prescribed fire and wildfire were developed to support the achievement of habitat objectives for the four vegetation categories—uplands, river bottoms, riparian areas and wetlands, and shorelines.

The terms and concepts for wildfire—prescribed fire and wildfire—are based on Federal interagency policy (Fire Executive Council 2009). Wildfire is any nonstructure fire that occurs in the wildland including prescribed fire. Response to wildfire is based on consideration of a full range of fire management actions—allowing the fire to benefit the resource where possible or taking suppression action when those benefits are not attainable or there is a likely risk to important resources or adjacent lands. Fire management actions may include controlling the fire's perimeter, protecting a specific area with highly valued resources, and monitoring fire conditions and activity.

Prescribed Fire

A prescribed fire is any fire ignited by management actions to meet specific objectives. A prescribed fire is conducted under a project-specific prescription of requirements for conditions such as weather, fuel moisture, and soil moisture. The prescription is designed to confine the fire to a predetermined area and produce the intensity of heat and rate of spread required for the fuel consumption that would accomplish the objectives.

Objectives for Prescribed Fire, Alternative A

Prescribed Fire A1. Continue with the 1986 record of decision strategy of treating existing plant communities with prescribed fire to achieve desired habitat conditions.

Rationale for Prescribed Fire A1. Habitat analysis indicates some deciduous shrubs have diminished on the refuge, and historical accounts indicate shrubs were once more abundant than they are today. A combination of actions would be taken to improve the present situation; the actions in priority order would probably be adjustments in livestock grazing, burning, and planting.

Strategies for Prescribed Fire A1

- (From the 1986 EIS) Increase the quality and quantity of deciduous shrubs by prescribed burning 525 acres per year. Following burning or planting, allow no livestock grazing for 2–3 years or longer, if necessary, to ensure successful establishment of the desired vegetation.
- Implement a fire management program to provide for appropriate management response areas and prescribed burns to protect fragile habitats, valuable coniferous areas, critical wildlife habitats, recreational developments, and other private and refuge developments.

Objectives for Prescribed Fire, Alternative B

Prescribed Fire B1. Within 2–4 years, revise the fire management plan.

Prescribed Fire B2. Within 5 years, determine priority units where prescribed fire would be used to meet the habitat needs of focal species or where needed to reduce hazard fuel.

(Same as Prescribed Fire D2.)

Prescribed Fire B3. Develop a patch-burning system using wildland fire to improve annually at least 2,500 acres of habitat suitable for target species. Additionally, reestablish natural fire regimes (fire occurs on average every 8–70 years) of nonfire refugia sites on about 30,000 acres using prescribed fire and wildfire managed for resource benefit.

(Same as Prescribed Fire D3.)

Prescribed Fire B4. Within 5–7 years, develop prescribed fire plans for the major habitat units.

Prescribed Fire B5. Within 1–2 years, work with the Ecological Services branch of the Service to identify what and how critical habitat for threatened and endangered species and species of concern would be adversely affected by prescribed fire and incorporate into fire management plan.

(Same as Prescribed Fire C4.)

Prescribed Fire B6. Over 15 years, use prescribed fire and wildfire managed for resource benefit to restore the natural ecological process of fire and to reduce by 5–10 percent the encroachment of ponderosa pine and Douglas-fir into the dry needlegrass-wheatgrass prairie.

(Same as Prescribed Fire C5 and D6.)

Prescribed Fire B7. Over 15 years, reduce 5 percent of hazard fuel on forested slopes, with an emphasis on protecting old-growth forests that have a fire-return interval of 75–100 years from catastrophic fire.

(Same as Prescribed Fire C6 and D7.)

Prescribed Fire B8. Over 15 years, establish partnerships with nongovernmental organizations, local governments, and private cooperators to identify and reduce 200–400 acres of hazard fuel in the wildland-urban interface.

(Same as Prescribed Fire D8.)

Rationale for Prescribed Fire B1–B8. See the rationale under uplands for alternative B about changes in the landscape since the demise of bison in 1881.

The Service has long recognized fire as a unique process that shapes wildlife habitat structure and function, and the agency has managed and used fire

extensively for the past 70 years. Guiding principles of fire management in the Service include responsible stewardship, habitat management strategies based on conserving ecological integrity, reducing hazardous fuels and establishing effective partnerships.

The emphasis of the refuge's fire management program has switched from strictly being suppression-oriented to a program that uses prescribed fire and wildfire as management tools to achieve habitat objectives and large, landscape-level change.

The sagebrush flats in UL Bend National Wildlife Refuge are critical nesting and wintering habitat for sage grouse. Wildfire in an area such as this could dramatically alter the habitat and result in severe impacts on associated wildlife. Within 1–2 years, refuge biologists would evaluate such areas and provide fire managers with a detailed map of the critical habitat to be protected, which would be taken into account in prescribed fire and wildfire plans.

There are large tracts of old-growth forest on the western half of the refuge that have not burned in the last 75–100 years (Douglas-fir and ponderosa pine). If a late-season, wind-driven wildfire were to occur in these areas, as has occurred throughout the central section of the refuge during the past decade, these old-growth forests would be practically eliminated, possibly forever. The refuge fire staff would evaluate these areas for possible reduction of hazard fuel and treat identified areas with prescribed fire or mechanical thinning, or both.

(Similar to C, with exceptions described under alternative C. Same as D.)

Strategies for Prescribed Fire B1–B8

- In cooperation with universities, partner scientists, and staff biologists, evaluate suitable areas for using prescribed fire as a habitat management tool to promote the abundance and viability of focal species.
- Enhance the fire organization with an increase of fire staff and prescribed fire competency: 2 prescribed fire burn bosses (type 1 and type 2), 15 prescribed fire seasonal employees, and 1 prescribed fire specialist (the seasonal employees and prescribed fire specialist would be additions to the current staff). These individuals would write burn plans and carry out an aggressive prescribed fire program. If increased funding through the fire program is not available, work to secure funding through the refuge program to hire the above fire staff. (Same as D.)
- Using research, fire-history data, and fire-scar evidence, conduct an inventory of sites that have exceeded average fire intervals. Set priorities for a burn rotation of hazard fuel in these areas, taking into account habitat and wildlife objectives. (Same as D.)
- Evaluate critical habitat areas across the refuge and provide the fire management officer with a detailed map of the critical habitat to be protected within 1 year of plan approval. (Same as C and D.)
- Evaluate old-growth forest areas that have a fire frequency of 75–100 years for possible fuel reduction and treat identified areas with fire or mechanical thinning. (Same as C and D.)
- Contract a fire planner to develop plans pertaining to the use of wildland fire that would cover all burnable acres on the refuge. (Same as C and D.)
- With the use of historical photos, aerial photos, GIS, and onsite evaluation, identify areas where conifer encroachment into grasslands has been the greatest. Manage these areas with fire or mechanical treatment. (Same as C and D.)
- Using the refuge's 2005 Hazardous Fuels Assessment and in cooperation with USACE and local cooperators and private landowners, carry out fuel reduction projects in wildland-urban interface areas including the Pines, Hell Creek, Rock Creek, and Nelson Creek recreation areas. Support communities in acquiring community assistance grants for mechanical treatment of wildland-urban interface areas. (Same as C and D.)

Objectives for Prescribed Fire, Alternative C

Prescribed Fire C1. Within 5 years, develop prescribed fire plans for habitat units with prescriptive livestock grazing to implement pyric-herbivory management for sentinel plants.

Prescribed Fire C2. Within 15 years, initiate a prescribed fire program in habitat units where vegetation palatability and composition has been identified as fair to poor or where there are large amounts of hazard fuel, or both, to improve range health and increase use of plant biomass by grazing ungulates.

Prescribed Fire C3. Over 15 years, work with partners and cooperators to reduce the risk of wildfire and negative economic effects to permittees by reducing fuel loading in habitat units through a combination of prescriptive livestock grazing and prescribed fire. Strike a balance between the needs of wildlife and improved forage for livestock.

Prescribed Fire C4. Same as Prescribed Fire B5.

Prescribed Fire C5. Same as Prescribed Fire B6 and D6.

Prescribed Fire C6. Same as Prescribed Fire B7 and D7.

Rationale for Prescribed Fire C1–C6. Similar to rationale for B, except there is more emphasis given to the economic effects of burning large units and units with active livestock grazing systems. Pastures without permit holders or where the permittee has taken voluntary nonuse would be the primary criteria for selecting prescribed fire units.

Strategies for Prescribed Fire C1–C6. Four strategies noted under B, plus:

- In cooperation with universities, partner scientists, and staff biologists, evaluate declining rangelands for the feasibility of using prescribed fire as a habitat management tool to improve range conditions and increase the use of plant biomass by grazing ungulates.
- Enhance the fire organization with an increase of fire staff and prescribed fire competency: 2 prescribed fire burn bosses (type 2) and 5 prescribed fire seasonal employees (additions to the current staff). These individuals would write burn plans and carry out a prescribed fire program.
- Within 5 years, contract with private vendors for 2,000 acres of mechanical fuels reduction in old-growth forests that are prone to a fire frequency of 70–150 years, with emphasis on habitat units that have the highest risk of loss to catastrophic wildfire.

Objectives for Prescribed Fire, Alternative D

Prescribed Fire D2. Same as Prescribed Fire B1.

Prescribed Fire D2. Within 5 years, identify priority habitat units where sentinel plant species have declined due to lack of fire or too much fire, and develop burn plans to apply prescribed fire in those areas.

Prescribed Fire D3. Same as Prescribed Fire B3.

Prescribed Fire D4. Within 2 years, identify critical habitat for threatened and endangered species and species of concern that could be adversely affected by fire; in addition, use prescribed fire in conjunction with research to determine if there would be any negative effects on species or critical habitat.

Prescribed Fire D5. Same as Prescribed Fire B5.

Prescribed Fire D6. Same as Prescribed Fire B6 and C5.

Prescribed Fire D7. Same as Prescribed Fire B7 and C6.

Prescribed Fire D8. Same as Prescribed Fire B8.

Rationale for Prescribed Fire D1–D8 *(Same as B)*

Strategies for Prescribed Fire D1–D8
Similar to B, except:

- Manage the landscape with a coordinated program of prescribed fire (patch burns) and livestock grazing to restore historical fire-return intervals and the fire-grazing interaction. This includes concentrated herbivory (grazing and fire) coupled with long periods of abandonment and reduced selectivity for important sentinel species (species that disappear first).
- In cooperation with universities, partner scientists, and staff biologists, evaluate areas with declining sentinel plant species due to lack of fire for the feasibility of using prescribed fire as a habitat management tool to promote the abundance and viability of sentinel plant species.
- Use prescribed fire to establish a semi-natural mosaic of burned patches that would (1) reestablish a more natural fire-browsing-grazing interaction; (2) promote long-distance animal movement; (3) cause long periods of abandonment from grazing and browsing ungulates; (4) reduce the selectivity for sentinel species by all ungulates; and (5) increase landscape species and structural heterogeneity.

USFWS

A small, low-intensity prescribed fire in 2008.

Wildfire

A wildfire is an unplanned ignition such as a fire started by lightning or an unauthorized or accidental fire started by humans. The response to a natural ignition fire is based on an evaluation of risks to firefighter and public safety and the circumstances under which a fire occurs including weather and fuel conditions, natural and cultural resource management objectives, values to be protected, and protection priorities.

Objectives for Wildfire, Alternative A

Wildfire A1. Within 15 years, revise the fire management plan and carry out a fire program that provides for a response strategy for wildfire with the primary objective of protecting fragile habitats, valuable coniferous areas, critical wildlife habitats, recreational developments, and other private and refuge developments consistent with resource objectives.

Rationale for Wildfire A1. Wildfire is a natural component of a healthy ecosystem. The Service has long recognized the many ecological benefits of fire in restoring, maintaining, and enhancing refuge lands. Keeping this capability is critical to the Service mission because most Service lands, including the refuge, evolved with fire as a natural disturbance. Not all wildfires are detrimental, nor should they be suppressed at all costs. It is important to evaluate wildfires for opportunities to use modified suppression tactics to promote natural processes.

Strategies for Wildfire A1

- Evaluate each wildfire to determine the safest and most economical and beneficial manner for suppression. This strategy may entail allowing a fire to burn toward natural barriers such as the river, lake, or bare clay ridges, while taking full suppression action on other areas of the fire (FWS 2004). In addition, this strategy may result in a larger fire but could provide resource benefits.
- Aggressively suppress that portion of any fire that threatens to burn off the refuge unless there is an agreement in place to do otherwise.

Objectives for Wildfire, Alternative B

Wildfire B1. Within 2–4 years, revise the fire management plan using the most current information. Incorporate a full spectrum of fire management actions for response to wildfire—knowing that managing fire is a dynamic process—including management of wildfire for resource benefit.

(Same as Wildfire D1.)

Wildfire B2. Within 10 years, develop maps to identify areas with the highest potential of success for reestablishment of fire on the landscape, using available scientific data on natural fire intervals, prescribed fire plans, and recent fire data.

Wildfire B3. Within 5 years, identify the locations with the highest valued resources, such as houses or wellheads, and ensure those values are not lost. Additionally, develop databases with maps that are readily available for managers to use in making sound decisions.

(Same as Wildfire C3 and D3.)

Wildfire B4. Within 5 years, identify areas where perimeter control is needed to preserve public safety and to protect both natural and human-made values at risk. Categorize these as hazard-fuel reduction areas, which would protect them as high-value resources (often called point protection).

(Same as Wildfire C4 and D4.)

Wildfire B5. After revision of the fire management plan, carry out appropriate fire management actions on natural ignition fires on the north side of the Missouri River. Control the fire perimeter for fires south of the Missouri River and in wildland-urban interface areas, both of which would be the highest priority for hazard fuel reduction.

(Same as Wildfire D5.)

Wildfire B6. Within 2 years, update and execute cooperative agreements with neighboring agencies—BLM, DNRC, the six counties, nongovernmental organizations, and neighboring landowners—for consideration of all fire management options when determining the management response to wildfires.

(Same as Wildfire D6.)

Wildfire B7. Within 1 year, identify areas of critical habitat for endangered species and/or species of concern that would be adversely impacted by fire. Fully suppress fires in these areas.

(Same as Wildfire D7.)

Rationale for Wildfire B1–B7. Consideration of the full spectrum of management response to wildfire does not replace, supersede, or give emphasis to any one particular strategy or tactic. Instead, the Service would consider all available strategies and tactics to determine a calculated response based on the circumstances of a particular fire at a particular time with particular characteristics. There is often more than one way to respond to a set of circumstances. (Northern Rockies Coordinating Group 2008).

Practices such as the following give the refuge the tools needed to manage wildfire for achieving multiple objectives. Fire has a role in maintaining the characteristics of an ecosystem (The WILD Foundation 2006) and in sustaining species. Sentinel plants and fire-return intervals have been studied on the refuge, showing that both have been interrupted by human activity (Frost 2008). Using the appropriate fire management actions to manage wildfire would help return natural processes to the Missouri River Breaks ecosystem. Wildfire management in concert

with a monitoring program and aggressive use of prescribed fire would ensure protection of areas of higher fire-return intervals.

The Service would use intensive suppression strategies where perimeter areas are threatening to burn off the refuge. While not all of the refuge's neighbors and cooperators share the Service's vision for wildfire, the refuge staff would continue to explore opportunities to incorporate the full range of fire management strategies on lands adjacent to the refuge where there is no mutual agreement between the Service and landowner.

Strategies for Wildfire B1–B7

- Take necessary actions, according to an approved fire management plan, to maintain above all else public and firefighter safety. (Same as C and D.)
- Using historical fire frequency data, evaluate the full range of fire management options and apply appropriate actions to use wildfire as a naturally occurring component of the patch burn program, in adherence with an approved fire management plan. (Same as D.)
- Monitor the effects of fire on habitat and wildlife populations. (Same as D.)
- Use natural wildfire occurrence within the scope of a full range of fire management options and an approved fire management plan to improve, enhance, and restore native wildlife habitat. (Same as D.)
- Over 15 years, increase public awareness in surrounding communities and refuge users about the full range of fire management options and how the Service evaluates and identifies strategies to manage wildfires along with prescribed fire to increase sentinel plants and reduce catastrophic wildfire risk. (Same as D.)
- Over 15 years, monitor the response of sentinel plants to both wildfire and prescribed fire; adjust fire management as needed to meet habitat objectives. Use monitoring data to update map databases and fire information for future planning. (Same as D.)

Objectives for Wildfire, Alternative C

Wildfire C1. Within 5 years, revise the fire management plan to retain, improve, or expand the refuge's capabilities to protect refuge resources and assist in local fire management.

Wildfire C2. Over 15 years, manage wildfires to aggressively suppress to the smallest acreage in the most cost-effective manner.

Wildfire C3–C4. Same as Wildfire B3–B4 and D3–D4.

Wildfire C5. Within 2 years, review, update, and execute cooperative agreements with BLM, DNRC, the six counties, and nongovernmental organizations. Conduct an annual meeting to discuss the capabilities of each partner.

Rationale for Wildfire C1–C5. Although wildfire is a natural function in the refuge's ecosystems, it can also be the biggest threat to those ecosystems. Natural fire regimes have been altered extensively on the refuge and have been replaced by frequent, large, and intense wildfires. This alteration is due to humans. A subsequent effect has been the infestation of invasive plants such as cheatgrass, which cures earlier in the year than native bunchgrasses and can lengthen the fire season.

An effective fire management plan is crucial to the long-term conservation of refuge resources and protection of private property. The existing plan would require revision. Wildfires on the refuge could potentially have adverse economic, habitat, and resource effects that could threaten life, property, and sensitive resources. Having adequate resources to contain and extinguish large fires is critical to the long-term preservation of natural, cultural, and recreational resources.

Strategies for Wildfire C1–C5

- Aggressively respond to wildfire by using the full range of suppression resources to keep fires at the smallest acreage possible and have at least 97 percent of the fires controlled within 24 hours of reported ignition. Use whatever means possible—such as heavy air tankers (retardant), single-engine air tankers (retardant, foam, or water), aviation personnel, smokejumpers, and hand crews—to ensure fires do not escape initial attack.
- Within 5 years, increase permanent and seasonal firefighting personnel by 50 percent.
- Within 5 years, increase the Sand Creek fire cache of firefighting equipment to an amount sufficient for the staff to respond to at least two major fires per year.
- Within 10 years, build fire caches at the Jordan and Fort Peck field stations to house fire engines and firefighting equipment sufficient to respond to suppression needs.
- Over 15 years, upgrade the fleet of fire engines by adding at least one new engine every 5–7 years to replace old engines, and add one additional engine.

Objectives for Wildfire, Alternative D

Wildfire D1. Same as Wildfire B1.

Wildfire D2. After revision of the fire management plan, evaluate a full range of fire management options and carry out appropriate actions on natural ignition fires on the north side of the Missouri River. Within

5–7 years, evaluate the suitability of various fire management options to consider for all ignitions within the refuge boundary.

Wildfire D3–D4. Same as Wildfire B3–B4 and C3–C4.

Wildfire D5–D7. Same as Wildfire B5–B7.

Rationale for Wildfire D1–D7 *(Same as B)*

Strategies for Wildfire D1–D7
Same as B, plus:

- Within 5 years, increase staff qualifications to include a fire use manager, field observer, and incident commander. Increase fire staff to include 5–7 new permanent employees and 50–60 percent more seasonals (based on 2009 personnel).
- Within 5–7 years, contract the development of a GIS overlay of the refuge for use in producing fire management strategies for each habitat unit.
- Within 3–5 years, work with cooperators to fully coordinate the determination of management responses to wildfires using historical fire occurrence data to delineate areas that may be appropriate for each of the various fire management options.

HABITAT–INVASIVE SPECIES

Invasive species objectives include both woody and nonwoody invasive plants and aquatic invasives such as zebra mussels.

Objectives for Invasive Species, Alternative A

Invasive Species A1. Over 15 years, maintain the existing invasive species control program including mapping, use of biocontrol and chemical spraying, weed wash stations, and requiring horse users to use weed-seed-free hay.

(Same as Invasive Species B1, C1, and D1.)

Rationale for Invasive Species A1. Invasive species such as Russian knapweed, spotted knapweed, leafy spurge, saltcedar and other species are increasing on refuge due to spread from illegal off-road vehicle use, infestations from upstream sites, and changes in lake levels that expose bare lakeshore areas. In 2008, about 1,431 upland acres (excludes saltcedar below high water mark) of undesirable plant species were mapped on the refuges.

The Service has been treating new infestations, working with partners on treating high public use areas, sponsoring weed wash stations, promoting education of users on identifying weeds and exploring other ways to reduce their spread. The Service would continue to work with partners to improve overall habitat conditions across the refuge. Healthy ecosystems with a diversity of native plants are resilient to new infestations of invasive species (Kennedy et al. 2002).

Long-term control requires the cooperation of public and private land managers throughout the area. A joint effort by all partners is needed to conduct research on finding the best management practices to control or eliminate individual species.

Strategies for Invasive Species A1 *(None)*

Objectives for Invasive Species, Alternative B

Invasive Species B1. Same as Invasive Species A1, C1, and D1.

Invasive Species B2. Within 1–3 years, develop an integrated pest management plan (step-down plan) for control of invasive plants, including invasive plants.

(Same as Invasive Species C2 and D2.)

Invasive Species B3. Within 5–7 years, map current infestations, and develop a strategy to achieve a 25-percent reduction in acres affected by noxious nonwoody plants.

(Same as Invasive Species C3 and D3.)

Invasive Species B4. Over 15 years, achieve a 25–50 percent reduction in acres affected by noxious nonwoody plants.

(Same as Invasive Species C4 and D4.)

Invasive Species B5. Within 5–7 years, target further encroachment of invasive woody plants (such as saltcedar and Russian olive) on Fort Peck lakeshores and bays.

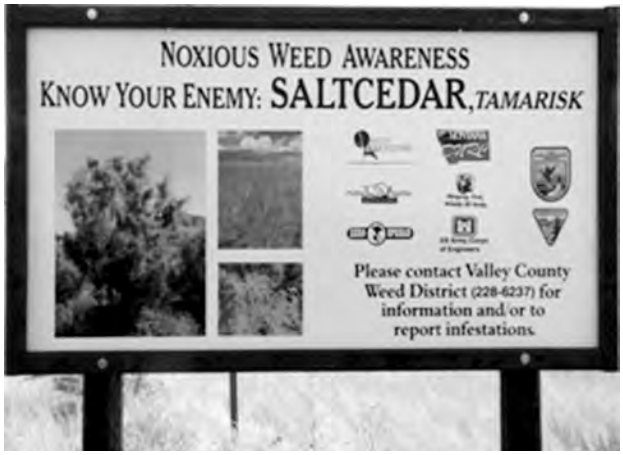
(Same as Invasive Species C5 and D5.)

Invasive Species B6. Within 5 years and with adequate funding, reduce the occurrence of invasive, woody plants in riparian areas—primarily the Missouri and Musselshell River corridors above the full-pool elevation by 10–25 percent.

(Same as Invasive Species C6 and D6.)

Invasive Species B7. Over 15 years, measure trends of invasive species not classified as noxious (including Japanese brome, sweetclover, and cheatgrass). Implement adaptive management as appropriate.

(Same as Invasive Species C7 and D7.)



USFWS

Saltcedar is the most prolific invasive species found on the refuge.

Invasive Species B8. Over 15 years, work with partners to increase public awareness of invasive plants on the refuge and surrounding lands by establishing an improved, coordinated signage system at major entrance points.

(Same as Invasive Species C8 and D8.)

Invasive Species B9. Continue current educational and monitoring efforts in cooperation with MFWP and USACE (same as Invasive Species C9 and D9). Prevent further spread of aquatic invasive species through 2027.

Rationale for Invasive Species B1–B9. Shrub-steppe grassland mosaic areas throughout western North America continue to decline in quantity and quality due in part invasion by exotic plant species (Samson and Knopf 1994, Bragg and Steuter 1995). River bottoms, lakeshore, and now the refuge uplands are experiencing an increase in invasive species. To date, only a small portion of the uplands has been mapped for invasive species and numerous acres could be infested. Studies suggest that shrub-steppe, grassland-mosaic bird species favor areas dominated by native vegetation. These bird species include sentinel species such as grasshopper sparrow, Baird's sparrow, long-billed curlew, upland sandpiper, mountain plover, lazuli bunting, chestnut-collared longspur, burrowing owl, and greater sage-grouse (Lindmeier 1960, Fairfield 1968, Owens and Myres 1973, Maher 1974, Stewart 1975, Wilson and Belcher 1989, Kantrud and Higgins 1992, Dhol et al. 1994, Davis and Duncan 1999, Johnson and Igl (2001). The degradation of remaining grassland areas in the northern Great Plains is likely due to inadequate or improper management as a principle factor in declining populations of grassland bird species.

Monotypic stands of invasive or nonnative species not only have the ability to negatively affect biodiversity but they also alter the flow energy and nutrients in the ecosystem and reduce resilience of the system.

Strategies for Invasive Species B1–B9

- Continue work with partners to provide at least one weed wash station during the hunting season.
- Work with partners to explore options for boat washing stations.
- Continue to provide educational materials to all hunters contacted and develop additional outreach methods to educate various users of the threat of invasive species to wildlife habitat.
- Work with partners and assess traffic count data to prioritize areas for location of informational invasive species signage.
- Over 15 years, in cooperation with USACE, treat (200 Service lands plus additional acres by USACE) acres of saltcedar along the shoreline each year depending on funding by contractor and/or strike team members. Maintain native vegetation in treated areas.
- Emphasize efforts to test and introduce biological controls for saltcedar.
- Continue to work with Service's invasive species strike team, county weed boards, neighbors and conservation organizations to maintain and update mapping of weed infestation. Review and update the integrated pest management plan every 5 years.
- Employ hunters in weed monitoring efforts by encouraging them to use their GPS devices to mark infestation sites.
- Prepare annual progress reports or have meetings to share current treatment techniques and results. In annual updates, include information on what treatment protocols may or may not have been successful in achieving stated objectives and any future plans.
- Conduct inventories following the Service's invasive species strike team operational guidelines, when completed, which will include mapping criteria.
- Store all inventory data in refuge land Geographic Information System (RLGIS).
- Repeat inventories at a minimum of 10-year intervals.
- Apply early detection, rapid response strategies to attack new infestations before they become large and costly to treat.
- Use the GIS to predict areas at greatest risk of new infestations.
- Conduct a surveillance program for new infestations of invasive plants every 2 years.
- Every 5 years, complete surveys for invasive plants using a GPS map locations. Create a baseline map and collaborate with partners to map records for neighboring lands.
- Monitor change over time by collecting RLGIS cover-type data for all invasive plant species.
- Map and store in the RLGIS anecdotal observations of infestations made by Service staffs while conducting other work activities.
- Map sites of invasive plant treatment each year in the RLGIS.
- Monitor infestation rates and effectiveness of control efforts.
- Share GIS layers of invasive plant infestations with partners.
- Attain help with invasive plants (applications and monitoring) by pursuing additional money through partnerships, grants, and invasive plant programs.
- Communicate with local, State, and Federal agencies and the public about invasive plant issues. In

a timely manner, make known information about new infestations, effective or ineffective treatment methods, and new treatment options.

- Coordinate invasive plant control by meeting at least once per year with county weed boards, representatives from weed management areas, and other partners to share information and discuss control strategies.
- Respond promptly to all landowner or other public complaints and address public complaints about invasive plants on Service-owned lands, while using integrated pest management strategies.
- Ensure all seed used to restore habitat is certified weed-free. Avoid purchasing seed from sources known to have violated the weed-free seed regulation.
- Begin habitat management treatments to develop habitat that will be more resilient to invasive plants.

Objectives for Invasive Species, Alternative C

Invasive Species C1. Same as Invasive Species A1, B1, and D1.

Invasive Species C2–C9. Same as Invasive Species B2–B9 and D2–D9.

Rationale for Invasive Species C1–C9 *(Same as B and D)*

Strategies for Invasive Species C1–C9
Same as B, plus:

- Increase law enforcement of weed-free hay regulations.

Objectives for Invasive Species, Alternative D

Invasive Species D1. Same as Invasive Species A1, B1, and C1.

Invasive Species D2–D9. Same as Invasive Species B2–B9 and C2–C9.

Rationale for Invasive Species D1–D9 *(Same as B and C)*

Strategies for Invasive Species D1–D9 *(Same as B)*

HABITAT–CLIMATE CHANGE

Over the past century, human activities have led to increases in "greenhouse" gases in the atmosphere. These gases are primarily carbon dioxide and methane, nitrous oxide, and halocarbon emissions. Places where atmospheric carbon may be sequestered are the ocean and in plants. About half the carbon emitted during the last 50 years is now stored in these places. The rest has remained in the air. Sources and sinks of carbon will likely change as climate continues to warm. The following information summarizes information from a comprehensive report produced by the U.S. Global Change Research Program (Karl et al. 2009) and influenced the climate change objectives.

Global Climate Change

Global average temperature and sea level have increased, and precipitation patterns have changed. Global temperatures are expected to rise at least 1 °F over the life of the CCP. Current climate change studies indicate that a further 2 °F increase will lead to severe, widespread, and irreversible impacts. Global temperatures are expected to continue rising and precipitation patterns will change (dry areas will be drier and wet areas will be wetter). Sea levels will continue to rise. Currently rare extreme weather events will become more common and abrupt changes are possible due ice level collapse, thawing of frozen soil, and change in ocean current circulation.

National Climate Change

The average U.S. temperature has risen more than 2 °F over the past 50 years and is expected to rise more in the future. Projections of future precipitation indicate that northern areas will be wetter and southern areas, particularly in the west, will be drier. Extreme weather events such as heavy downpours of rain, heat waves, regional drought, and hurricanes have increased in the past 50 years and likely will increase further in the future. Sea levels have risen along the United States' coasts and will continue to rise. Cold-season storm tracks are shifting northward and the strongest storms are likely to become stronger and more frequent. Arctic sea ice is declining rapidly and this is very likely to continue.

Climate Change Influence in the Great Plains

The refuge is located in the northwestern Great Plains. As in much of the rest of the Nation, the Great Plains is projected to experience increases in temperature, evaporation, and drought frequency. The average temperature is expected to increase 2–4 °F by the year 2020 in the plains. The final CCP will be in place in 2020.

Agriculture and ranching will be stressed by an increasingly limited water supply. Drought and grazing-adapted weeds will increasingly compete with native vegetation on rangelands. Wetland and riparian areas will decrease in size or be lost. Preservation of native vegetation, wetlands, and riparian areas will require increased vigilance, adaptation, and mitigation as the climate changes.

Objectives for Climate Change, Alternative A

Climate Change A1. Over 15 years, implement the Service's climate change initiatives as they apply to the refuge:

- Biological planning and conservation design at broad landscape scales.
- Landscape conservation that supports climate change adaptations by fish, wildlife, and plant populations of ecological and societal significance.

- Monitoring and research partnerships.
- Achieving carbon neutrality by 2020.
- Building capacity to understand, apply, and share terrestrial carbon sequestration science, and work with partners to sequester atmospheric green house gases while conserving fish and wildlife habitat at landscape scales.
- Providing educational and training opportunities for Service employees regarding the implications and urgent nature of climate change as it relates to the Service mission and will engage them in seeking solutions.
- Public education.
- Partnerships—locally, nationally, internationally.

  (Same as Climate Change B1, C1, and D1.)

Rationale for Climate Change A1. The Service would implement climate change objectives within the existing habitat management practices.

Strategies for Climate Change A1

- Continue maintaining a wind turbine, recycling effort, increasing energy efficiency and adopting other ways to reduce the refuge's carbon footprint
- Consider what conditions precipitated by climate change that the refuge may deal with like increased drought, longer fire seasons, hotter fires, loss of plant and wildlife species, increase of other plant and wildlife species, change in migration patterns, and relocations of species.

Objectives for Climate Change, Alternative B

Climate Change B1. Same as Climate Change A1, C1, and D1.

Climate Change B2. By year 3, develop a climate change research project with other partners that can be implemented across the Great Plains that identifies fire, sentinel plant, pollinators, and sentinel animal changes in behavior or use due to climate change.

(Same as Climate Change C2 and D2.)

Rationale for Climate Change B1–B2. Ecological systems store large amounts of carbon in plants and soils; they regulate water flow and quality; and they stabilize local climates. These functions are not accounted for financially, but society depends on them. Ecosystem processes are the underpinning of these services: photosynthesis, the plant and soil processes that recycle nutrients from decomposing material and maintain soil fertility, herbivory, predation, natural fire, and flooding, and the processes by which plants draw water from the soil and return water to the atmosphere. These ecosystem processes are affected by climate and the concentration of carbon in the atmosphere.

Biological diversity in ecological systems is itself an important resource that maintains the ability of these systems to provide the services on which society depends. Many factors affect biodiversity including the following: climate conditions, the influences of competitors, herbivores, predators, parasites and diseases; and disturbances such as herbivory, and fire. Human-induced climate change, in conjunction with nonclimate stresses, is exerting major influences on natural environments and biodiversity, and these influences are expected to grow with increased warming.

The following information is from the publication Global Climate Change Impacts in the United States (Karl et al. 2009). Large-scale shifts have occurred in the ranges of species and the timing of seasons and animal migration; these factors are very likely to continue. The range and timing of each species shift will be in response to its sensitivity to climate change, its mobility, its lifespan, and the availability of the resources it needs (such as soil, moisture, food, and shelter). The speed with which species can shift their ranges is influenced by factors including their size, lifespan, and seed dispersal techniques in plants. Some migration pathways will be blocked by development and habitat fragmentation. All of these variations result in the breakup of existing ecosystems and the formation of new ones, with unknown consequences. Interactions among effects of climate change and other stressors will greatly increase the risk of species extinctions. At the same time, insect pests, disease pathogens, and invasive weeds have increased, and these trends are likely to continue.

A first step to mitigate climate change is to advance the management of ecological processes on the site to reduce nonclimate stressors (Hansen et al. 2003). In many places habitat fragmentation, over use, invasive species, and herbivory, are nonclimate stressors having a greater affect on species viability than climate change, at this time. Reduction of nonclimate stressors will promote ecological resilience and insulate species from subtle (not substantial) changes in climate.

To reduce the effects of these stressors and the future affects of climate change the refuge would develop heterogeneity of species and structure, protect grassland types across environmental gradients, promote connectivity and corridors to facilitate migration, restore natural fire regimes, and promote sustainable herbivory.

The refuge staff is currently working with multiple partners to restore historical ecological processes, promote heterogeneity, and build habitat linkages and ecological resilience within the Missouri River Breaks and the northern Great Plains. Habitat linkages and corridors would be developed through partnerships with the landscape conservation cooperative sphere of influence (refer to strategic habitat conservation in chapter 1).

The refuge would continue to take reactive and anticipatory approaches to managing landscapes for carbon sequestration and climatic resilience–heterogeneity of species, structure, and succession. Fire-herbivory interactions are keys to resilience in this region. The focus would be on research, monitoring, and management of carbon sinks and sources, black carbon, climate sentinel plants and dependent animals and ecological process sentinel plants and the food web that uses them, beginning with pollinators.

The refuge would evaluate the response of ecosystems to fire, herbivory, and other ecological processes using sentinel plant species. These diagnostic plant species warn of impending ecosystem-wide changes to plant and animal populations and can guide adaptive management actions. They are the first to vanish. They serve primarily not as management goals themselves but as diagnostic lookouts for fully functional ecological processes. The sentinel approach to ecological systems management uses first to decline species as diagnostic and direct indicators of ecosystem well being and management direction.

The refuge would assess and reduce carbon footprints associated with using adaptive management to achieve resilience to climate change including the role of wildland fire.

Since fire happens in the region as both unplanned wildfire or as prescribed fire, the refuge would focus much of the research on pyrogenic carbon sequestered in the soil from fire. Fire is also important for the climatic resilience associated with diversity of species and succession (DeLuca and Aplet 2008).

The refuge would serve as a model for other land management agencies and landowners to manage for wildlife first with best management practices for climate resilience and carbon sequestration. The components of this program would include a focus carbon sequestration, monitoring, and management on climate sentinels, ecological process sentinels, and resilience adaptation.

Strategies for Climate Change B1–B2

- Assist in implementation of Service's Climate Change Plan (refer to Chapter 1–Introduction).
- Monitor the effects of climate change on the spread of West Nile virus and the decline of buffaloberry.
- In cooperation with universities and other partner scientists and statisticians, develop methods to identify, inventory, and monitor climate sentinel plant species and those determined potentially affected wildlife species.
- Evaluate success with climate sentinel plant species population viability analysis at permanently established trend sites.
- Continue to monitor wildlife populations that have been determined as "first to decline" for population trends within each species' already established habitat zones.
- In cooperation with partners, reestablish climate sentinel plant species populations on sites where they have been extirpated.
- Reduce carbon footprint of refuge operations and continue "greening" efforts to meet climate change initiatives (for example, upgrade offices to "green standards"—encourage teleconferencing, turning off lights, recycling, turning down heat, and installing solar panels or a small individual wind turbine for new facilities at the Sand Creek Field Station).
- Study carbon sequestration benefits of the refuge.
- Incorporate Service's climate change messages in the refuge's public use programs.

Objectives for Climate Change, Alternative C

Climate Change C1. Same as Climate Change A1, B1, and D1.

Climate Change C2. Same as Climate Change B2 and D2.

Rationale and Strategies for Climate Change C1–C2

(Same as B)

Objectives for Climate Change, Alternative D

Climate Change D1. Same as Climate Change A1, B1, and C1.

Climate Change D2. Same as Climate Change B2 and C2.

Rationale and Strategies for Climate Change D1–D2

(Same as B)

WILDLIFE–BIG GAME

There are six big game species of primary importance that are found on the refuge: Rocky Mountain elk, mule deer, white-tailed deer, pronghorn, Rocky Mountain bighorn sheep, and mountain lion.

Objectives for Big Game, Alternative A

The wildlife objectives and strategies listed for alternative A are the actions selected in the record of decision from the 1986 EIS. Alternative A would continue managing wildlife according to these actions; many have already been implemented. The 1986 EIS blended objectives and strategies, and these were separated to the extent possible to more closely follow the format used in current CCP documents.

Big Game A1 (elk). Over 15 years, maintain elk habitat in good to excellent condition and improve security cover to a level capable of maintaining a population of 2.5 over-wintering elk per square miles in the coniferous and closely associated grassland communities.

Big Game A2 (mule deer). Over 15 years, improve and maintain mule deer habitat on the refuge in sage-grassland, ponderosa pine-juniper, and grassland-

USFWS

Mule deer populations on the refuge fluctuate, and the Service has several untis with more restrictive hunting regulations.

deciduous shrub vegetative types in good to excellent condition to support over wintering populations of 10 deer per square mile, in a manner that will also benefit sharp-tailed grouse. (Note: 10 deer per square mile refers to the total estimated population, not the density of deer observed during aerial surveys as not all deer are detected). Continue harvest management efforts that strive to achieve a posthunting season mature buck to doe ratio of at least 20:100 (mature is defined as bucks having four or more points on at least one antler).

Big Game A3 (pronghorn). Over 15 years, improve and maintain pronghorn winter habitat in good to excellent condition on suitable juniper and sage-grassland sites to support 1,500 wintering animals.

Big Game A4 (bighorn sheep). Over 15 years, continue to manage bighorn sheep populations and habitat to support a minimum of 160 observed animals and for an average age of 7.5 years old for harvested rams.

Big Game A5 (bighorn sheep). Over 15 years, expand Rocky Mountain bighorn sheep into suitable habitat.

Rationale for Big Game A1–A6. The focal issue addressed in the 1986 EIS was livestock grazing and its effects on wildlife habitat (refer to Chapter 2–Refuge History and Vision). Although some of the objectives from the 1986 EIS were accomplished and other objectives evolved after the EIS, the management emphasis on big game would continue (refer to Chapter 4–Affected Environment, Big Game, for a discussion of current conditions). At the time of the 1986 EIS, many of the species specifically addressed were listed under the Endangered Species Act, but the Service felt it was important to focus on some of the other ungulate species for maintaining balanced wildlife populations, supporting recreation, and contributing to the overall mission of the Refuge System.

Strategies for Big Game A1–A3.

- Continue to respond to inquiries and provide information about refuge hunting opportunities. (Same as B, C, and D.)
- Continue listening to refuge users throughout the year and annually review refuge hunting regulations to ensure clarity, address any emerging issues or concerns and adjust as necessary to achieve refuge objectives. (Same as B, C, and D.)
- Continue to publish the refuge hunting regulations brochure to inform the public of hunting opportunities (including accessible opportunities) and refuge-specific regulations. (Same as B, C, and D.)
- Distribute the refuge's brochure more widely. (Same as B, C, and D.) Continue to prohibit mountain lion and predator hunting.
- Permit limited coyote hunting (mid-October through March 1).
- Continue to prohibit trapping.
- Require nontoxic shot for waterfowl hunting to reduce the incidental poisoning of nontarget wildlife. Continue to allow nontoxic or lead shot for upland game bird and mourning dove hunting. (Same as C.)
- Continue to monitor boat use for accessing hunting areas along the river to ensure that wildlife species utilizing the habitat along the river are not negatively affected over the long term. (Same as B, C, and D.)

Objectives for Big Game, Alternative B

Big Game B1. Within 5 years, in cooperation with MFWP develop and coordinate big game aerial surveys and research projects concerning basic ecology of all big game across the landscape surrounding the refuge.

Big Game B2 (elk and mule deer). Within 5 years of the plan's approval, work with MFWP to manage elk and mule deer populations at the highest levels possible without negatively affecting habitat or other wildlife species (refer to Upland Strategies for Objectives B1–B8 if monitoring indicates habitat conditions are declining).

Big Game B3 (elk and mule deer). Over 15 years, manage harvest levels to result in herd sex and age ratios similar to a lightly harvested population. Manage elk harvest levels to achieve a ratio of 35–40 brow-tined bulls per 100 cows posthunting season. Manage mule deer harvest levels to achieve 35–40 adult bucks per 100 does posthunting season (all bucks older than 1.5 years old).

Big Game B4 (pronghorn). By 2015, develop winter and summer survey techniques to monitor pronghorn abundance and distribution with the aim of documenting use on the refuge by 1,500 pronghorn as called for in Executive Order 7509.

(Same as Big Game C2.)

Big Game B5 (pronghorn). By 2015, collaborate with partners to initiate a pronghorn ecology research study with a focus of documenting movements, habitat use, and what role refuge lands play in pronghorn ecology in a landscape context.

(Same as Big Game C3.)

Big Game B6 (bighorn sheep). Over 15 years, work with the MFWP, landowners and cooperators to expand the huntable (at least 45 rams per 100 ewes with at least 30 percent of rams having a ¾ curl and an average age of at least 6.5 years) bighorn sheep populations in suitable and unoccupied habitat.

(Same as Big Game C4.)

Big Game B7 (bighorn sheep). Over 15 years, manage harvest levels to result in herd sex and age ratios similar to a lightly harvested population, and at the highest densities possible that do not negatively affect habitat or result in elevated risks to disease outbreaks.

(Same as Big Game C5.)

Big Game B8 (bighorn sheep). Within 5–7 years establish a huntable bighorn sheep population east of Timber Creek out onto Harpers Ridge.

(Same as Big Game C6.)

Big Game B9 (bighorn sheep). Within 7–15 years work with MFWP, cooperators and private landowners to establish a huntable bighorn sheep population south of Missouri River where there is about 200 square miles of suitable habitat, of which 90 percent is in public ownership (65 percent is on the refuge).

(Same as Big Game C7.)

Big Game B10 (mountain lion). By 2015, with support from MFWP and other cooperators, develop and implement methodology for mountain lion monitoring to determine population levels, abundance, distribution and population trends.

Rationale for Big Game B1–B10. In 1935 Olaus Murie surveyed the Missouri River Breaks area to determine the potential for creating a refuge (refer to Uplands in chapters 3 and 4). Amid his many observations, Murie believed the west end of the refuge could support 2,000–2,500 elk, and he predicted that mule deer would continue to flourish in the pine uplands. He also believed that the 22,000-acre area on the south side of the refuge could support 400–500 bighorn sheep (Murie 1935). With this alternative focused on maintaining abundant wildlife populations, management would focus on producing relatively large populations of big game relative to surrounding areas and expanding distribution where possible. The allowable abundance of big game animals would be determined by habitat monitoring that demonstrates any negative effects of big game on other species or their habitats.

Big game populations are highly dynamic and cover large areas in their daily and seasonal movements. Cooperation with landowners and wildlife managers is necessary to ensure that big game populations are healthy to support wildlife-dependent recreational activities. Coordination of surveys and research will ensure these populations will continue to be robust and provide the opportunity for sustained harvest. Research studies would focus on movement of animals, interaction with other ungulates, response to patch burns, browse availability, and use the data to build habitat suitability models.

Strategies for Big Game B2–B3 (elk and deer)

- Using previous survey data, habitat modeling and in collaboration with partners, tailor big game density objectives to specific ecological regions of the refuge based on the ability of different areas to support big game. Regulate and monitor harvest levels. (Same as D.)
- Develop habitat monitoring programs to detect when, where and which ungulate populations negatively affect habitats.
- Continue or enhance current ungulate population monitoring surveys to document cervid abundance, distribution and herd composition.
- Continue to meet with MFWP and other cooperators to implement habitat and population monitoring procedures to make adjustments in management based on monitoring data.
- Continue throughout the life of the CCP with chronic wasting disease monitoring in cervids and respond as needed to detection of chronic wasting disease as already specified in the refuge's chronic wasting disease management plan (FWS 2007b). (Same as C and D.)

Strategies for Big Game B4–B5 (pronghorn)

- Establish pronghorn survey areas based on habitat potential modeling using GIS.
- Conduct aerial surveys and adjust as needed with information resulting from research studies.

- Based on pronghorn research results and habitat monitoring specific to pronghorn, manage livestock grazing and fire to maintain or enhance pronghorn habitat.

Strategies for Big Game B6–B9 (bighorn sheep)

- Develop habitat potential maps using GIS, published literature and field surveys to delineate what is thought to be bighorn sheep habitat.
- Develop and carry out reintroduction plans in conjunction with MFWP to stock areas with bighorn sheep.
- Use GPS collars on current residents in established areas, and newly translocated individuals into new areas, to monitor survival, sightability, habitat use and movements.
- Continue monitoring bighorn sheep populations with aerial winter and summer counts and ground-based surveys.
- Establish habitat and disease risk monitoring programs to evaluate habitat and herd health conditions.
- Continue to restrict ewe permits east of Timber Creek until all available habitat is occupied and population levels suggest a need for reduction.
- Harvest ewes (in any area) when there is a demonstrated need to reduce sheep density for herd health (disease potential), or because of habitat degradation.

Strategies for Big Game B10 (mountain lion)

- Maintain and monitor GPS and VHF (very high frequency) collars on 5–10 percent of the estimated lion population on the refuge.

Objectives for Big Game, Alternative C

Big Game C1 (elk and mule deer). Over 15 years, manage elk and deer populations at levels consistent with MFWP objectives, the capacity of adjacent private lands, and the tolerance of adjacent private landowners.

Big Game C2–C3 (pronghorn). Same as Big Game B4–B5.

Big Game C4–C7 (bighorn sheep). Same as Big Game B6–B9.

Big Game C8 (bighorn sheep). Over 15 years, manage population levels for rams and ewes as outlined in MFWP's conservation strategy for bighorn sheep.

Big Game C9 (mountain lion). Within 10 years, use population monitoring data to evaluate, and implement if warranted, a mountain lion hunt program.

Rationale for Big Game C1–C9. With the focus on recreation and public uses, management of big game resources is geared toward maximizing harvest and recreation opportunities while still maintaining a balance with other needs and requirements. MFWP management is geared toward achieving this objective (MFWP 2008).

Strategy for Big Game C1–C9

- Adopt MFWP population objectives and hunting seasons and regulations for those species for which harvest is currently allowed on the refuge. Adjust harvest levels in response to habitat conditions, sportsmen desires, and social tolerance of adjacent landowners.

Strategies for Big Game C1 (elk and deer)

- Adopt MFWP adaptive mule deer harvest approach, basing conservative, standard or liberal harvest regulations on long-term average densities and fawn recruitment trends.
- Continue with chronic wasting disease monitoring. (Same as B and D.)

Objectives for Big Game, Alternative D

Big Game D1. Develop cooperative big game population and habitat monitoring programs with MFWP by 2015. Establish population levels, sex and age composition targets, and harvest strategies that are jointly agreed to and tailored to the varied habitat potential on the refuge during the development of the HMPs. Design hunting regulations to provide a variety of quality recreational opportunities, including population objectives with diverse male age structures not generally managed for on other public lands.

Big Game D2 (elk and mule deer). Manage elk harvest levels to result in a ratio of 20–30 bulls to 100 cows posthunting season. Manage mule deer harvest levels to achieve about 25 total bucks per 100 does posthunting season.

Big Game D3 (elk and deer). Within 5 years, work with all partners to initiate ecological studies of elk and mule deer habitat selection and response to management actions (for example, prescribed fire) and natural disturbances.

Big Game D4 (bighorn sheep). Manage bighorn sheep ram harvest levels to result in an average age of 6.5 years old for harvested rams (the MFWP objective is at least 6.5 years old). Manage ewe harvest in the Mickey/Brandon Buttes area to maintain a population of 25–30 ewes (same as MFWP objective). Collectively manage ewe harvest in all areas to maintain a total population of 225, +/–10 percent, observed during aerial surveys; average density would range from 1.8 to 2.2 bighorn sheep/square mile (the MFWP objective is 175–200 sheep, but does not include now-occupied habitat east of Timber Creek of about 20 square miles).

Big Game D5 (mountain lion). Same as Big Game B10, except consider harvest if monitoring shows a lim-

ited harvest could be sustained (refer to objectives and rationale under Public Use–Hunting).

Rationale for Big Game D1–D4. Early explorers left vivid accounts of the abundant big game populations that inhabited the region (Moulton 2002). With restoration of natural ecological processes the focus of this alternative, the aim is to restore such game abundance and diversity within the current limits of habitat capability. Prior to those visits of early explorers, the intensity of human harvest of big game was different than today, as likely there was not the active selection for killing the largest antlered males possible that is the norm of some hunting programs today.

National wildlife refuges are the only Federal lands managed specifically for wildlife conservation, and the objectives reflect an emphasis on sustaining abundant and healthy wildlife populations. Such wildlife-priority management is not generally possible elsewhere because of multiple use mandates on other Federal lands and conflicting priorities on State and private lands. The big game objectives reflect the wildlife-priority emphasis and for providing high-quality opportunities for wildlife-dependent recreation, which are described in the Improvement Act and the Service's hunting policy (FWS 2006f).

Big game hunting is the dominant public use activity on the refuge and surrounding lands, accounting for nearly 90,000 hunter visits (refer to Chapter 4–Affected Environment, 4.5 Visitor Services). Between Service-owned lands, BLM lands, and MFWP block management areas, there are huge areas open to public hunting. Such free and open access to such large blocks of land is becoming increasingly valued by the hunting public as access to some private lands becomes more restrictive. The Service, together with its partners, would work to provide access and quality recreational experiences for hunting big game populations throughout the refuge. However, some limitations may need to be imposed, but the Service believes there would be public support for this approach.

The Missouri River Breaks region, including the refuge is recognized throughout Montana as a highly valued wildlife recreation sites anywhere in Montana (Dickson 2008) (for more information, refer to figure 36 in Chapter 4–Affected Environment).

Comparatively conservative harvest levels for bull elk by MFWP in the Missouri River Breaks has likely contributed to the popularity (statewide and nationally) of the big game resources in this area. The long-term average adult bull-to-cow ratio in hunting district 410 is 32:100 (Tom Stivers, personal communication, June 2010). The objective in the MFWP elk management plan for the Missouri Breaks area calls for a minimum of 30:100, or three times the objective of a minimum of 10:100 found in many western Montana areas. In many years the actual bull-to-cow ratio in the Missouri Breaks is substantially higher, averaging around 45:100 in Phillips County (Mark Sullivan, personal communication, June 2010). Such management for quality elk herds and recreational opportunities is one reason why the Missouri Breaks are valued by the public.

Bighorn sheep are a highly valued big game animal, and ram harvest levels across Montana are managed conservatively with an emphasis on having opportunities to harvest older rams. As stated in the MFWP Bighorn Sheep Conservation Strategy, the goal for Missouri River Breaks bighorn sheep is to manage for healthy and productive populations with a diverse age structure of rams.

Alternatively, harvest guidance from the MFWP Bighorn Sheep Conservation Strategy could be followed that is based on population size, ram:ewe ratio and number of ¾+ curl rams observed.

The refuge views sex and age structure of big game populations as important considerations in managing human harvest of native ungulates to achieving ecological resilience and biological integrity (FWS 2001). Ungulate population management considers densities, social structures, and population dynamics. The aim is to strike the right balance between managing for natural wildlife populations (as called for in the executive orders that established Game Ranges back in the 1930s), wildlife-dependent public uses, and other needs and responsibilities. The Service believes the big game objectives outlined under alternative D strike that right balance.

Strategies for Big Game D1–D5. Similar to B, except:

- Using previous survey data, habitat modeling, and collaboration with partners, tailor big game density objectives to be reflective of varied habitat capabilities.
- Regulate harvest to maintain big game populations at levels that promote healthy sentinel plant populations and other species. Consider effects on adjoining landowners.
- Identify and protect critical wintering habitat for pronghorn by reducing hazardous fuel in these areas using prescribed fire.

WILDLIFE–FURBEARERS and SMALL PREDATORS

Furbearers include beaver, muskrat, river otter and mink, raccoons, badgers, and other small mammals. Small predators include coyotes, swift fox, weasel, and civet cat (spotted skunk).

Objectives for Furbearers and Small Predators, Alternative A

No objectives currently exist for managing furbearers. Under alternative A, there would be no objectives and strategies established for managing any of these species.

Objectives for Furbearers and Small Predators, Alternative B

Furbearers and Small Predators B1. By 2016, work with partners to determine population levels and distribution of furbearers and small predators that currently occur on the refuge.

Furbearers and Small Predators B2. By 2017, evaluate habitat and determine the habitat suitability of reintroducing populations of swift fox to the refuge and, if so, the number of breeding population pairs that could be reintroduced into suitable habitat. If reestablishment does not occur by 2020, more active management would be necessary to establish a viable population on the refuge.

(Same as Furbearers and Small Predators D3.)

Furbearers and Small Predators B3. As part of the Service's Strategic Habitat Conservation and Landscape Conservation Cooperatives (refer to Chapter 1–Introduction) evaluate the potential for natural colonization of extirpated species into suitable habitats by evaluating current corridors. If extirpated species naturally colonize the refuge then work with State and others to ensure refuge management is compatible with State and Federal management plans. (Same as D).

Rationale for Furbearers and Small Predators B1–B3. Protection from harvest should result in maximum abundance, consistent with the focus of this alternative. Little is known about limiting factors for these species on the refuge, but habitat management for diversity and health should benefit them. Expanding suitable riparian habitats would provide the basis for increased populations of muskrat, beaver, river otter and mink.

A few swift fox sightings have been reported on/near the refuge and reintroduction into suitable habitat would help speed population establishment.

A research project on bobcats conducted in 1979 to mid-1980 indicated illegal hunting to be the largest mortality factor among radio-collared bobcats on the refuge (Knowles 1981). Current population numbers on the refuge remain relatively unknown; however, continued restrictions would be beneficial to maintaining a viable bobcat population in the Missouri River Breaks as areas around the refuge continue to be hunted.

Strategies for Furbearers and Small Predators B1–B3

- Maintain current protection and do not permit any harvest. Reintroduce swift fox. Restore riparian communities in Missouri River tributaries to promote beaver, muskrat, river otter, and mink expansion. Increase law enforcement to reduce potential illegal bobcat take. (Same as D.)
- Fencing areas to provide for protection during the reestablishment period of reintroduced swift fox.

Objectives for Furbearers and Small Predators, Alternative C

Furbearers and Small Predators C1. By 2014, prior to initiating harvest opportunities for furbearer species, develop and implement monitoring program to determine relative densities of regulated and unregulated furbearing species.

Furbearers and Small Predators C2. By 2016, determine minimum population levels to support sustainable harvest opportunities for furbearing species regulated by MFWP (muskrat, mink, bobcat, and beaver) consistent with providing a moderate to excellent opportunity for public viewing of these furbearer species.

Furbearers and Small Predators C3. Maximize sustainable harvest opportunities for furbearing species not regulated by MFWP (red fox, coyote, raccoon and badger, but exclude least weasel, long-tailed weasel and striped skunk) consistent with providing reasonable public opportunities for viewing of these furbearer species.

Rationale for Furbearers and Small Predators C1–C3. Currently, take of State-regulated furbearing species is not permitted on the refuge. Creating opportunity for sustainable use of these wildlife species would increase public use and economic use emphasis.

Currently, for unregulated furbearing or small predator species, take of these (with the exception of coyotes) is not permitted on the refuge. Creating opportunity for hunting and trapping of these wildlife species would increase public use and economic use emphasis.

Strategies for Furbearers and Small Predators C1–C3

- Initiate studies and monitoring program to determine populations (indices of abundance) levels before initiating any action on opening any additional furbearer species for harvest.
- Determine if trapping is appropriate and compatible with refuge purposes. If so then complete trapping packages to allow trapping of furbearers on the refuge that are regulated by MFWP.
- Develop trapping packages to allow trapping of red fox, coyotes, raccoon, and badgers on the ref-

uge. Develop hunting packages for badger, raccoon, and red fox to allow shooting these species on the refuge.

Objectives for Furbearers and Small Predators, Alternative D

Furbearers and Small Predators D1. Within 5 years, initiate comprehensive monitoring program to determine density levels and distributions if considering opening furbearer species for harvesting (either hunting or trapping).

Furbearers and Small Predators D2. Over 15 years, maintain self-sustaining populations (able to maintain its relative abundance at time of initiating harvest) of furbearing species that are regulated by MFWP (muskrat, beaver, mink, swift fox, bobcat) and unregulated by MFWP (least weasel, long-tailed weasel, striped skunk, badger, raccoon, red fox, coyote) by restricting and/or regulating harvesting opportunities on the refuge.

Furbearers and Small Predators D3. Same as Furbearers and Small Predators B2.

Furbearers and Small Predators D4. Within 10 years, have viable beaver populations in a minimum of two tributaries of the Missouri river on the refuge.

Furbearers and Small Predators D5. Over 15 years, encourage research on priority furbearer species on the refuge to determine its ecological relevance to conservation. Universities or other organizations will conduct research with assistance from the refuge in the form of funding, supplies, volunteers, or technical assistance.

Furbearers and Small Predators D6. Within 1 year, eliminate the taking of coyotes by U.S. Department of Agriculture (Wildlife Services) on the refuge.

© Diane Hargreaves

American Badger

Furbearers and Small Predators D7. Same as Furbearers and Small Predators B3.

Rationale for Furbearers and Small Predators D1–D7. Same as B, except the Service would evaluate the harvest potential for furbearers and small predators to provide a wildlife-dependent recreational opportunity (refer to objectives under Public Use–Hunting below). A stable or growing population of furbearers and small predators would be maintained for its contribution to the overall biological diversity, biological integrity, and environmental health of the refuge.

Strategies for Furbearers and Small Predators D1–D7

- Maintain current protection and do not permit any harvest until population surveys are completed, and it has been determined that a harvest strategy could be implemented without affecting the naturally occurring population dynamics. Reintroduce swift fox. Restore riparian communities in Missouri River tributaries to promote beaver, muskrat, river otter, and mink expansion. Increase law enforcement to reduce potential illegal bobcat take. (Same as B.)
- Maintain current protection for those species already protected on the refuge. Allow hunting of red fox and coyotes.
- With stable population levels, the Service will allow furbearers and small predators (coyote, long tailed and least weasel, swift fox, skunk, beaver [keystone species], muskrat, mink, river otter, bobcat, badger, raccoon, and red fox) as defined by MFWP to be managed for naturally occurring population dynamics.
- Develop a standardized data sheet to collect information in regards to furbearing animals that will be input into a new designed database to establish a GIS layer for mapping their locations).

WILDLIFE–AMERICAN BISON RESTORATION

The American bison historically ranged throughout the Great Plains and the last bison was extirpated from this area in the late 1800s. Bison played a significant ecological role with fire to shape the landscape. Restoring historical fire-return intervals and bison would be a major step in restoring the biological integrity and natural ecosystem functions on the refuge and surrounding areas.

The momentum and interest in bison restoration in North America has increased substantially in recent years. The International Union for Conservation of Nature established the Bison Specialist Group that was charged in 2005 with developing a "North American Strategy for Bison Conservation". That comprehensive plan is expected to be released

in the near future and will provide scientifically based guidelines for proponents interested in restoring bison at an ecologically functional scale.

The Wildlife Conservation Society has recently reestablished the American Bison Society to promote bison conservation. The society, originally active from 1905 to 1935, was largely responsible for keeping bison from extinction then, and establishing the conservation herds that are managed today by the Service and National Park Service for the American public.

MFWP's Comprehensive Fish and Wildlife Conservation Strategy lists the American bison as a priority, tier 1 species for conservation. MFWP and others have invested time and effort trying to produce brucellosis-free bison from the genetically valuable Yellowstone herd as stock to establish herds managed for conservation and ecological purposes elsewhere.

There would be multiple agencies, partners, and cooperators in any proposed bison restoration effort. The Service has taken the position that it will not consider reintroducing bison on the refuge unless MFWP initiates an effort to restore bison, as a wildlife species on a large landscape. The Service recognizes the State's role in managing native wildlife and would work cooperatively with MFWP in the development of a bison restoration plan. MFWP does not have any plans at this time to consider reintroducing a free-ranging herd of bison in the area. The Service has no desire to manage another high fence captive bison herd on Service lands.

Objectives for American Bison Restoration, Alternative A

There are no objectives under alternative A.

Objectives for American Bison Restoration, Alternative B

Bison B1. Over 15 years, continue to work with MFWP, conservation organizations and neighbors to evaluate the economic, social and biological feasibility of restoring bison as a natural component on the surrounding landscape.

Bison B2. On advancement of a MFWP proposal that includes the refuge lands in a bison restoration effort, develop a step-down framework defining under what conditions the refuge would participate.

Bison B3. Within 1 year of that framework development (Bison B2), and in cooperation with MFWP and other partners, develop a bison management plan that specifies and ranks areas of suitable habitat, establishes appropriate abundance, composition and distribution targets based on habitat conditions and appropriate for management of wildlife and recreation on a national wildlife refuge and details cooperative management responses to be applied to anticipated conflict situations.

Bison B4. Over 15 years, continue to develop and carry out research proposals to better understand the interaction of bison, livestock, wild ungulates and other wildlife and vegetation in relation to fire and other abiotic influences.

Rationale for American Bison Restoration B1–B4. Any reintroduction of bison would need to be a cooperative venture with MFWP. At this time, the State does not have an ongoing plan to reintroduce bison in the Missouri River Breaks.

The Service would cooperate with MFWP, BLM, DNRC, conservation organizations, and others to conduct the necessary biological, social and economic research to determine the feasibility of such a proposal.

The Service recognizes the ecological importance of such an effort, but also recognizes the complexity and controversy that would be associated with any such effort. Hence, the approach under this alternative is to work cooperatively and collaboratively with others as a full partner in any proposal with full engagement of the public.

The following strategies would be implemented concurrently with any proposal by MFWP for bison restoration in areas around the refuge.

Strategies for American Bison Restoration B1–B4 *(Same as D)*

- Work with MFWP, major universities, World Wildlife Fund, The Nature Conservancy, American Prairie Foundation, and others to develop and carry out research proposals to evaluate the biological, social, and economic feasibility of restoring free-ranging bison in and around the refuge.
- Work with a variety of economists to determine the potential economic effects/impacts of a free-ranging bison herd in the area.
- Prior to any bison reintroduction, finalize a cooperative bison management plan, developed and agreed to by all involved management parties, that addresses population objectives and management, movement of animals outside restoration areas, genetic conservation and management, disease management and conflict resolution procedures.

Objectives for American Bison Restoration, Alternative C

Bison C1. Over 15 years, if bison are restored to areas outside the refuge, and animals migrate into the refuge as State-managed wildlife species, the refuge would adopt the MFWP management plan.

Rationale for American Bison Restoration C1. Under this alternative, the Service would not participate in an active restoration proposal for the refuge. This

objective attempts to balance economic uses, such as livestock grazing, with bison restoration by not intending to actively restore bison on the refuge land, but passively accepting bison as wildlife to be managed in accordance with MFWP management guidelines.

Strategy for American Bison Restoration C1

- Work with MFWP to manage habitat and bison population for any bison that migrate onto the refuge.

Objectives for American Bison Restoration, Alternative D

Bison D1–D4. Same as Bison B1–B4.

Rationale and Strategies for American Bison Restoration D1–D4 *(Same as B)*

WILDLIFE–BIRDS

The refuge has been designated an Important Bird Area by the National Audubon Society because "The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern (National Audubon Society 2009). More than 250 species of birds have been documented on the refuge including both migratory birds and residents.

Objectives for Birds, Alternative A

These objectives were identified in the 1986 EIS.

Birds A1. Maintain existing migration habitat for bald eagles and determine feasibility of establishing a breeding population.

Birds A2. Improve and maintain habitat for sharp-tailed grouse and associated species in good to excellent condition in the ponderosa pine-juniper, juniper, and grass-deciduous shrub types to support (on suitable areas) 30 spring breeding birds per square mile (males and females) by the year 2005 when weather, predation life cycles, or other natural factors permit.

Birds A3. Improve and maintain riparian habitat on the Missouri and Musselshell Rivers and other suitable riparian areas in good to excellent condition to benefit waterfowl, kingbirds, mourning doves, American kestrels, ring-necked pheasants, and turkeys.

Birds A4. Over 15 years, maintain a minimum of two peregrine falcon eyries.

Birds A5. Over 15 years, improve waterfowl habitat so it is in good to excellent condition on all suitable ponds.

Rationale and Strategies for Bird A1–A5 (None)

Objectives for Birds, Alternative B

Birds B1. Within 4–6 years, complete a baseline inventory to determine the existing composition, distribution and relative abundance of breeding and nonbreeding resident and migratory bird species using the refuge during each season of the year.

(Same as Birds C1 and D1.)

Birds B2. Within 7 years, establish a refugewide bird-monitoring program, and determine and describe sentinel plant associations and habitat requirements of 75 percent of high priority and sentinel bird species (species will be based on results of bird inventories).

Birds B3. Within 10 years, complete bird management plans for each of the four habitat types (upland, river bottom, riparian area, and shoreline) for resident, wintering, breeding, and migratory bird species with an emphasis on designated sentinel birds.

(Same as Birds C3 and D3.)

Rationale for Birds B1–B3. Establishing the known species is a first step in species conservation. This step will lead to species/habitat associations and adaptive management actions. Along with identifying species, knowledge of the numbers of birds in a population is needed as it can provide a benchmark from which management decisions can be measured. As management resources are always limited, accurate information gathered on species and relative abundance allows for prioritization of time and money when assessing which species are at greatest risk of decline.

The land base within the refuge has never had a comprehensive baseline inventory of bird species present throughout the different seasons of the year. Baseline inventory data and conducting monitoring on wildlife refuges is essential for identifying conservation targets, detecting climate-related system changes, identifying vulnerable species and habitats, and evaluating management choices (Defenders of Wildlife 2008).

Bird monitoring, if done correctly, can quantify the status of bird populations, measure trends or changes in status, reveal effects of natural or human-induced changes, and aid in the development and evaluation of management decisions (Lambert et al. 2009).

Sentinel birds, like sentinel plants, are those species first to decline at both poles of environmental processes. Herbivory, fire, flooding, and climate changes, as well as any combinations of these processes, can have an impact on bird species and abundance. Potential sentinel bird species follow:

- Grassland and shrub-steppe: grasshopper sparrow, Baird's sparrow, long-billed curlew, upland sandpiper, mountain plover, lazuli bunting, chestnut-collared longspur, burrowing owl, greater sage-grouse, sharp-tailed grouse, Brewer's sparrow
- Conifer grassland mosaic: sharp-tailed grouse, western tanager

- River bottom: northern flicker, yellow warbler, Bullock's oriole
- Riparian area: sora, American kestrel, yellow-breasted chat, least flycatcher, red-headed woodpecker
- Shoreline: piping plover, spotted sandpiper, bald eagle

Dave Menke/USFWS

Western Tanager

Strategies for Birds B1–B3

- Conduct point count surveys across the refuge for 3 years, six times each year.
- Conduct migration walks across the refuge for 3 years during each migration season.
- Conduct fall and early winter raptor surveys across the refuge for 3 years.
- Conduct night surveys to detect owls and nightjar species across the refuge for 3 years.
- Conduct river survey via boat for shoreline and river corridor species across the refuge for 3 years.
- Work with partners and gather historical data to add to the inventory data base.
- Develop a data management system including a GIS database for recording bird sightings.
- Within 4 years, establish and complete breeding bird surveys on the refuge for a baseline inventory.
- Within 4 years, establish and complete walking routes based on habitat types for a baseline inventory.
- Annually participate in State and national bird surveys such as owl surveys, nightjar surveys, raptor surveys, and resident bird surveys with the addition of habitat and management information in each of the four general habitat types on the refuge.
- Incorporate all habitat and management information into a data management system.
- Implement a study to determine the habitat needs of select sentinel birds from each of the refuge's four habitat types (including evaluating the influence of herbivory and fire and the abundance and distribution of each species for each season of the year.
- Implement a vegetation monitoring program to assess if each chosen sentinel bird's habitat requirements are being met during each season of the year.

Objectives for Birds, Alternative C

Birds C1. Same as Birds B1 and D1.

Birds C2. Within 7 years, establish a refugewide bird monitoring program and determine and describe sentinel plant associations and habitat requirements of 50 percent of high-priority and sentinel bird species (species will be based on results of bird inventories).

Birds C3. Same as Birds B3 and D3.

Birds C4. Within 5 years, determine greater sage-grouse and sharp-tail grouse distribution, nesting densities and nesting success in upland prairie areas of the refuge and relate these to the effects of management alternatives (burning and grazing) and sentinel species.

Rationale for Bird C1–C4. Same as B, plus prairie grouse such as sharp-tailed and greater sage-grouse have relatively large home ranges and require vast acreages of quality grassland to sustain their populations. Because these grassland birds are year-round residents they can easily be designated as flagship species for other grassland birds (Vodehnal and Haufler 2007). Currently, greater sage-grouse are listed on the Montana Natural Heritage list as a State of Montana species of concern and are also listed as sensitive on both BLM and U.S. Forest Service species status lists (MFWP 2010). Although sharp-tailed grouse are not currently listed on any agency status lists, historical records show a marked decrease in this prairie grouse species.

Prairie grouse species evolved with a diversity of ecological communities that were formed by two

main influences–many different ecological sites and the disturbances (fire and grazing by native species) on these ecological sites. Restoring and keeping prairie grouse species as well as other high priority grassland species means understanding, managing, and restoring this diverse grass and shrub ecosystems (Vodehnal and Haufler 2007).

Strategies for Bird C1–C4

- Within 2 years, establish and complete five new breeding bird surveys on the refuge for a baseline inventory.
- Within 3 years, establish and complete permanent walking routes based on the four habitat types for a baseline inventory.
- Annually participate in State and national bird surveys such as owl surveys, nightjar surveys, raptor surveys, and resident bird surveys with the addition of habitat and management information in each of the four general habitat types on the refuge.
- Incorporate all habitat and management information into a data management system.
- Within 2 years, work with partners to refine the current monitoring program for greater sage-grouse and sharp-tailed grouse, and continue yearly monitoring of both species.
- Within 5 years, determine, inventory, and monitor current dancing ground, nesting, brood-rearing, foraging and fall/winter habitat needs on a year-round basis for both species including habitat/management information in each of the four general habitat types on the refuge.
- Develop a data management system including a GIS database for recording bird sightings.

Objectives for Birds, Alternative D

Birds D1. Same as Birds B1 and C1.

Birds D2. Within 7 years, establish a refugewide bird-monitoring program and determine and describe sentinel plant associations and habitat requirements of 90 percent of high priority and sentinel bird species (species will be based on results of bird inventories).

Birds D3. Same as Birds B3 and C3.

Birds D4. Same as Birds C4.

Rationale and Strategies for Birds D1–D4 *(Same as B)*

WILDLIFE–OTHER WILDLIFE

Many species of invertebrates, amphibians, reptiles, fish, and small mammals are found on the refuge and serve as key indicators in evaluating the environmental health of the ecosystem.

Objectives for Other Wildlife, Alternative A

There are no objectives under alternative A.

Objectives for Other Wildlife, Alternative B

Other Wildlife B1. Within 1–2 years, assess the need for baseline inventory plans, surveys, or research for fish, reptiles, amphibians, invertebrates, or other small mammals found on the refuge. Prioritize the highest needs (for example, top 7–10) particularly those that support or are tied to the monitoring efforts for upland, river bottoms, and riparian objectives. Within 5 years, initiate and/or complete inventory plans or baseline surveys for about 30–50 percent of the highest priority needs. Over 15 years, complete 75–100 percent of the top 10 priorities. Prioritize monitoring needs based on sentinel species that support habitat goals and objectives or climate change effects.

(Same as Other Wildlife C1 and D1.)

Rationale for Other Wildlife B1. Limited information is available on the diversity of fish, reptiles, amphibians, invertebrates, and other small mammals such as bats and rodents that are found on the refuge including the composition and distribution of these species. As part of implementing the objectives for uplands, river bottoms, and riparian areas, baseline information or additional survey work is needed to monitor and evaluate the success of the habitat objectives. While the need for understanding baseline information is important for the habitat monitoring effort, funding limitations and other staff priorities necessitate that these plans and surveys are prioritized and coordinated with MFWP, including obtaining necessary permits.

The Missouri River Breaks provide unique habitats for the many nongame species including fish, amphibians, invertebrates, and small animal in the northern plains due to the topographic features and forest outliers present. This region has not had a comprehensive baseline inventory of species present. Establishing the species present is the foundational first step in species conservation. This step will lead to species/habitat associations and adaptive management actions that are tied to the habitat objectives.

Because terrestrial small mammals have limited distributions, small home ranges, and require relatively high densities to maintain viable populations (Silva 2001), they are susceptible to population declines resulting from habitat degradation or loss at many scales, including local disturbances (Van Dyke 2003, Gaines et al. 1997, Rossenberg et al. 1997). However, detailed data concerning specific habitat influences on abundance and distribution are lacking, and this limits the ability of managers to effectively sustain healthy populations across the landscape.

Important habitats for plants and animals can be restricted or otherwise modified by prescribed fire, rotational grazing, or other types of habitat management such as thinning, reseeding, and chemical or mechanical weed control. Because populations can be sampled relatively easily, small mammal communities are often used as indicators for monitoring ecosystem responses to habitat restoration and management (Douglass 1984, Olson et al. 1994). As a prerequisite of using small mammals in such a conservation program, however, it is critical to identify and understand the structure and composition of small mammal communities in areas exposed to management.

(Same as D.)

Strategies for Other Wildlife B1 *(Same as D)*

- Conduct stream surveys based on refuge priorities (functioning and nonfunctioning streams) using qualified aquatic ecologists versed in prairie stream survey techniques and methods.
- Work in partnership with Federal, State, nongovernmental organizations and others to write management plans and incorporate other plans or planning efforts such as the Missouri River Fish Management Plan, strategic habitat conservation and land conservation cooperatives, and the Montana Fish and Wildlife Conservation Strategy.
- Document fish inhabiting the refuge's ephemeral, intermittent, and perennial streams using Bramblett and Zale (1999) as a baseline.
- In cooperation with BLM, restore degraded riparian areas by limiting expansion of existing stock ponds or limiting additional stock ponds and other water developments.
- Remove fish passage impediments such as culverts, grade control structure, or diversion structures on case-by-case basis.
- Develop habitat management strategies to preserve and enhance populations of nongame species on the refuge. These strategies will include detailed prescriptions for habitat management, protocols to monitor the status of these species, and methods to evaluate the effectiveness of management actions.
- Hire additional refuge staff and encourage universities or other organizations to conduct surveys on the effects of public use, wildfire (wildfire and prescribed fire), and other management strategies throughout the calendar year on a yearly basis to determine changes in use.
- Establish standardized reporting methods for incidental sightings to include: species, date, property, specific location, and habitat type, as minimum information, and size, sex, and age data as additional information where possible.
- Develop and maintain a GIS database for the refuge used to record distribution and locations of incidental sightings of all nongame species.
- Continue to monitor and identify nongame species with limited distribution or specific habitat requirements (for example, snake den sites, bat rookery or roosting sites) on the refuge using three-year rotation surveys.

Objectives for Other Wildlife, Alternative C

Other Wildlife C1. Same as Other Wildlife B1 and D1.

Other Wildlife C2. Over 15 years, place a management emphasis on those species of fish, amphibians and reptiles that are of recreational interest.

Other Wildlife C3. Over 15 years, work with partners to enhance populations of paddlefish and increase fishing opportunities by stocking livestock ponds and reservoirs that will support a fisheries.

Rationale for Other Wildlife C1–C3. Same as B and D, plus in 2006 recreational sport fishing to the refuge contributed 2.1 million dollars in revenue to local communities (Carver and Caudill 2007). Providing additional fishing opportunities should increase recreational fishing visits to the area. Restoring riparian areas with native reptiles and amphibians will promote ecological health of the area. The secondary benefit of this restoration will promote diversity of other wildlife, which will lead to additional wildlife-viewing opportunities.

Strategies for Other Wildlife C1–C3 *(Same as B and D)*

Objectives for Other Wildlife, Alternative D

Other Wildlife D1. Same as Other Wildlife B1 and C1.

Rationale for Wildlife D1 *(Same as B)*

Strategies for Wildlife D1 *(Same as B and C)*

THREATENED and ENDANGERED SPECIES and SPECIES OF CONCERN

Threatened and endangered species of importance that are found on the refuge are: black-footed ferret (endangered), least tern (endangered), pallid sturgeon (endangered), and piping plover (threatened). This section also addresses grizzly bear (threatened) and gray wolf (endangered), which are not currently found on the refuge but could migrate with the 15-year period. In addition, there are objectives for the following species of concern for the refuge: black-tailed prairie dog, greater sage-grouse, mountain plover, burrowing owl, sicklefin chub, sturgeon chub, and northern leopard frog.

USFWS

Endangered Black-footed Ferret

Objectives for Threatened and Endangered Species (TES) and Species of Concern, Alternative A

TES and Species of Concern A1 (black-footed ferret). Maintain habitat for and reintroduce a minimum of six pairs of black-footed ferrets on six or more prairie dog towns when animals are available.

TES and Species of Concern A2 (black-footed ferret). Over 15 years, continue the black-footed ferret recovery effort including releasing animals, intensive monitoring, and disease and habitat management.

TES and Species of Concern A3 (black-footed ferret). Maintain viable prairie dog towns totaling no less than 5,000 acres and no more than 10,000 acres on suitable areas with sizes and patterns desirable for black-footed ferrets.

Rationale and Strategies for TES* and Species of Concern *A1–A3 *(None)*

Objectives for TES and Species of Concern, Alternative B

TES and Species of Concern B1 (black-footed ferret). Over 15 years, continue to provide technical and scientific assistance where possible in black-footed ferret recovery to State, conservation organizations and private landowners interested in black-footed ferret recovery.

(Same as TES and Species of Concern C1 and D1.)

TES and Species of Concern B2 (black-footed ferret). Continue monitoring of the existing UL Bend population and consider additional releases of captive-reared ferrets for useful purposes.

(Same as TES and Species of Concern C2 and D2.)

Rationale for TES and Species of Concern B1–B2 (black-footed ferret). By itself, the refuge lacks the habitat potential to produce sufficient prairie dog acreage to support a self-sustaining black-footed ferret population. Because of this, it was always anticipated that the refuge would play a minor role (10 percent) in providing viable black-footed ferret habitat in Phillips County. For a variety of reasons, those expectations have not been fulfilled.

The Service has worked hard actively releasing and monitoring ferrets at UL Bend since 1994. The refuge also built a captive rearing and preconditioning facility near Malta that was operated for several years, but has now been abandoned. The refuge staff have also assisted with ferret reintroductions and monitoring on BLM lands, on the Fort Belknap Indian Reservation and on the Northern Cheyenne Indian Reservation.

A self-sustaining ferret population has yet to be established in Montana. MFWP is the leader in prairie dog conservation in Montana and the refuge staff will collaborate with them on ferret recovery activities where possible.

(Same as D.)

Strategies for TES and Species of Concern B1–B2 (black-footed ferret)

- Cooperate with adjacent land managers to maintain, expand, and protect prairie dog colonies in configurations capable of supporting a viable black-footed ferret population. Continue providing monitoring, management and research expertise from refuge staff.
- Provide technical and scientific expertise to State, counties, and other landowners interested in black-footed ferret recovery efforts on their lands.

TES and Species of Concern B3 (least tern). Over 15 years, work with the USACE to maximize suitable nesting habitats that are attractive to least terns with the goal of maximizing annual productivity to promote recovery.

(Same as TES and Species of Concern D3.)

TES and Species of Concern B4 (piping plover). Over 15 years, work with the USACE to maximize suitable nesting habitats that are attractive to piping plovers with the goal of maximizing annual productivity to promote recovery.

(Same as TES and Species of Concern C4 and D4.)

Gene Nieminen/USFWS

Piping Plover

Rationale for TES and Species of Concern B3–B4. Certain areas of the reservoir (certain islands and shorelines) tend to be more attractive to nesting least terns and piping plovers. Once identified, it may be practical to manage those habitats to ensure their continued suitability. Recognizing that reservoir levels vary greatly, it may only be feasible to identify sites that, in most successive years, are attractive and available to these species. (Same as D.)

TES and Species of Concern B5 (pallid sturgeon). Over 15 years, work cooperatively with MFWP and other partners along the Missouri River to develop management actions (in compliance with recovery plan) to benefit pallid sturgeon populations.

(Same as TES and Species of Concern C5 and D5.)

TES and Species of Concern B6 (pallid sturgeon). Over 15 years, work cooperatively with partners to monitor populations of pallid sturgeons.

(Same as TES and Species of Concern C6 and D6).

TES and Species of Concern B7 (grizzly bear). Over 15 years, develop a grizzly bear management plan, in cooperation with MFWP, for managing grizzly bears that could naturally colonize the refuge.

(Same as TES and Species of Concern C7 and D7.)

Rationale for TES and Species of Concern B7 (grizzly bear). This refuge-specific plan is being developed in case grizzly bear naturally recolonize the refuge. The philosophy of the plan under this alternative would be toward promoting grizzly bear abundance (within ecological constraints) and providing for recreational (viewing) opportunities. Grizzly bears would provide natural predation pressure on large ungulates and influence movements around the refuge.

Strategies for TES and Species of Concern B7 (grizzly bear)

- Work with MFWP and others to document grizzly bear presence on the refuge and to monitor abundance, distribution, and population trends if grizzly bears become established, and work to educate user groups about the ecological role grizzly bears play in the environment.
- On a case by case basis, approved agents could be permitted to remove grizzly bears that are documented depredating livestock.
- Promote, help sponsor, and conduct research on grizzly bears ecology in the Missouri River Breaks.
- No hunting season for grizzly bears on the refuge would be established if grizzly bears are delisted.

TES and Species of Concern B8 (gray wolf). Within 4 years, develop a refuge-specific wolf management plan in cooperation with MFWP that follows the Northern Rockies Gray Wolf Recovery Plan.

(Same as TES and Species of Concern C8 and D8.)

Rationale for TES and Species of Concern Gray Wolf B8. Wolves were reintroduced into Yellowstone National Park in 1995 and steadily increased in numbers to an estimated population at the end of summer 2008 of 497. There are an estimated 34 breeding pairs in Montana (MFWP 2009e).

This refuge-specific plan would be developed in case wolves naturally recolonize the refuge. Wolves would provide natural predation pressure on large ungulates that may help to balance sex and age ratios and influence movements around the refuge.

(Same as C and D.)

Strategies for TES and Species of Concern Gray Wolf B8 *(Same as C and D)*

- Work with MFWP and others to document wolf presence on the refuge and to monitor abundance, distribution, and population trends if wolves become established, and work to educate user groups about the ecological role wolves play in the environment.
- Collaborate with others to educate the public and refuge users about the ecological role wolves play in the environment.
- On a case-by-case basis, wolves that are documented depredating livestock would be removed.
- Promote, help sponsor and conduct research on wolf ecology in the Missouri River Breaks.
- No hunting season for wolves on the refuge would be established.

TES and Species of Concern B9 (black-tailed prairie dog). Over 15 years, continue protection, restoration and expansion of black-tailed prairie dog populations refugewide to maximize occupancy of potential habitat.

(Same as TES and Species of Concern C9 and D9.)

TES and Species of Concern B10 (black-tailed prairie dog). Work with MFWP, conservation organizations and neighbors to implement the State black-tailed prairie dog management plan and work to establish at least two 5,000-acre complexes that could support black-footed ferrets in which the refuge could contribute to the larger complex.

(Same as TES and Species of Concern C10 and D10.)

TES and Species of Concern B11 (black-tailed prairie dog). GPS map all black-tailed prairie dog colonies on the refuge every 3 years (if funding and personnel allow). Continue with research, monitoring, and treatment.

(Same as TES and Species of Concern D11.)

Strategies for TES and Species of Concern B9–B11 (black-tailed prairie dog)

- Within 3 years, map and rank the quality of all potential and existing prairie dog habitats.
- Promote expansion by mechanically removing vegetation, targeted prescriptive grazing and fire.
- Coordinate with MFWP and others on how the refuge could best contribute to conservation of prairie dogs and associated species.
- Use current disease (plague) management tools and translocation procedures (Truett et al. 2001, Dullum et al. 2005) to promote prairie dog population growth and persistence in desired areas.
- Continue research and field trials on existing and developing plague management tools.

TES and Species of Concern B12 (greater sage-grouse). Within 2 years, using MFWP's sage-grouse core area map and existing research projects, delineate areas of the refuge that are of high importance to sage grouse. Gear proposed actions and responses to wildfires to minimize short-term impacts and maximize long-term benefits for sage-grouse and other sage-steppe associated species.

(Same as TES and Species of Concern C12 and D12.)

Strategies for TES and Species of Concern B12 (greater sage-grouse)

- Using existing lek locations and existing research telemetry data, combined with the many available GIS data layers, map and model sage-grouse habitat and rank its quality.
- Identify existing and potential threats to sage-grouse habitat and develop remedies

TES and Species of Concern B13 (mountain plover). Over 15 years, continue to promote prairie dog towns to provide habitat for mountain plovers and other prairie dog-dependent species.

(Same as TES and Species of Concern C14 and D13.)

Strategies for TES and Species of Concern B13 (mountain plover)

- The strategy for mountain plover conservation is to promote persistence and expansion of prairie dog colonies, especially those on ridges and with gravelly substrates, as such sites appear more attractive as nesting habitat for mountain plovers. See also section on management of black-tailed prairie dogs that provide habitat for nesting mountain plovers in certain areas.
- Design and conduct at least every 3 years, population surveys for mountain plovers.

TES and Species of Concern B14 (sicklefin chub and sturgeon chub). Over 15 years, work with MFWP and other partners to improve monitoring of rare fish (sicklefin chub and sturgeon chub) and develop management actions to benefit pallid sturgeon populations.

(Same as TES and Species of Concern C15 and D14.)

Rationale for TES and Species of Concern B14. The sicklefin chub was petitioned for listing under the Endangered Species Act in 1994 and is currently a Category 1 species, meaning there are sufficient data to support a listing proposal. It has been documented in the Missouri River above Fort Peck Reservoir, but little is known about its abundance or distribution. The Montana Chapter of the American Fisheries Society reports that the sturgeon chub is relatively common and widespread in eastern Montana and populations appear relatively secure. The refuge has spent little effort on rare fish, but is willing to work with others on their conservation. Neither of these species was encountered during a 1999 fishery of several streams on the refuge conducted by Robert Bramblett and Alexander Zale (1999). (Same as D.)

Strategies for TES and Species of Concern B14 (sicklefin chub and sturgeon chub)

- Meet with MFWP fishery staff to discuss the status of these fish species and what actions the refuge might consider for better management of them.

TES and Species of Concern B15. Over 15 years, protect, conserve, and enhance populations of special status species where the refuge and partners can make significant contributions to recovery efforts on the refuge. Give priority to species that are listed federally or by the State of Montana.

(Same as TES and Species of Concern D15.)

Rationale for TES and Species of Concern B1–B15. The Service manages threatened and endangered species as trust species and is responsible for assisting in the recovery of these species that occur within the Refuge System. To implement effective management for the protection and recovery of threatened and endangered species, a major goal of the Refuge System is to develop priorities for refuge management among species. Prioritization is important because limitations in funding and staff time prevent targeting all special status species for management. Limited resources are allocated, in part, through inventories of special status species and prioritization of management needs.

Consistent with the theme of alternative B, resources would be directed toward maintaining, and enhancing where appropriate, population levels to the maximum extent possible and practicable for these special status species.

The northern leopard frog is currently being considered for listing under the Endangered Species Act. Refuge staff has observed them in several places, but no standardized monitoring has ever been done. The refuge staff currently assists with the large-scale North American Amphibian Monitoring Program and a refuge-specific monitoring strategy would be patterned after those efforts.

(Same as D.)

Strategies for TES and Species of Concern B1–B15
Same as C and D, except as noted:

- By 2014, evaluate and prioritize the special status species that occur on the refuge to determine which species require active management and the level and type of management needed. Criteria for prioritization will include listing status, implementation of actions identified in recovery plans, status within Montana, population size on the refuge, threats to survival, sensitivity to disturbance, and the ability of the refuge to contribute to recovery or conservation of the species.
- By 2015, compile all field surveys, literature, historical records pertaining to the special status species that occur on the refuge. Incorporate MFWP Comprehensive Fish and Wildlife Conservation Strategy whenever possible.
- By 2016, develop habitat management strategies to preserve and enhance populations of high-priority special status species on the refuge. These strategies will include detailed prescriptions for habitat management, protocols to monitor the status of these species, and methods to evaluate the effectiveness of management actions. The effects of public use on special status species will also be monitored. The strategies will cover federally listed species such as the black-footed ferrets, piping plover, least tern, and pallid sturgeon.
- Over 15 years, encourage research by refuge staff, graduate students or other organizations on priority special status species to better understand and promote their conservation. Continue to assist USACE with historical plover and tern surveys so that the survey data remains consistent.
- Within 5 years, work with Ecological Services branch to identify areas of critical habitat for endangered species and species of concern. Prescribed fire could be used in these areas to achieve specific resources objectives as long as there were not significant impacts. These ares would be identified in the fire management plan as areas of special concern and would be protected from wildfire.
- Collaborate with other interested parties and secure funds to hire additional seasonal employees to conduct amphibian monitoring and turtle monitoring.
- See riparian section for strategies to improve riparian habitats that would benefit amphibians.

Objectives for TES and Species of Concern, Alternative C

TES and Species of Concern C1–C2 (black-footed ferret). Same as TES and Species of Concern B1–B2 and D1–D2.

Rationale and Strategies for TES and Species of Concern C1–C2 (black-footed ferret) *(Same as B and D)*

TES and Species of Concern C3 (least tern). On plan approval, and depending on lake levels, work with the USACE to maintain suitable least tern nesting habitats.

TES and Species of Concern C4 (piping plover). Same as TES and Species of Concern B4 and D4.

Rationale and Strategies for TES and Species of Concern C3–C4 (least tern and piping plover)
Same as B and D, except:

- Do not restrict livestock grazing on beaches beyond current levels.

TES and Species of Concern C5–C6 (pallid sturgeon). Same as TES and Species of Concern B5–B6 and D5–D6.

TES and Species of Concern C7 (grizzly bear). Same as TES and Species of Concern B7 and D7.

TES and Species of Concern C8 (gray wolf). Same as TES and Species of Concern B8 and D8.

Rationale and Strategies for TES and Species of Concern C7–C8 (grizzly bear and gray wolf) *(Same as B and D)*

TES and Species of Concern C9–C10 (black-tailed prairie dog). Same as TES and Species of Concern B9–B10 and D9–D10.

TES and Species of Concern C11 (black-tailed prairie dog). GPS map all prairie dog colonies on the refuge every 5 years.

Rationale and Strategies for TES and Species of Concern C9–C11 (black-tailed prairie dog)
Same as B and D, plus:

- Continue attending Montana and local prairie dog management meetings and help MFWP implement their conservation plans.

TES and Species of Concern C12 (greater sage-grouse). Same as TES and Species of Concern B12 and D12.

TES and Species of Concern C13 (greater sage-grouse). Identify two leks near each field station suitable for public viewing (refer to public use objectives).

TES and Species of Concern C14 (mountain plover). Same as TES and Species of Concern B13 and D13.

TES and Species of Concern C15 (sicklefin chub and sturgeon chub). Same as TES and Species of Concern B14 and D14.

Rationale and Strategies for TES and Species of Concern C15 (sicklefin chub and sturgeon chub) *(Same as B and D)*

TES and Species of Concern C16. Over 15 years, protect, conserve, and enhance populations of special status and their habitats. Priority will be given to species that are State or federally listed. Expand on those opportunities to provide public view of special status species and other wildlife-dependent recreation.

Rationale for TES and Species of Concern C1–C16. Same as B, plus there is less emphasis on habitat and population recovery/monitoring and more emphasis on getting the public involved in wildlife-dependent recreational activities associated with these special status species (see objectives for Public Use and Education). Given the emphasis in this alternative, fewer resources would be spent on species recovery, but the Service would fulfill the legal and policy requirements for these species, and more emphasis on public use and enjoyment of these species.

Objectives for TES and Species of Concern, Alternative D

TES and Species of Concern D1–D2. Same as TES and Species of Concern B1–B2 and C1–C2.

TES and Species of Concern D3. Same as TES and Species of Concern B3.

TES and Species of Concern D4–D10. Same as TES and Species of Concern B4–B10 and C4–C10.

TES and Species of Concern D11. Same as TES and Species of Concern B11.

TES and Species of Concern D12. Same as TES and Species of Concern B12 and C12.

TES and Species of Concern D13–D14. Same as TES and Species of Concern B13–B14 and C14–C15.

TES and Species of Concern D15. Same as TES and Species of Concern B15.

Rationale for TES and Species of Concern D1–D15. Same as B, except: Maintenance, restoration and enhancement of special status species is essential to restoration of natural ecological processes, the theme of this alternative.

Strategies for TES and Species of Concern D1–D15 *(Same as B)*

OBJECTIVES for GOAL
Public Use and Education

PUBLIC USE–HUNTING

Hunting is permitted on the refuge for elk, mule deer, white-tailed deer, pronghorn, bighorn sheep, coyotes, waterfowl, and upland game birds. It is used both as a management tool for improving habitat conditions and as an appropriate and compatible wildlife-dependent recreational activity (refer to hunting compatibility determination in appendix C). In some areas of the refuge, big game hunting seasons and harvest quotas on the refuge could be more restrictive than State regulations. All other wildlife is protected. Trapping is not allowed.

Objectives for Hunting, Alternative A

Hunting A1. Within 2–5 years, develop a visitor services plan that includes a hunting plan.

(Same as Hunting B1, C1, and D1.)

Hunting A2. Over 15 years, maintain current hunting programs for ungulates, upland birds, waterfowl, and coyote and prohibit trapping.

Hunting A3. Over 15 years, continue to facilitate the hunting program by allowing access on open refuge roads, camping as designated under refuge rules, and boat access.

Rationale for Hunting A1–A3. Hunting has long been an important cultural and social component to the lands that make up the refuge. It is also an important tool for managing wildlife populations.

Interest in experiencing the natural and wild wonders of the area has been focused in large part on participating in a variety of hunting opportunities. The refuge would continue to provide for many quality and diverse hunting experiences.

This alternative would continue with the existing strategies as long as they are deemed compatible with refuge purposes.

Strategies for Hunting A1–A3

- Continue to respond to inquiries and provide information about current refuge hunting opportunities. (Same as B, C, and D.)
- Continue yearly review of refuge hunting regulations to ensure clarity and to address any emerging issues or concerns, and give the public an opportunity to review and comment on any changes. (Same as B, C, and D.)
- Continue to publish and/or update the refuge hunting regulations brochure to inform the public of hunting opportunities (including accessible opportunities) and refuge-specific regulations. (Same as B, C, and D.)
- Distribute the refuge's brochure more widely. (Same as B, C, and D.)
- Continue to prohibit most predator hunting except permit limited coyote hunting would be allowed (mid-October through March 1).
- Continue to prohibit trapping or shed hunting.

Brett Billings/USFWS

Hunting is one of the most popular activities on the refuge.

- Continue to monitor boat use for accessing hunting areas along the river to ensure that wildlife species utilizing the habitat along the river are not negatively affected over the long term. (Same as B, C, and D.)
- Continue to permit camping within 100 yards of roads to facilitate harvest opportunities. (Same as C and D.)

Objectives for Hunting, Alternative B

Hunting B1. Same as Hunting A1, C1, and D1.

Hunting B2. Over 15 years, continue to facilitate the hunting program by allowing access on open refuge roads, horseback riding, camping as designated under refuge rules, and boat access.

Hunting B3. Within 5 years, work with partners to create diverse and quality hunting opportunities on the refuge that represent a diversity of all age classes. By year 5, 60–70 percent of hunters report a reasonable harvest opportunity and satisfaction with the overall experience.

Hunting B4. Within 5 years, evaluate the demand for additional access for hunters with mobility impairments. If warranted, by year 10 provide one additional hunting access for hunters with mobility impairments.

Hunting B5. Working with MFWP and within the State's hunting-season framework, within 4 years, expand opportunities for young people to hunt with at least one new hunt that is only available to young hunters.

Hunting B6. Over 15 years, maintain the furbearer hunting policies as found in alternative A (no trapping and wildlife is protected).

Hunting B7. Over 15 years, work with MFWP to increase hunting opportunities by opening additional populations (i.e., bighorn sheep that have expanded to new areas).

Rationale for Hunting B1–B7. Similar to A, except hunting activities are primarily focused on strategies associated with maximizing wildlife populations within the capacities of healthy habitats.

For many hunters, unique hunting opportunities on the refuge could be the result of mature bull elk in the 8- to 10-year class, where a population of mule deer that can reach 8 years and bighorn sheep that may reach the age of ten. Some natural fluctuations of population age structure would occur due to random events, but overall representative age classes would be available to refuge visitors. Some game animals of both male and female would be expected to die from old age.

Strategies for Hunting B1–B7

- Adopt MFWP hunting seasons and regulations for those species for which harvest is currently allowed (except for mule deer) on the refuge (elk, white-tailed deer, and pronghorn). Continue with the 3-week mule deer season or consider other alternatives until buck-to-doe ratio as identified in wildlife objectives is achieved.
- Work with the MFWP to determine the appropriate hunting permit levels for elk for achieving habitat objectives related to herd populations and herd composition. Both biological integrity and landowner tolerance need to be taken into account when setting permit levels for elk.
- Evaluate hunting district 652 (mule deer buck special-draw area) for mule deer home ranges, hunting district size, harvest strategy, permit numbers, habitat quality, and access and assess effects on management objectives.
- Initiate tooth annual study/survey to evaluate age structure for all hunted species.
- Within 2–5 years, complete a survey on user preferences and include questions needed to evaluate big game harvest on the refuge.
- Use annual wildlife surveys, car count data, and trail cams to monitor and evaluate hunting use.
- Evaluate motorized access for hunting and make determination of implementing seasonal road closures to promote quality walk in hunting opportunities or retrieval roads to promote harvest in remote areas of the refuge.
- Through visitor contact and hunting information, encourage hunters to walk in to hunt.
- If deemed necessary due to increasing hunting pressure and over harvest of certain species, implement a refuge permit system to control the number of hunters.
- Work with the State to establish and coordinate hunter days or events for hunters with special needs.
- Work cooperatively with MFWP to conduct law enforcement patrols at the refuges to ensure compliance.
- Develop a policy for addressing tree stand use on the refuge. Address number of stands permitted, timeframe that can be up and how many days before, during or after a hunt.
- Require nontoxic shot for all bird hunting to reduce the incidental poisoning of nontarget wildlife.
- Work with the State of Montana to establish a special, permitted, weekend hunt for elk and deer in all hunting districts covering the refuge that is only available to young hunters.

Strategies for Hunting B2 (boat use and camping)

- Continue to monitor boat use for accessing hunting areas along the river. (Same as A, C, and D.)
- Working with USACE and others, begin monitoring the amount of boat access occurring in popular hunting areas. If monitoring shows that increased access is negatively affecting wildlife populations using river bottom areas, make recommendations and work with users to reduce the impacts (for example, limit motor size or number of boats allowed on river).
- Continue to permit minimally disturbing, pack-in/pack-out backcountry camping throughout the entire refuge.
- Allow visitors to drive within 50 yards of public use roads to access campsites for wildlife-dependent recreational activities.
- Within 5 years, designate the most popular public use areas for camping and harden those sites to minimize erosion and impacts on habitat.
- If an area is overly affected by camping implement temporary closures or create hardened access points.
- Work with USACE to evaluate the need for horse camps at popular recreation areas or wilderness study areas.
- Define current camp areas along the river to prevent campground creep into the riparian habitat.
- Allow boat camping along the beaches of the lakeshore.
- Continue working with USACE to restrict boat camping from the islands in the river.

Strategies for Hunting B4 (hunters with mobility impairments)

- Work with partners (such as Wheeling Sportsmen and Wilderness on Wheels) to improve the current accessible blind in the Sand Creek Unit.
- Identify where potential accessible sites are needed and where they could be developed if the demand arises.
- Increase outreach about the refuge's accessible hunting opportunities by developing a one-page tear sheet that explains the accessible hunting opportunities and facilities. Post information on the website.

Objectives for Hunting, Alternative C

Hunting activities are primarily focused on those legitimate strategies that also provide an economic benefit to local communities.

Hunting C1. Same as Hunting A1, B1, and D1.

Hunting C2. Over 15 years, continue to facilitate the hunting program by allowing access on open refuge roads, camping as designated under refuge rules, and boat access.

Hunting C3. Within 5 years, in combination with achieving the habitat objectives already defined, work with partners to create hunting opportunities on the refuge that are not achieved on other public lands, including harvesting big game animals that represent all age classes. By year 7, 70–85 percent of hunters report a reasonable harvest opportunity and satisfaction with the overall experience.

Hunting C4. Within 5 years, provide two additional hunting accesses for hunters with mobility impairments.

Hunting C5. Within 4 years, expand opportunities for young people (under 17 years old) to hunt with at least one new hunt each in areas 400, 600, and 700 that are only available to young hunters, in conjunction with MFWP.

Hunting C6. Over 15 years, if supported by a monitoring program, adopt MFWP harvest strategies and opportunities for hunting and/or trapping furbearing species regulated by MFWP (muskrat, mink, and bobcat) and not regulated by MFWP (red fox, coyote, raccoon, and badger; but excluding least weasel, long-tailed weasel, and striped skunk).

Hunting C7. Same as Hunting B7.

Rationale for Hunting C1–C7. Similar to A, except the refuge would look to expand opportunities for all hunters including youth and hunters with mobility impairments. Increasing hunting and trapping opportunities on the refuge and promoting the refuge's hunting program will increase license sales for MFWP and boost economic activity in the surrounding communities. This could increase the value of leased private lands within and adjacent to the refuge. Additionally, this could increase leases values of State lands within the refuge that can be acquired by outfitters who have a permit to operate on the refuge.

Providing that monitoring supports allowing for a harvest, the Service would cooperate with MFWP to open up hunting or trapping opportunities for furbearer species both regulated (muskrat, mink, and bobcat and unregulated (red fox, coyote, raccoon, and badger) that are not currently open to hunting or trapping. For big game, the Service would also cooperate with the State to maximize the number of cow elk tags when the numbers are above objective levels and not restrict antlerless mule and whitetail deer tags. As the bighorn sheep population expanded in areas where they were reintroduced, this would provide additional harvest opportunities.

Through promotions and information, more hunters would be encouraged to hunt on the refuge,

which in turn could provide for more economic benefit to the local communities. Although there could be more hunters than what is currently found in alternative A, it is anticipated that the vast majority will report satisfaction with their overall experience.

Strategies for Hunting C1–C7

- Adopt MFWP hunting seasons and regulations for those species for which harvest is currently allowed (except for mule deer) on the refuge (elk, white-tailed deer, pronghorn). Continue with a 3-week mule deer season until buck-to-doe ratio identified in wildlife objectives is achieved. (Same as B.)
- Use annual wildlife surveys, hunter surveys, car count data and trail cams to monitor and evaluate hunting use. (Same as B.)
- Develop a policy for addressing tree stand use on the refuge. Address number of stands permitted, timeframe that can be up–how many days before, during or after a hunt. Make policy less restrictive than alternative B.
- Work with the State of Montana to establish a special, permitted, weekend hunt for elk and deer in all hunting districts that is only available to young hunters.
- Maximize cow elk tags when numbers are above population objectives, allowing A9/B12 to be valid on the refuge and not restricting antlerless mule deer and whitetail deer tags on the refuge.
- Develop hunt packages to create harvest opportunities for those species present, but not currently open to hunting if biologically supported (mountain lion, moose, and black bear).
- If wolves arrive and establish a resident refuge population that a refuge biologist determines is huntable, consider establishing a limited wolf-hunting season.
- Increase outreach to hunters and create more outlets for promoting hunting opportunities on the refuge to outside audiences.
- Create new partnerships, and maintain and expand existing partnerships with hunters and hunter groups to increase awareness of hunting opportunities and the habitat conservation.
- Require nontoxic shot for all bird hunting to reduce the incidental poisoning of nontarget wildlife.

Strategies for Hunting C2 (boat use and camping)

- Continue to monitor boat use for accessing hunting areas along the river. (Same as A, B, and D.)
- Within 5 years, designate and develop camping areas to accommodate the number of recreationists to the refuge. Include conveniences such as location to the river for easier access, pit toilets, and possibly tie-downs for horse camps.
- Continue to restrict all camping to within 100 yards of a numbered route. (Same as A and D.)
- If an area is overly affected by camping implement temporary closures or create hardened access points. (Same as B.)
- Work with USACE to evaluate the need for horse camps at popular recreation areas or wilderness study areas. (Same as B.)
- Harden current camp areas along the river to prevent campsite creep into the riparian areas.
- Cooperate with USACE to allow camping on river islands and along the beaches of the lakeshore.
- Within 5 years, evaluate the potential effects of camping within the islands along the Missouri River corridor.

Strategies for Hunting C4 (hunters with mobility impairments)

Same as B, plus:

- Restrict access by others at specific times to increase harvest opportunities for hunters with mobility impairments.
- Allow motorized vehicle access on seasonally closed roads for impaired hunters.
- Allow priority access to accessible blind to impaired hunters.
- If a demand is identified, develop a second accessible blind.
- Plant crops to attract more wildlife and increase harvest opportunities.

Strategies for Hunting C5 (young hunters)

- Hunting opportunities for young people will be expanded to include hunting district 417, 410, and 700 to recruit young hunters and promote a quality opportunity for young hunters (2015 biannual season setting process).

Strategies for Hunting C6 (trapping)

- Develop trapping packages to allow trapping of furbearers on the refuge that are regulated by MFWP. Do not permit trapping of beaver and swift fox.
- Require all furbearer trappers on the refuge to tag all traps with proper identification and report harvest within 30 days after the end of the season.
- Develop trapping packages to allow trapping of red fox, coyotes, raccoon, and badgers on the refuge.
- Develop hunting packages for badger, raccoon, and red fox to allow shooting these species on the refuge.
- Adjust current regulations to allow coyote hunting year-round on the refuge.
- Provide outreach to all visitors to advise them of where trapping is allowed.

Objectives for Hunting, Alternative D

Hunting D1. Same as Hunting A1, B1, and C1.

Hunting D2. Over 15 years, continue to facilitate the hunting program by allowing access on open refuge roads, camping as designated under refuge rules, and boat access.

Hunting D3. Within 5 years, work with MFWP and other partners to create diverse and quality-oriented hunting opportunities on the refuge, including harvesting big game animals that represent all age classes. By year 10, 65–75 percent of hunters report a reasonable harvest opportunity and satisfaction with the overall experience.

Hunting D4. Same as Hunting B4.

Hunting D5. Same as Hunting B5.

Hunting D6. Over 15 years, work with MFWP to consider the opportunity for limited hunting of furbearers and mountain lion, provided monitoring of wildlife and habitat indicates stable and growing populations.

Rationale for Hunting D1–D6. Under the Service's wildlife-dependent recreation policy (FWS 2006c), providing for quality experiences is highlighted as an important component of a hunting program (605 FW1, 605FW2). Safety, reasonable opportunities for success, and working collaboratively with the State wildlife agencies are important elements that should be considered. Under alternative D a quality experience could mean participants could expect reasonable harvest opportunities, uncrowded conditions, fewer conflicts between hunters, relatively undisturbed wildlife, and limited interference from, or dependence on, mechanized aspects of the sport.

Big game hunting is popular on the refuge and, as a result, at times crowding is becoming an issue that potentially affects the quality of the hunting experience. Too many hunters in some areas could lead to unsafe hunting conditions and compromised harvest opportunities. With a growing number of private property acres off limits to hunting, pressure is intensifying on Service lands. To ensure a good-quality hunting experience, it would be essential to maintain healthy populations of resident wildlife and migratory birds (FWS 2006b), in part by achieving the habitat objectives identified previously. Additionally, there is interest of implementing new opportunities such as a hunt for mountain lions and the expansion of bighorn sheep populations for additional hunting opportunities. The Service would consider allowing for limited, quality-oriented hunting opportunities of furbearers or mountain lion provided the populations are stable. For mountain lion, there would likely be a special drawing and only a few licenses would be issued.

It is also important to engage young people in wildlife-dependent recreation and engender enthusiasm and support for hunting, wildlife conservation, and the Refuge System to build a conservation ethic. Early season or preseason hunts are best suited for youth since they provide the best harvest opportunities. These programs would spark interest in hunting and hopefully lead to recruitment of more young refuge supporters.

There is also a demand for hunting opportunities that are accessible to hunters with special needs, such as hunters with mobility impairments. Currently, there is one accessible blind on the west end of the refuge and the USACE has an accessible campground downstream of the dam.

The refuge is isolated and many hunters feel that camping is necessary to ensure a quality hunt. Under this and the other alternatives camping would be continue to be permitted, however, efforts would be made to minimize any habitat and wildlife disturbances that result from camping.

Strategies for Hunting D1–D6

Same as B, except:

- No planting of domestic crops to lure big game.
- Continue to restrict all camping to within 100 yards of a numbered route.

PUBLIC USE–FISHING

Fishing is permitted on the refuge. Anglers often catch catfish, walleye, northern pike, sauger, perch, small mouth bass, bullhead, paddlefish, and lake trout. The USACE is responsible for providing recreation on their primary lands and waters. The Service works cooperatively with USACE to manage the lands, waters and public recreation opportunities within the Fort Peck Lake Project and the refuge boundary. The Service will continue to cooperate with the USACE and the State to ensure that a quality-fishing program exists within the refuge.

Objectives for Fishing, Alternative A

Fishing A1. Over 15 years, continue to follow State fishing regulations.

(Same as Fishing B1, C1, and D1.)

Fishing A2. Over 15 years, continue to cooperate with MFWP to regulate paddlefish fishing.

Rationale for Fishing A1–A2. Fishing within the refuge has centered on three basic types of opportunity: the fishery within the Fort Peck Reservoir and some opportunities associated with game fish stocked reservoirs scattered throughout the upland portion of the refuge. Fisheries resources have been primarily managed by MFWP (refer to chapter 4, section 4.5) and the refuge has participated in a partnering capacity when opportunities have occurred. There is

a combination of interest in both introduced species of game fish as well as a native fish component that provides for a well rounded set of opportunities for the angler. In particular, native fisheries management associated with the free flowing Missouri River has seen increasing emphasis in management in recent years, by both MFWP and the Service. This management focus will continue into the future and will provide for an increased diversity of opportunities for anglers to gain understanding of the importance of native fisheries while taking part in angling activities.

In this alternative, fishing activities are primarily focused on continuing existing strategies and coordinating future fisheries management with MFWP.

In 2006, about 60,100 fishing visits were recorded out of 233,000 visits to the refuge. Fisherman spent more than 2 million dollars in expenditures, making it third highest ranking wildlife-dependent recreational use of the refuge (Carver and Caudill 2007). Fishing contributes to the local economies through the rental of hotel rooms, eating at restaurants, buying of supplies and fuel.

Paddlefish fishing is very popular with anglers across Montana. In Montana, the Slippery Ann area is one of a few important paddlefish fishing areas along the Missouri River. Historically paddlefish fishing was open to all, and hundreds of anglers would pack into accessible areas from Kipp Recreation Area to Rock Creek boat ramp along the Missouri River. Law enforcement officers remained busy keeping order and preventing resource damage from camping and bank fishing. In recent times, MFWP has placed limits on paddlefish fishing (MFWP 2009c).

Another popular activity, ice fishing is currently permitted on the Missouri River and Fort Peck Lake.

Strategies for Fishing A1–A2

- Work with USACE on maintaining and extending critical boat ramps as the lake recedes due to prolonged periods of drought.
- Follow State regulations for establishment of permanent and portable ice fishing houses.
- Continue to enforce no shoreline driving.

Objectives for Fishing, Alternative B

Fishing B1. Same as Fishing A1, C1, and D1.

Fishing B2. Within 5 years, monitor the effects of fishing on the surrounding resources. Cooperate and collaborate with MFWP to ensure that paddlefish fishing remains a compatible use.

(Same as Fishing C2 and D2.)

Fishing B3. Over 15 years, work with MFWP, USACE and other partners to maintain current access for fishing of sport fish in the Missouri River and Fort Peck Reservoir.

(Same as Fishing C3 and D3.)

Brett Billings/USFWS

Paddlefish

Fishing B4. Within 5 years, evaluate and establish an additional youth fishing opportunity or event at one additional area within the refuge as part of Montana's free fishing weekend.

(Same as Fishing C4 and D4.)

Fishing B5. Within 2–4 years have a mechanism and/or agreement in place to ensure that Refuge System permit requirements are added or incorporated with USACE and/or State-issued permits.

(Same as Fishing C5 and D5.)

Rationale for Fishing B1–B5. As with alternative A, the Service would continue to cooperate and work with MFWP, USACE, and the counties in providing access for anglers. However, under alternative B the Service would closer with MFWP to develop additional strategies to ensure that paddlefish fishing, in particular, remains a sustainable and compatible use. The popularity of paddlefishing has resulted in some shoreline areas becoming heavily impacted from users who come to camp and fish. In the past, it has been considered for protection under the Endangered Species Act, but currently is not a listed species (MFWP 2009b).

The opportunity to expand and develop a closer partnership with MFWP and others would benefit the refuges' goal to introduce youth to the Refuge System.

The refuge has provided little to no oversight of the commercial harvest of fish in the past since most fish management falls under the primary jurisdiction of the USACE and the MFWP. However, Federal regulations governing the Refuge System state that "fishery resources of commercial importance on wildlife refuge areas may be taken under permit in accordance with Federal and State law and regulations" (50 Code of Federal Regulations, Part 31.13). Other regulations govern all commercial uses on refuges. The USACE and State currently manage commercial fishing within the refuge boundary. The Service recognizes these agencies has having primary jurisdiction for management of these activities and will work cooperatively when requested.

Fishing tournaments are popular on the Fort Peck Lake and on thus within the refuge. Care must also be taken to safeguard sensitive habitats or fish and wildlife areas within the refuge. Since fishing tournaments are a use of the refuge, they are subject to regulations governing uses on national wildlife refuges. The refuge has not provided any oversight to tournaments in the past, deferring to the State, and at USACE's regulatory and permitting processes. The Service recognizes these agencies has having primary jurisdiction for management of these activities and will work in a cooperative nature to ensure that public fishing opportunities are not impacted by these activities.

Strategies for Fishing B2 (paddlefish)

- Work with MFWP to determine an acceptable number of permitted paddlefish fishing permits, dates, and harvest strategies to limit conflicts with anglers, wildlife habitat, and other refuge visitors.
- Work with MFWP and build on the research and data collection (creel surveys) already being conducted.
- Work with MFWP to identify critical spawning areas.

Strategies for Fishing B3 (sport fishing)

- If needed, improve access to the lake and river.
- Within 5 years, establish clear access points for ice fishing to minimize effects on upland habitat from vehicles.
- Work with USACE on maintaining and extending critical boat ramps as the lake recedes due to prolonged periods of drought.
- Follow State regulations for establishment of permanent and portable ice fishing houses.
- Seek out partnerships to develop accessible facilities such as piers or platforms that accommodate anglers with disabilities.
- Work with the State to maintain healthy fish populations.
- Work with counties to maintain existing gravel roads to the lake for fishing purposes.
- Identify roads that provide direct access to the lake including all-terrain vehicle access.
- Continue to enforce no shoreline driving.

Strategies for Fishing B4 (young anglers)

- Work with MFWP and USACE to sponsor a fishing event for young anglers in the Fort Peck area that is associated with fishing education program at the Fort Peck interpretive center.

Strategies for Fishing B5 (commercial fishing)

- Recognize the State and USACE as having primary responsibility for managing commercial fishing within Fort Peck Lake and work with these agencies to ensure the fisheries resources of the lake are not impacted.
- Work with MFWP to establish a method of sharing permittee and catch information for the refuge.

Objectives for Fishing, Alternative C

Fishing C1. Same as Fishing B1 and D1.

Fishing C2–C5. Same as Fishing B2–B5 and D2–D5.

Rationale for Fishing C1–C5. Alternative would be similar to alternative B, except that the Service would work with partners on ways to increase fishing opportunities for economic benefit for the community (providing they are found compatible).

Strategies for Fishing C2 (paddlefish)

Same as B and D, plus:

- Evaluate commercial egg harvesting opportunities.

Strategies for Fishing C3 (sport fishing)

Same as B and D, plus:

- Work with MFWP and USACE to evaluate brood ponds to determine if they could provide youth and/or accessible fishing opportunities.
- Explore opportunities for creating additional motorized access areas for ice fishing during winter months (Elk Hole or the Big Swirl) by providing access from the south side of river or Timber Creek. Access from the river or shoreline would not be allowed.
- Seek partnerships or alternative funding for establishment of additional fishing access points.

Strategies for Fishing C4 (young anglers) *(Same as B and D)*

Objectives for Fishing, Alternative D

Fishing D1. Same as Fishing B1 and C1.

Fishing D2–D5. Same as Fishing B2–B5 and C2–C5.

Rationale and strategies for Fishing D1–D5
Same as B, plus:

- Explore opportunities for creating additional motorized access areas for ice fishing during winter months (Elk Hole or the Big Swirl) by providing access from the south side of river or Timber Creek. Access from the river or shoreline would not be allowed.

PUBLIC USE–WILDLIFE OBSERVATION, PHOTOGRAPHY, and INTERPRETATION

The refuge provides a number of facilities for participating in wildlife viewing, photography, and learning about and appreciating the refuge's resources. These include the auto tour route, signs, kiosks, nearly 670 miles of road, the Fort Peck Interpretive Center that the Service cooperates with USACE for operation, and contact stations at Sand Creek and Jordan field stations.

Interpretation consists of self-guided trails, interpretive panels, and brochures as well as staff-dependent exhibits, tours and special events. Interpretation plays a key role in a visitor's experience and environmental awareness and helps foster an appreciation, support, and understanding of the refuge-specific topics and the Refuge System as a whole.

Freeman Tilden (1957) stated, "Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile." Similarly, the Service's Visitor Services Handbook (FWS 2009h) suggests focusing the interpretive message on "resource issues that are of the highest importance to the Service, the Refuge System, and the refuge, and are of greatest interest to visitors." The refuge offers excellent opportunities to interpret the wildlife resource, paleontological discoveries, the Refuge System, western settlement history and the large intact landscape of the Missouri River Breaks in meaningful ways for visitors. To achieve this end, additional interpretive programs and facilities are needed to orient and educate visitors and elicit "revelation upon information" (Tilden 1957).

Self-guided interpretive opportunities allow visitors to learn independently. Interpretive tools for these self-guided opportunities will include exhibits, programs, trails, brochures, website, and signage.

Each of these wildlife-dependent recreational activities requires different programming elements. Because these are nonconsumptive activities (not hunting or fishing), and they are often closely interrelated (for example, a visitor may observe and photograph wildlife while participating in an interpretive program), the objectives have been combined for all. The strategies have been broken out by specific type of program, such as wildlife observation, self-guided activities, and guided activities.

Objectives for Wildlife Observation, Photography, and Interpretation, Alternative A

Observation, Photography, and Interpretation A1. Over 15 years, maintain existing wildlife observation and interpretive facilities and programs to support approximately 40,000 visits who participate in these activities.

Rationale for Observation, Photography, and Interpretation A1. Nonconsumptive uses such as photography, observation, and interpretation are estimated to account for over 40,000 visits to the refuge (Carver and Caudill 2007). Facilities that support these activities include the Fort Peck Visitor Center, contact stations at Sand Creek and Jordan, interpretive displays, auto routes, overlooks and observation platforms, and informational kiosks.

Visitors drawn to the refuge for nonconsumptive activities have found birding and wildlife observation to be the most important activities, which are facilitated with the auto tour route, and walking interpretive trails. During the fall when the elk are in rut, the Slippery Ann Elk Viewing Area enables visitors to see hundreds of elk, and during peak times, on average as many as 175 vehicles have been counted entering the viewing area. In September 2008, traffic counters on the auto tour route counted approximately 390 vehicles or a vehicle every 2.3 minutes from 6:00 a.m. to 8 p.m. (refer to Chapter 4–Affected Environment). Visitors also tend to observe and photograph wildlife collaterally at the same time they participate in other wildlife-dependent activities (hunting and fishing). The auto tour route gives visitors excellent opportunities to view birds and other wildlife.

Under alternative A, the refuge would maintain the same level of services for these activities.

Strategy for Observation, Photography, and Interpretation A1

- Maintain or upgrade existing facilities, signs, website, brochures, exhibits, and other programs.

Objectives for Wildlife Observation, Photography, and Interpretation, Alternative B

Observation, Photography, and Interpretation B1. By year 5, develop and complete a visitor service plan for the refuge. The plan would identify specific programming elements in addition to identifying interpretive themes, messages, and audiences for wildlife observation, photography, and interpretation to support objectives B4 and B5 (refer to table 3 in section 3.13 below about step-down plans).

(Same as Observation, Photography, and Interpretation C1 and D1.)

Observation, Photography, and Interpretation B2. Within 5 years and as part of objective B1 above, conduct a visitor experience survey to obtain an accurate estimate of visitors and their desired needs and experiences for wildlife observation.

Observation, Photography, and Interpretation B3. By year 5, hire an outdoor recreation planner for the refuge (refer to objectives for refuge operations).

Observation, Photography, and Interpretation B4. Over 15 years, increase participation in wildlife observation, photography, and interpretive activities use by 5–10 percent annually (approximately 2,000–4,000 visits).

Observation, Photography, and Interpretation B5. Over 15 years, improve the quality of and/or increase the number of observation, photography, and self-guided and staff-dependent interpretive programs or facilities by approximately 5–10 percent (from alternative A). This would be based on the visitor services plan and could include observation blinds or facilities, trails, sign, science center at the Sand Creek Field Station, or other programs.

Rationale for Observation, Photography, and Interpretation B1–B5. The refuge provides a beautiful and remote setting for wildlife observation and photography. While the extensive road system provides access to areas that are rich with wildlife and are picturesque, many observation areas are not promoted nor signed. With the exception of the elk-viewing areas, visitors may have difficulty locating overlooks and other areas that lend themselves to photography and observation. The large number of vehicles using the elk-viewing area in the fall raises concerns about overcrowding.

Successful implementation of the habitat management improvements identified under uplands, river bottoms, riparian areas, and shorelines would provide for a greater diversity of wildlife available for observation, photography, and other interpretive programs. Initially most of the refuge's resources will be spent at improving habitat conditions on the refuge, and as a result it would likely take 15 years to fully develop and implement a program that would result in modest increases in visitation.

Simultaneously, the refuge would seek to close 106 miles of existing road and increase proposed wilderness units (refer to Access and Wilderness for specifics). The visitor services plan would identify where modest improvements could be made (for example, building a lek blind) to attract visitors seeking wildlife observation or birding opportunities. A critical component in accomplishing the objectives and strategies is having an outdoor recreation planner on staff as currently, there is not a person dedicated to the overall recreation, interpretive, and education program. Additionally, a visitor survey would enable the refuge to have a better estimate of the number of visitors coming to the refuge to participate in nonconsumptive activities and identify the issues and needs for future facilities such as parking areas and observation areas.

Constructing additional facilities for wildlife watching such as blinds, trails, or designating another road on the refuge would draw in visitors who are seeking that opportunity. It will be important that new and expanded wildlife observation and photography facilities complement the natural settings within the refuge.

Strategies for Observation, Photography, and Interpretation B1–B5 (wildlife observation and photography)

- Maintain existing wildlife-viewing area.
- Recruit volunteers for the Christmas bird count and other birding-related events.
- Identify observation areas to the public through signage and maps.
- Develop website-based observation materials such as bird lists and information, maps, and web cams.
- At Fort Peck Interpretive Center, provide a computer kiosk where visitors can access birding information (for example, songs, using Thayer birding software).
- Incorporate the refuge as a stop on the Montana birding trail and regional birding drives. Provide support materials at the refuge, headquarters, and online to guide visitors through the State and direct them to key birding spots.
- Construct one to three additional facilities (blinds, trails, or tour routes) to support wildlife observation (accessibility standards would be followed). (Refer to objectives and strategies for Refuge Operations.)

Strategies for Observation, Photography, and Interpretation B1–B5 (interpretation)

- Maintain the Fort Peck Interpretive Center exhibits.
- Identify gaps in interpretation materials or programs and additional themes to expand on through improved programming
- Develop additional interpretive exhibits and materials.
- Update the existing refuge wildlife and bird lists.
- Continue to print and distribute the refuge's general brochure.
- Update the refuge history brochure.
- Improve visitor contact areas at the Sand Creek, Fort Peck, and Jordan field stations by providing more interesting and informative information.
- Routinely update the website and incorporate changing interpretive content into the design.
- Increase elk-viewing bus tours to include other communities.
- Work with Phillips County to use their buses for interpretive activities and bus tours.
- Incorporate a stewardship message into interpretive facilities and programs to instill in visitors greater support for the refuge and its resources.
- Continue to place interpretive signs at public access and overlook points (for example, Crooked Creek) in cooperation with various agencies and units of government.
- Inventory, maintain, and replace signs, as needed.
- Maintain the auto-tour route.
- Inventory all facilities, and determine audiences for outreach efforts and update inventory annually.
- Design two, short, accessible, hiking trails with interpretive signage and brochures for visitors of all needs at Fort Peck and Sand Creek field stations.
- Continue to cosponsor special events related to wildlife and habitat conservation.
- Actively publicize and participate in one national event such as National Wildlife Refuge Week and Migratory Bird Day.

Objectives for Wildlife Observation, Photography, and Interpretation, Alternative C

Observation, Photography, and Interpretation C1. Same as Observation, Photography, and Interpretation B1 and D1.

Observation, Photography, and Interpretation C2. Same as Observation, Photography, and Interpretation B2 and D2.

Observation, Photography, and Interpretation C3. By year 5, hire two outdoor recreation planners for the refuge (refer to objectives for refuge operations).

Observation, Photography, and Interpretation C4. Over 15 years, increase participation in wildlife observation, photography, and interpretive activities use by about 20–50 percent on the refuge (approximately 8,000–20,000 more visitors annually).

Observation, Photography, and Interpretation C5. Over 15 years, improve the quality of and/or increase the number of observation, photography, and self-guided and staff-dependent interpretive programs or facilities by approximately 5–15 percent (from alternative A). This would be based on the visitor services plan and could include observation blinds or facilities, trails, sign, an interpretive center at Sand Creek Field Station, or other programs and facilities.

Rationale for Observation, Photography, and Interpretation C1–C5. MFWP states that nature-related tourism and recreation are growing trends nationally, regionally, and within the State of Montana (MFWP 2009d). Wildlife viewing is in the top two reasons for travel to the State in all "travel countries" within the State. Although Yellowstone and Glacier National Parks and other areas along the Rocky Mountain Front account for the greatest expenditures for travel and tourism, the demand for wildlife viewing is expected to increase nationally and in the Rocky Mountain west, and demand will almost be double that of supply (MFWP 2009d).

With these trends, the Service believes under alternative C it would be realistic to significantly increase participation in nonconsumptive activities over 15 years. For example, bird watching is growing faster than any other form of outdoor recreation, and providing facilities like viewing blinds that enhance viewing experiences represent an investment in that economy as well as in creating a conservation constituency (Colorado Division of Wildlife 2007). To increase the numbers by about 20–50 percent, (up to 20,000 more visits), the refuge would need to invest in additional viewing facilities and programs (for example, blinds or improving access). An interpretive center at Sand Creek Field Station, developed in partnership with others, could draw more visitors to the refuge. The Service would also need to increase the awareness of the refuge as a place to visit. Additionally, the Service would improve access into several areas (for example, potentially gravel Knox Ridge Road and establish a trail on the eastern edge of the refuge (Sand Arroyo). Reducing the acreage of proposed wilderness units could also create additional access opportunities.

Similar to alternative B, within 5 years a visitor experience survey would be initiated and a visitor

services plan would be written to take a more comprehensive look at the overall program and facilities needs. Two outdoor recreation planners would be hired (Lewistown and Fort Peck field stations), and these positions would be critical to achieving these objectives.

Strategies for Observation, Photography, and Interpretation C1–C5 (wildlife observation and photography)

Same as B, plus:

- Host bird identification events in conjunction with International Migratory Bird Day in May and other special events.
- Explore new areas to promote for their wildlife observation and photography opportunities.
- Where feasible, develop a simple map within each visitor center where visitors can record what they saw and where (for example, a laminated refuge map that people can write on with a dry-erase marker).
- Construct two to five accessible facilities (blinds, trails, or tour routes) including a lek blind (refer to objectives and strategies for Refuge Operations).
- Design and map bird-watching trails for public use. Work with partners in establishing and 8-mile Sand Arroyo trail along the eastern boundary of the refuge in cooperation with BLM and others (4 miles would be on Service land—see figure 9).

Strategies for Observation, Photography, and Interpretation C1–C5 (interpretation)

Same as B, plus:

- Develop a tour map with geological and biological information for each segment.
- Develop a portable tabletop exhibit.
- Enhance/update/improve Fort Peck Interpretive Center exhibits.
- Explore closed captioning visual/audio in providing accessible exhibits.
- Develop materials such as exhibits and pamphlets, as well as educational programs that explain the region's conservation priorities and the refuge's resources.
- Improve visitor contact areas at the Sand Creek, Fort Peck, and Jordan field stations, make brochures always available.
- Update the website and incorporate changing interpretive content into the design.
- Initiate grouse-viewing programs and provide blinds for public use.
- Expand elk-viewing opportunities in other locations.
- Develop, sign, and map an additional interpreted auto tour route.
- Complete exhibits and natural plant landscaping at refuge headquarters in Lewistown and at each of the three field stations. Ways to do this include:
  - Establish office native plant gardens with interpretive information.
  - Add interpretive information to all office artifacts and mounts.
  - Coordinate with Fort Peck Interpretive Center on natural landscaping and interpretive programs at the center.
- Actively publicize and participate in three events such as National Wildlife Refuge Week or Migratory Bird Day.

Objectives for Wildlife Observation, Photography, and Interpretation, Alternative D

Observation, Photography, and Interpretation D1. Same as Observation, Photography, and Interpretation B1 and C1.

Observation, Photography, and Interpretation D2. Same as Observation, Photography, and Interpretation B2 and C2.

Observation, Photography, and Interpretation D3. Same as Observation, Photography, and Interpretation C3.

Observation, Photography, and Interpretation D4. Over 15 years, increase participation in wildlife observation, photography, and interpretive activities use by about 15–25 percent on the refuge (approximately 6,000–10,000 more visits annually).

Observation, Photography, and Interpretation D5. Over 15 years, improve the quality of and/or increase the number of observation, photography, and self-guided and staff-dependent interpretive programs or facilities by approximately 10 percent (from alternative A). This would be based on the visitor services plan and could include observation blinds or facilities, trails, signs, science and interpretive center at Sand Creek Field Station, or other programs and facilities.

Rationale for Observation, Photography, and Interpretation D1–D5. Similar to B, habitat improvements to uplands, river bottoms, riparian areas, and shorelines could increase opportunities for viewing and photographing wildlife. The Service would seek to increase by a moderate amount the number of visitors participating in these activities, subsequently adding programs or facilities (for example, observation blinds and/or science and interpretive center at Sand Creek Field Station) as needed, but would provide for quality-based experiences. Although quality is difficult to define precisely, and it means something different for every visitor, developing an experienced-based approach that provides for the diverse interests of visitors, while operating within

the capabilities of the resources (Manfredo 2002), would achieve this goal. Experience-based management proposes that recreation opportunities be described in terms of the experience, setting, and the activity. Some visitors have a great experience if they observe a lot of wildlife, regardless of how many other people are around. For others, a quality experience could mean seeing less wildlife but being around fewer people (Manfredo 2002).

Increasing visitation by 15 percent would require a moderate investment in facilities and programs. As with alternative C, a critical component for implementation is the development of the visitor services plan, completing a visitor experience survey, and the addition of two outdoor recreation planners to carry out and oversee the program.

Strategies for Observation, Photography, and Interpretation D1–D5

Same as B, plus:

- Explore new areas to promote for their wildlife observation and photography opportunities, such as expansion of elk-viewing opportunities.
- Where possible, establish universally accessible observation blinds.
- Initiate grouse-viewing programs and provide accessible blinds that allow visitors to view grouse on leks after peak hen attendance has occurred. Peak attendance of male grouse occurs towards the end of the breeding season and this allows visitors to have quality viewing experiences while minimizing disturbances to actual breeding activity.
- Develop a bird guide map to target birder audiences and provide more sophisticated quality interpretive opportunities.
- Develop at least one additional (three total), accessible nonmotorized trails system for families and people with disabilities.
- Develop 2–5 miles of primitive hiking trails including one on east side at Sand Arroyo (see figure 10).
- Consider the State section north of Slippery Ann for facilities.

PUBLIC USE–ENVIRONMENTAL EDUCATION

The purpose of environmental education is to advance public awareness, understanding, appreciation, and knowledge of key fish, wildlife, plant, and resource issues through formal, curriculum-based programs tied to national and State education standards. Environmental education may be geared toward children or adults, and it is key for changing attitudes and

USFWS

Refuge staff member conducting an interpretive field trip on the refuge.

behavior, which affect the refuge through off-refuge land use decisions and on-refuge conduct and use. Only through understanding and appreciation will people be moved to personal and collective action to ensure a healthy refuge for the future.

Objectives for Environmental Education, Alternative A

Education A1. Over 15 years, maintain limited educational programs.

Rationale for Environmental Education A1. Most of the schools in the six counties surrounding the refuge are located far from the refuge making field trips difficult due to time constraints and budgets. The refuge staff provides classroom presentations when requested but there is not an outdoor recreation planner on staff or refuge-specific curricula. Fort Peck and Jordan field station staffs have participated with other agencies in annual environmental camps. There is an education trunk available for loan to the school through the Fort Peck Interpretive Center.

Strategy for Environmental Education A1

- Continue to offer the educational bus tour, school visits and staffing the fair booth.

Objectives for Environmental Education, Alternative B

Education B1. Within 5–7 years, expand the quantity of the environmental education programs (on and off refuge) offered by the refuge by about 5 percent (program elements will be identified in the overall visitor services plan for all public uses—refer to table 3 in section 3.13 below about step-down plans).

Rationale for Environmental Education B1. The Service is committed to connecting people with nature through initiatives such as "Children in Nature" (FWS 2009b). Books like Last Child in the Woods (Louv 2005) have highlighted the importance of connecting children with nature. Louv contends that the lack of nature in the lives of today's wired generation (Louv refers to it as nature-deficit) contributes to disturbing childhood trends, such as rises in obesity, attention disorders, and depression.

Similar to the objectives for wildlife observation above, the first action under alternative B is to develop the visitor services plan that identify the elements of an environmental education program at the refuge and hire an outdoor recreation planner. Given that very limited environmental education programming exists, with additional staff, there would be a moderate increase in the quantity of environmental education programs. The programs will focus on wildlife biology and habitat requirements and will modify existing curricula to highlight refuge issues. Since environmental education is curriculum-based and labor intensive, initial efforts will be limited to Fort Peck and Lewistown field stations when an outdoor recreation planner is hired.

Strategies for Environmental Education B1

- Develop environmental education program as part of the visitor service's step-down plan.
- Identify gaps in environmental education materials/programs and additional themes to expand on through improved programming and/or conducting a visitor experience survey.
- Promote teacher taught and refuge taught programming that incorporates the "Children in Nature" initiative in both structured and unstructured ways. Encourage family visits and family awareness of the refuge and the refuge system. Promote programs to get all ages of children outdoors (for example, "Lets go Outside" initiative).
- Respond to request for technical assistance for curriculum-based environmental education (for example, Range Days, Bio-Blitz, Envirothon, Field Days).
- Use refuge website to promote environmental education. Include downloadable podcast.
- Offer two teacher workshops on a yearly basis to all interested school districts in central and eastern Montana promoting refuge-based (local community) and regional-based information.
- Within 5–7 years, provide refuge-taught environmental education programming at no less than two school visits per year.
- Over 15 years, work with partners to modify existing environmental education curricula tailored to the refuge (for example, BLM, USACE, State, Project Wild, Project Wet, Nature Learning, and Project Learning Tree.) Potential topics include prairie streams, prairie plants and wildlife, and invasive plants.
- Align teacher and refuge taught school programs with State and local educational standards.

Objectives for Environmental Education, Alternative C

Education C1. Within 5–10 years, expand the quantity of the environmental education programs (on and off refuge) offered by the refuge by about 25 percent (program elements will be identified in the overall visitor services plan for all public uses—refer to table 3 in section 3.13 below about step-down plans).

Rationale for Environmental Education C1. Similar to B, except because public use is emphasized under this alternative, the refuge environmental education program would be substantially expanded and would focus on threatened and endangered species, reintroduced species, and restoration activities. Existing curricula would be modified to highlight these issues

and several new curricula will be developed in compliance with State standards.

Because it would be more labor intensive, additional staff would be needed (two identified—refer to objectives for wildlife observation, photography, and interpretation).

Strategies for Environmental Education C1

Same as B, except:

- Offer five teacher workshops annually to school districts in central and eastern Montana promoting refuge-based (local community) and regional-based information.
- Within 5–7 years, provide refuge-taught environmental education programming at no less than five school visits per year.
- Over 15 years, work with partners to create up to three environmental education curricula, unique to the refuge and modify existing environmental education curricula tailored to the refuge. Potential topics include prairie streams, use of fire, prairie plants and wildlife, invasive plants, paleontological resources, and threatened and endangered species.
- Request that researchers working at the refuge share information they collected through presentations at schools.
- Hire two outdoor recreation planners (as part of public use program). (Same as D.)
- Seek out partnerships with the Office of Public Instruction to encourage expansion of environmental education programs among local schools.
- Build on existing relationships with schools for both on-site and off-site programming.
- Refuge staff or volunteers will present at Job/Education days a local high schools.

Objectives for Environmental Education, Alternative D

Education D1. Within 5–10 years, expand the quantity of the environmental education programs (on and off refuge) offered by the refuge by about 10 percent (program elements will be identified in the overall visitor services plan for all public uses—refer to table 3 in section 3.13 below about step-down plans).

Rationale for Environmental Education D1. Similar to B, except there would be a moderate increase in the environmental education program, with an emphasis on quality. The programs would primarily focus on the Service's conservation goals as well as biological diversity, biological integrity and the ecological processes that shape the refuge, but other topics including ranching history would be included. Existing curricula will be modified to highlight these issues and at least one new curriculum will be developed in compliance with State standards.

Strategies for Environmental Education D1

Same as B, plus:

- Offer two to four teacher workshops on a yearly basis to all interested school districts in central and eastern Montana promoting refuge-based (local community) and regional-based information.
- Over 15 years, work with partners to create up to two environmental education curricula, unique to the refuge. Potential topics include prairie streams, use of fire, prairie plants and wildlife, invasive plants, and ecology of the Missouri River Breaks with emphasis on sentinel plants.
- Hire two outdoor recreation planners (as part of public use program). (Same as C.)

PUBLIC USE–OUTREACH

Outreach efforts help educate people about the refuge and its needs. It involves communication between the refuge and interested groups and the public such as local communities and city, county, State, and Federal officials. Outreach may include formal meetings or informal discussions with visitors or landowners, as well as news releases, organized programs, tours, and presentations. It is an "on-going, concerted effort that establishes mutual understanding, promotes involvement, and influences attitudes and actions, with the goal of improving joint stewardship of our natural resources" (FWS 2009h).

Objectives for Outreach, Alternative A

Outreach A1. Over 15 years, current outreach activities at current levels.

(Same as Outreach B1.)

Rationale for Outreach A1. Currently outreach activities include public presentations, news releases, weed tours, county commissioner meetings, and meetings with nongovernmental organizations to talk about refuge programs and activities.

Strategies for Outreach A1

- Occasionally participate in State and local events such as State, county, and school career fairs.
- Make presentations as requested.
- Recruit volunteers to support staff.
- Seek grants in partnership with others to fund special events or programs.
- Use the Internet to keep public informed about refuge's programs and activities.

Objectives for Outreach, Alternative B

Outreach B1. Same as Outreach A1.

Outreach B2. By year 10, build greater awareness and appreciation for the Service and refuge's resources. As a result there would be a 5-percent increase in requests for information, visitation, and website hits.

Outreach B3. By year 5, engage outside audiences (such as interested groups, the public, or visitors) in at least two meetings, presentations and/or open houses per year.

Rationale for Outreach B1–B3. The refuge would increase its outreach efforts whether through active participation in local events and meetings or by developing a friends group (a nongovernmental organization that specifically works on behalf of furthering the refuge or Refuge System's goals). The outreach message would be focused on the refuge's goal of increasing wildlife resources. Increased efforts toward outreach should result in modest increases in results for information about the refuge from current levels.

For example, improving the quality and content of the refuge's website would be one way for the refuge to reach out to a larger audience. Recent data suggests that "hits" (visits to the website http://fws.gov/cmr) are seasonal and likely due to a visitor's particular interest, for example, hunting or development of the refuge's CCP. Prior to hunting season, hits to the website increase from all over the United States as well as residents in Montana.

Strategies for Outreach B1–B3

Same as A, plus:

- Actively participate in one State and local events such as State, county, and school career fairs.
- Investigate developing a friends group for the refuge within 2 years of the CCP approval.
- Improve the refuge's website by adding at least two of the following activities:
  - Add photographs of the refuge.
  - Add video of elk rut, prairie dog towns, and sage-grouse and sharp-tailed grouse leks.
  - Expand web cams on the refuge.
  - Incorporate blogs on the refuge–specific information on a prairie dog town or the elk-viewing area. Include downloadable podcast.
  - Include travel conditions for roads on the website.
  - Add downloadable version of all refuge brochures to the website.
- Conduct two information-sharing events (such as interviews, public service announcements, an writing articles) with the media (newspaper, television, and radio), chambers of commerce, congressional contacts, and tourism outlets per year.
- Develop an outreach plan as part of the visitor services plan (refer to table 3 in section 3.13 below about step-down plans).
- Work with the Montana tourism department to promote the refuges and their resources.

Objectives for Outreach, Alternative C

Outreach C1. By year 10, build greater awareness and appreciation for the Service and refuge's resources. As a result there would be a 15-percent increase in requests for information, visitation and website hits.

Outreach C2. By year 5, engage outside audiences such as interested groups, the public, and potential visitors in at least five meetings, presentations and/or open houses per year.

Rationale for Outreach C1–C2. Similar to B, except there would be a greater emphasis on outreach for both communicating wildlife and habitat goals as well as for increasing visitation to the refuge.

Strategies for Outreach C1–C2

Same as B, plus:

- Develop a friends group immediately on completion of CCP and a second volunteer group focused on advocating on behalf of the refuge.
- Use the Internet to complete four to six of the following activities:
  - Add photos of refuge.
  - Expand web cams on the refuge. For example, add video of elk rut, prairie dog towns, and sage-grouse and sharp-tailed grouse leks.
  - Incorporate blogs on the refuge–specific information on a prairie dog town or the elk-viewing area.
  - Include travel conditions for roads on the website.
  - Add downloadable version of all refuge brochures to the website.
- Annually conduct five information-sharing events, such as interviews and writing articles, with the media (newspaper, TV, and radio), chambers of commerce, congressional contacts, and tourism outlets.

Objectives for Outreach, Alternative D

Outreach D1. By year 2, build greater awareness and appreciation for the Service and refuge's resources. As a result there would be a 5–10 percent increase in requests for information, visitation and website hits.

Outreach D2. By year 5, engage outside audiences such as interested groups, the public, and potential visitors in at least three meetings, presentations and/or open houses per year.

Rationale for Outreach D1–D2. Similar to C, except outreach would focus on the refuge's goal of restoring ecological processes. There would be less emphasis on maximizing the number of visits and more emphasis on the quality of the public use programs.

Strategies for Outreach D1–D2

Same as B, plus:

- Conduct three information-sharing events (such as interviews, public service announcements, an writing articles) with the media (newspaper, television, and radio), chambers of commerce, congressional contacts, and tourism outlets per year.

PUBLIC USE–ACCESS

There are nearly 670 miles of road found on the refuge. Hard-surfaced, all-weather roads are limited to U.S. Highway 191 on the western end of the refuge and several highways around Fort Peck. A number of graveled roads provide direct access to the refuge. All other roads are passable only in dry weather. All-terrain vehicles (ATVs) and motorcycles must be street-legal. Properly licensed snowmobiles are allowed only on the frozen surface of Fort Peck Reservoir. Bicycles may be used only on numbered roads, including seasonally closed roads.

Boating is permitted on the refuge although special regulations apply on the western edge, which is part of the National Wild and Scenic River System. Aircraft may not land on the uplands of the refuge. Landing of fixed-wing aircraft is permitted at specific locations on Fort Peck Reservoir (refer to Chapter 4–Affected Environment).

Objectives for Access, Alternative A

Access A1. Over 15 years, keep about 670 miles of roads and trails open (see figure 7). Maintain to existing standards.

Access A2. Within 3–5 years, work with partners to develop comprehensive travel management plan.

(Same as Access B2, C2, and D2.)

Access A3. Over 15 years, allow for public access as currently designated by refuge regulations.

Rationale for Access A1–A3. To limit erosion and protect plants and wildlife, mechanized vehicles are permitted only on numbered refuge roads that are designated as open. Some seasonal road closures could occur, but generally access would remain as it currently exists.

Under all alternatives including alternative A, the Service would develop a comprehensive travel plan, which would also dove-tail with the visitor services plan for alternatives B, C, and D.

Strategies for Access A1–A3

- Institute seasonal closures on a limited basis. Continue to permit horseback riding; all-terrain vehicle use on public roads; biking on numbered roads (including seasonally closed roads).
- Permit public planes to land only on water or ice as determined by USACE's plan.
- Roads within proposed wilderness units would remain closed.

Objectives for Access, Alternative B

Access B1. Within 3–5 years, analyze all forms of access to determine what effect access has on wildlife populations, habitat conditions and cultural resources.

Access B2. Same as Access A2, C2, and D2.

Access B3. Over 15 years, work with counties to reconfigure the refuge road system, closing about 106 miles of roads or sections of roads that no longer provide a public benefit or do not facilitate the achievement of habitat objectives.

Access B4. By year 5, identify safety hazards and partners to routinely maintain the refuge road system.

(Same as Access C4 and D4.)

Rationale for Access B1–B4. With more than 670 miles of road crisscrossing the refuge, there are few places that cannot be accessed within a mile of a road (refer to Chapter 4–Affected Environment). The majority of the roads are primitive and not heavily traveled except during hunting season; nonetheless, the number and extent of the road system is cause for concern from a wildlife management, law enforcement, and road maintenance perspective.

Some refuge roads have become severely rutted and braided, particularly during wet seasons, and there is little funding to maintain or patrol all the roads. Roads and invasive plants go hand in hand on most public lands in the United States (USFS 2003), as roads are a known vector for carrying weed seeds. The full extent of the problem is unknown at the refuge because invasive species mapping has not been done for all upland areas, but invasive weeds are of considerable concern in many areas (for example, north fork of Rock Creek and Big Dry Arm (see figure 20 in chapter 4). The Service has worked with refuge users, particularly during hunting season, to reduce the transport of invasive species by vehicles by running the weed wash station.

Roads also can result in wildlife disturbance and habitat fragmentation. Habitat fragmentation has been shown to exacerbate the problem of habitat loss for grassland birds. While understanding the effects of habitat fragmentation is complex and not easy to assess, it is critically important to do so in making decisions about grassland management (Johnson 2001).

With the emphasis on increasing wildlife populations under alternative B, the Service would look to close about 106 miles of road (see figure 8). This would increase the size of undisturbed habitat blocks on the refuge and could benefit wildlife as a whole. It also could reduce the spread of invasive plants carried in by vehicles. Closures would not occur before

fully analyzing harvest strategies in cooperation with MFWP or other public access concerns. Access to private land would not be affected by any road closures. The following roads (by road number) would be closed based on the criteria listed (some roads meet multiple criteria and will appear more than once below):

- For protection of wilderness values: 306, 311, 315, 318, 327 (east end), 410, 411, 412, 420, 452, and 838
- To increase blocks of undisturbed habitat or reduce wildlife impacts: 219, 308, 309, 311, 315, 320, 327, 329, 332, 333, 335, 353, 359, 366 (east end), 366 (includes 621 and 622), 374, 401, 405, 410, 411, 412, 416, 417, 428, 440, 441, 442, 476, 479, 542, 543, 548, 602, 825, 838, and 864
- For protection of riparian areas: 308, 405, and 420
- To address safety or maintenance issues: 219, 302, and 513
- Where there is no defined legal public access: 215, 353, 355, 359, 365, 476, 479, 488, 489, 547, 548, 609, 616, 617, and 618
- Where the area is easily accessible from off the refuge or from another road: 309, 320, 355, 416, 420, 440, 441, 513, 548, 616, and 618

Strategies for Access B1–B4

- Direct funds and staff to evaluate all forms of access (including motor boat) and its affects on various wildlife populations.
- Use this information to make final recommendations for closing access (roads) seasonally or permanently or restricting boat motors to reduce disturbance to wildlife.
- Within 2–5 years, assess the use of mountain bikes within all numbered routes, seasonally closed roads, and closed roads.
- Study effects of recreation in proposed wilderness and wilderness on the refuge along with closed, seasonally closed and numbered roads to evaluate current restrictions and its wildlife and habitat effects.
- Work with private landowners, counties, USACE, BLM, and MFWP to identify roads that provide legal public access on/off the refuge. Acquire legal access where needed and feasible.
- Eliminate all roads that provide exclusive access to the refuge because of inaccessible private lands within or outside the refuge.
- By the year 2014, produce a GIS road layer and public use "Guide Map" that shows legal public access to/on the refuge, designates all weather roads and dirt "two tracks" and roads that end at waters edge, and shows fences and gates to accommodate horse users.
- Consider opening or closing numbered routes seasonally or permanently.
- Consider restricting all access during some times of the year and allowing it at other times such as seasonal closures.
- Work with partners to improve the elk-viewing area and reduce congestion by enlarging the area.
- Evaluate the demand for multimodal accessibility.
- Determine the extent of road use and the types of use.
- Reduce road stems.
- Maintain directional signage and improve way-finding system as needed.
- Develop road management systems to compete for national funds.
- Perform "hot spot" road safety audits (for example, problem areas include Knox Ridge and Sandy Creek Road).
- Perform an audit of 100–200 roads by year 3.

Objectives for Access, Alternative C

Access C1. Within 3 years, evaluate all access points and possible new access points and determine methods for increasing access to the refuge.

Access C2. Same as Access A2, B2, and D2.

Access C3. Over 15 years, work with partners to improve the road system to improve access (see figure 9).

Access C4. Same as Access B4 and D4.

Rationale for Access C1–C4. A number of options would be explored to improve public access. There would be few additional road closures (see figure 9), although seasonal closures could still be needed for wildlife protection. Generally, the Service would work with the counties and other partners to improve the road system (for example, additional road maintenance on some roads, or by graveling). Some existing roads would be evaluated to determine if road improvements could be made without significantly affecting wildlife (such as Knox Ridge and Turkey Joe roads). Many users have expressed the desire for increased access during the winter months to popular ice fishing areas like Swirl, Elk Creek, and Timber Ridge, and these areas would be evaluated for safety and other factors. The Service would also look at whether the elk-viewing area could be expanded or use spread out to other areas to reduce congestion and improve the visitor experience during the fall viewing season.

Strategies for Access C1–C4

Same as B, plus:

- Improving access will include diverting refuge funds and staff to purchase rights of ways for

graveling all-weather roads, creating additional parking for disabled persons, developing trailheads, vehicle-parking areas, camping sites, and providing equestrian facilities.

- When it is determined that a form of access has no negative affect on wildlife populations, access could be increased or improved.
- Within 5 years, evaluate all roads that end at waters edge to determine if it is feasible to construct boat ramps for water access.
- Increase access to lake/river for fishing and other uses by identifying roads that lead to the waters edge.
- Increase opportunities to access wilderness by creating parking lots adjacent to proposed wilderness units.
- Work with counties and others to upgrade additional all weather roads to and on the refuge (for example, Knox Ridge and Turkey Joe).
- Evaluate the opportunity for motorized vehicles on lake/river during winter season (for example, ATVs and snowmobiles) and consider providing seasonal access to desirable winter fishing holes including Swirl, Elk Hole, and Timber Creek.
- Institute seasonal use of the roads where appropriate.
- Improve roads adjacent to proposed wilderness units to enhance wilderness recreation and value (for example, Soda Creek, Beauchamp, and Harpers Ridge).
- Work with partners to improve the elk-viewing area and create additional pull-offs and/or viewing areas along the road system to facilitate wildlife observation.
- Evaluate the demand for multimodal accessibility.
- Within 10 years, designate and post closed roads within the refuge and wilderness study areas as hiking trails open to the public. Delineate on the current refuge map the location of these closed roads for guidance and accessibility.
- Determine the extent of road use and the types of use.
- Maintain directional signage and improve wayfinding system as needed.

Objectives for Access, Alternative D

Access D1. Within 3 years, evaluate access points and determine improvements that can be made to enhance ecological processes on the refuge.

Access D2. Same as Access A2, B2, and C2.

Access D3. Over 15 years, work with counties to reconfigure the refuge road system, initially closing about 23 miles of roads or sections of roads as needed to encourage free movement of animals, permit prescribed fire activities, harvest wild ungulates, provide for quality wildlife-dependent recreation, or allow other activities that contribute to overall improved ecological health. (See figure 10 in section 3.7 above.)

Access D4. Same as Access B4 and C4.

Rationale for Access D1–D4. Alternative D strikes a balance between providing for the improved access that some refuge users desire, managing big game populations to improve habitat, and meeting MFWP harvest objectives while ensuring that the access plan enables the Service to restore ecological processes. To achieve the overall habitat and public use objectives, other road closures could be needed, but this would be assessed in consideration of harvest strategies and other public uses and would be identified during development of the transportation plan. There would be moderate increases in providing for nonconsumptive uses, and improved access and facilities could be important in facilitating these activities. The Service would consider allowing motorized access on some closed roads (outside of wilderness areas) for game retrieval only. If conditions warrant, other improvements or closures would be considered.

The following roads (by road number) would be closed based on the criteria listed (some roads meet multiple criteria and will appear more than once below):

- For protection of wilderness values: 306, 311, and 315
- To increase blocks of undisturbed habitat or reduce wildlife impacts: 320
- To address safety or maintenance issues: 374 (portion of) and 825
- Where there is no defined legal public access: 353, 355, 365, 476, 479, 488, 489, 609, 616, 617, and 618
- Where the area is easily accessible from off the refuge or from another road: 320, 616, and 618

Strategies for Access D1–D4

Same as B, plus:

- Consider funding and personnel requirements for opening and closing roads (including seasonally closed roads), or additional access points, or changes in access.
- Increase access to roads to meet habitat objectives, such as for game retrieval.
- Consider ways to improve opportunities for visitors to participate in nonconsumptive uses, such as by providing viewing areas.
- Consider improving Knox Ridge Road for all-weather access (gravel).

- Work with other agencies/partners to restrict access or expand roadless areas if needed to facilitate ecological processes.
- Institute seasonal closures at beaches to protect nesting endangered species.
- Decrease access to roads to minimize invasive species (for example, north fork of Rock Creek and Big Dry Arm).
- Replace structures that are barriers to aquatic organisms (for example, fish-friendly culverts).
- Restrict access to proposed wilderness units to meet biological objectives.

PUBLIC USE–RECREATION SITES

There are two primary types of recreation areas found on the refuge: (1) developed areas that have amenities such as campsites, running water, and boat ramps and are managed by USACE or outgranted to MFWP or BLM; and (2) primitive areas that only have vault toilets and are managed by the Service. Additionally, there are a few additional primitive areas with no facilities that were outgranted to the Service in the Enhancement Act (refer to chapter 1, section 1.9). The following objectives address areas that the Service manages.

Objectives for Recreation Sites, Alternative A

Recreation Sites A1. Over 15 years, work cooperatively with USACE to further define and/or improve existing Service recreation areas.

Rationale for Recreation Sites A1. The 1992 Fort Peck Lake Master Plan identified 18 recreation areas around the lake. These are mostly managed by the USACE with a few outgranted to MFWP, BLM, Petroleum County and the Service. Seven of these 18 (Downstream campground, Fort Peck West, The Pines, James Kipp, Crooked Creek, Hell Creek, and Rock Creek on the Big Dry Arm) have been classified as intensive use. Intensive use means these areas may have concession operations, resort, and quasi-public development (camping loops, picnic tables and shelters, play areas and landscaping). Other intensive use areas are less developed. The remaining areas are defined as low intensity. Development in low intensity areas is limited to facilities that promote or allow public use but do not greatly alter the natural character of the area. Facilities permitted include trails, parking areas, boat ramps, vault toilets, picnic tables, and fire rings.

Camping areas that the Service manages are Slippery Ann, Rock Creek, Turkey Joe, Withrow Bottoms, Jones Island, and Rocky Point. Where opportunities arise, the Service would work with USACE to further define these areas to prevent the campsites from spreading into adjacent habitat. These are primitive areas with a vault toilet where the public camps while hunting or fishing. In addition, there are the primitive Bear Creek and Bob Cat areas that have no facilities.

Strategies for Recreation Sites A1 *(None)*

Objectives for Recreation Sites, Alternative B

Recreation Sites B1. Within 5 years, work with the USACE to further define and/or improve existing Service recreation areas.

(Similar to Recreation sites C1 and D1.)

Rationale for Recreation Sites B1. Current Service-managed recreation areas are primitive (vault toilet) compared to the USACE or other agency managed recreation areas around the refuge. More visitors are using these areas for hunting, fishing, and elk viewing. These areas provide a site for visitors to gather and enjoy the Breaks while participating in wildlife-dependent recreational activities. Without these designated areas, the natural resources would be affected largely due to visitors being dispersed across a wider area.

Strategies for Recreation Sites B1

- Harden all sites to define current recreation area boundary to prevent future expansion into habitat.
- Work with USACE to evaluate the site potential for improving camping within the designated USACE recreation areas.
- Coordinate accessible and usable camping sites that would suit the required needs of those requiring special accommodations.
- Evaluate current recreational facilities and restrictions for user friendliness and ecological effects.

Objectives for Recreation Sites, Alternative C

Recreation Sites C1. Similar to Recreation Sites B1 and D1.

Rationale for Recreation Sites C1. Same as B, except more improvements would be made to improve the experience.

Strategies for Recreation Sites C1

Same as B, plus:

- Consider the possibility of expanding into already disturbed land around the existing recreational area and improve existing recreation facilities, for example, additional restrooms and handicap-accessible landings, to improve the experience.

Objectives for Recreation Sites, Alternative D

Recreation Sites D1. Similar to Recreation Sites B1 and C1.

Rationale for Recreation Sites D1. Same as B, except there would be more improvements made under alternative D than B but fewer than under alternative C.

Strategies for Recreation Sites D1

Same as B, plus:

- Consider improving existing facilities to improve the overall refuge experience.

PUBLIC USE–COMMERCIAL RECREATION

Commercial uses are any economic use of a national wildlife refuge. Other commercial uses are cooperative farming, haying, timber harvest, commercial fishing, and grazing. Outfitting is another example of a commercial use. All commercial uses must be appropriate and compatible with the mission of the Service and the Refuge System and the purpose for the refuge was established. Commercial uses that are not appropriate and compatible are not allowed and if they are occurring, they must be eliminated or modified to be compatible.

Objectives for Commercial Recreation, Alternative A

Commercial Recreation A1. Over 15 years, limit the annual number of outfitter hunting permits to 11.

Rationale for Commercial Recreation A1. Commercial guiding and outfitting services have been and would continue on the refuge under a special use permit. These activities primarily are associated with hunting. Currently fishing outfitting, fishing tournaments, and commercial fishing are not covered by special use permit. All commercial activities on the refuge require a permit as identified by Title 50, Code of Federal Regulations (50 CFR).

Strategy for Commercial Recreation A1

- Continue to prohibit commercial outfitting for coyote hunting.

Objectives for Commercial Recreation, Alternative B

Commercial Recreation B1. Within 5 years, in collaboration with MFWP and USACE, implement a consistent process for issuing permits for persons conducting for-hire outfitter hunting and wildlife observation activities.

(Same as Commercial Recreation D1.)

Rationale for Commercial Recreation B1. Same as A, plus commercial fishing including tournaments are a popular activity on Fort Peck Lake where USACE has primary jurisdiction. The refuge has little to no oversight of commercial fishing harvest, deferring to the State's expertise and experience as well as USACE's primary jurisdiction.

The Service would look to work with MFWP and USACE to better understand the fishery resources and the levels of harvest. The refuge participated in the development of the Fort Peck Reservoir Fisheries Management Plan (MFWP 2002) that addressed fishing tournaments and commercial fishing. MFWP is in the process of rewriting the 10-year plan and the refuge would request to be a cooperating agency.

Strategies for Commercial Recreation B1

- Evaluate all commercial uses on the refuge for possible effects on wildlife populations.
- Evaluate current intensity of outfitting to determine if public use is being affected as a result.
- With the above information, make adjustments as necessary to ensure commercial uses are compatible with refuge missions and purposes.
- Evaluate the numbers of animals harvested by commercial outfitters. Require outfitters to project expected harvest levels in permit application each year.
- Determine net-client hunter use days and harvest success rates for each outfitter and outfitter-sponsored client numbers.
- Work with the State, BLM and USACE to develop capacity parameters within the refuge for various types of guiding operations. The parameters should aim to minimize competition or conflict with the public engaged in hunting, fishing, and wildlife observation, minimize conflicts between guides, and ensure a viable economic opportunity for existing guiding businesses.
- Conduct a public information effort through news releases and media contacts to implement the objective.
- Provide proactive enforcement through the refuge's and other agencies' law enforcement officers.

Objectives for Commercial Recreation, Alternative C

Commercial Recreation C1. Same as Commercial Recreation B1.

Commercial Recreation C2. Within 5 years, implement a wilderness guide and retrieval permit to promote harvest of surplus game animals in proposed wilderness units.

Rationale for Commercial Recreation C1–C2. Permits would continue to allow outfitting throughout the refuge and not designate specific areas of use. A new type of outfitting permit would be created to encourage hunters to harvest surplus game animals in the proposed wilderness units. These roadless areas provide security habitat for a variety of wildlife. These outfitting permits would promote harvest of cow elk that would help to reduce local populations. This

would also create a economic opportunity to local outfitters and provide for a quality recreational experience for hunters that choose to hunt with a guide.

Strategies for Commercial Recreation C1–C2

Same as B, plus:

- Expand commercial outfitting (for example, paleontological prospecting, trail rides, birding, youth-challenge adventures, fishing, and hunting) by issuing more annual permits.
- Extended camping will be authorized when requested to facilitate commercial use.
- Promote commercial outfitting through media outlets on an annual basis.
- Partners with others to promote ecotourism opportunities on the refuge and throughout the Missouri River Breaks.
- Create a new outfitting permit for guiding and/or game retrieval in proposed wilderness units.

Objectives for Commercial Recreation, Alternative D

Commercial Recreation D1. Same as Commercial Recreation B1.

Rationale and Strategies for Commercial Recreation D1

Same as B, except:

- Consider implementing outfitter permit for guiding and retrieval in the proposed wilderness if cow elk numbers continue to increase or are causing impacts on vegetation in the area.

There are 20,819 acres in the UL Bend Wilderness and 155,288 acres of proposed wilderness within 15 units on the Charles M. Russell National Wildlife

Larry Allain/USDA–NRCS PLANTS Database

Purple Prairieclover

OBJECTIVES for GOAL
Wilderness

Refuge. Service policy requires a review of proposed wilderness including making recommendations on whether additional acreage could be added or other changes should be made (refer to Appendix E–Wilderness Review and Summary). The alternatives consider different approaches for managing the proposed wilderness within the refuge.

Objectives for Wilderness, Alternative A

Wilderness A1. Over 15 years, continue to manage the 20,819-acre UL Bend Wilderness as a class I air shed.
(Same as Wilderness B1, C1, and D1.)

Wilderness A2. Within 2 years, finalize the wilderness study and submit recommendations to the Service Directorate and Secretary for the Department of the Interior.
(Same as Wilderness B2, C2, and D2.)

Wilderness A3. Over 15 years, continue to manage about 155,288 acres of proposed wilderness within 15 areas of Charles M. Russell National Wildlife Refuge in accordance with Service policy.

Wilderness A4. Continue the practice of allowing the use of game carts in proposed wilderness units.
(Same as Wilderness B4, C4, and D4.)

Rationale for Wilderness A1–A4. The UL Bend Wilderness (Public Law 94-557) and the proposed wilderness units are managed according to the Wilderness Act of 1964. The act requires wilderness be managed in a natural condition, with opportunities for solitude and a primitive and unconfined type of recreation. Visitors to the UL Bend Wilderness and the proposed wilderness units are primarily hunters and hikers seeking big game hunting and wildlife observation opportunities. The Service's wilderness policy (FWS 2008d) describes how the refuge manager preserves the character and qualities of designated wilderness while managing for the establishing purposes of the refuge. This policy, like the Wilderness Act, states that wilderness is maintained with outstanding opportunities for solitude and a primitive and unconfined type of recreation. The refuge manager conducts minimum requirements analyses before taking any action that may affect wilderness character. In general, the manager would not modify habitat, species population levels, or natural ecological processes in refuge wilderness unless doing so maintains or restores ecological integrity that has been degraded by human influence or is necessary to protect or recover threatened and endangered species.

Strategies for Wilderness A1–A4 *(None)*

Objectives for Wilderness, Alternative B

Wilderness B1–B2. Same as Wilderness A1–A2, C1–C2, and D1–D2.

Wilderness B3. Over 15 years, and on approval by within the Department of the Interior, expand existing proposed wilderness by about 25,037 acres by expanding the Antelope Creek, Crooked Creek, Alkali Creek, Wagon Coulee, West Hell Creek, and Sheep Creek units.

Wilderness B4. Same as Wilderness A4, C4, and D4.

Rationale for Wilderness B1–B4. Alternative B places the greatest emphasis on increasing or maximizing wildlife populations. One of seven key considerations in evaluating the tangible and intangible aspects of wilderness characteristics as described in the Wilderness Stewardship Policy (FWS 2008d) is providing "environments for native plants and animals" (refer to Appendix E–Wilderness Review and Summary). Maintaining or increasing wilderness along with closing roads could increase security for wildlife, reduce habitat fragmentation, and provide other positive benefits for wildlife. Following the wilderness review conducted for this draft CCP and EIS (appendix E), and in consideration of the wildlife emphasis under alternative B, none of the existing proposed wilderness units were recommended for reduction and in 10 units acreage would be expanded.

Strategies for Wilderness B1–B4

- Continue to allow game retrieval carts in proposed wilderness units.
- Conduct a minimum requirement analysis of all proposed wilderness.
- Inform and educate the public about wilderness on the refuge adopting some or all of interpretive themes identifying for wilderness education in the wilderness stewardship policy.

Objectives for Wilderness, Alternative C

Wilderness C1–C2. Same as Wilderness A1–A2, B1–B2, and D1–D2.

Wilderness C3. Over 15 years and on approval by the Department of the Interior, reduce the existing proposed wilderness units to 119,407 acres by eliminating the units of East Beauchamp Creek, West Beauchamp Creek, and East Hell Creek (a 35,881-acre reduction).

USFWS

Proposed wilderness units on the refuge provide secure habitat for wildlife like these bighorn sheep.

Wilderness C4. Same as Wilderness A4, B4, and D4.

Rationale for Wilderness C1–C4. Alternative C has the greatest emphasis on promoting wildlife-dependent uses and economic uses while protecting wildlife populations and habitat to the extent possible. During the public comment period for scoping and the alternatives (refer to Appendix B–Public Involvement), some refuge users expressed concern that wilderness designation limits the ability of many people, particularly an aging hunting population and other users to access areas of the refuge. Few roads would be proposed for closure under this alternative, and access would be improved in some areas.

Following the wilderness review conducted for this draft CCP and EIS (appendix E), and in consideration of the emphasis on public and economic uses, under alternative C, several of the existing proposed units would be eliminated. In these units, the wilderness qualities and characteristics, as described in the Service's wilderness policy, are not as high compared to those found in other units. Private lands within the unit, adjacent roads, degraded habitat, adjacent sights, and sounds, and private lands located within the unit are all factors in proposing to remove these units from proposed wilderness designation.

Strategies for Wilderness C1–C4 *(Same as B)*

Objectives for Wilderness, Alternative D

Wilderness D1–D2. Same as Wilderness A1–A2, B1–B2, and C1–C2.

Wilderness D3. Over 15 years, on approval by the Department of the Interior, expand wilderness protection in 6 units totaling about 18,559 acres in Antelope Creek, Crooked Creek, Alkali Creek, Wagon Coulee, West Hell Creek, and Sheep Creek units, and reduce or eliminate three units totaling 26,744 acres in East Beauchamp Creek, West Beauchamp Creek, and East Hell Creek.

Wilderness D4. Same as Wilderness A4, B4, C4.

Rationale for Wilderness D1–D4. Alternative D has an emphasis toward restoring the biological diversity, integrity, and environmental health of the refuge while providing for quality wildlife-dependent uses. Similar to alternative B, keeping the wilderness designation, in combination with closing some roads will increase security for wildlife, reduce habitat fragmentation, invasive species infestations, and provide other positive wildlife benefits, which are important considerations in restoring ecological processes. Three of the units totaling about 26,744 acres that currently possess fewer quality wilderness characteristics as described in the Service's wilderness policy would be eliminated. Private lands within the unit, adjacent roads, degraded habitat, adjacent sights and sounds, and private lands located within the unit, and other management considerations are factors in proposing to remove these units from proposed wilderness designation (see figure 10).

Six units totaling 18,559 acres would be expanded because they possess the outstanding wilderness tangible and intangible aspects as described in the Service's wilderness policy.

Strategies for Wilderness D1–D3 *(Same as B and C)*

OBJECTIVES for GOAL
Cultural and Paleontological Resources

CULTURAL RESOURCES

The refuge contains hundreds of prehistoric and historic resources (more than 50 years old). There are numerous old homestead cabins, cemeteries, and Native American sites. Remnants of old river towns such as Carroll and Rocky Point, which sprung up in the 1820s and 1860s to serve the fur trade and steamboat traffic have been washed away by the mighty Missouri River. Other homestead sites were lost when Fort Peck dam was completed and the lush river bottoms were flooded by the reservoir.

Objectives for Cultural Resources, Alternative A

Cultural Resources A1. Over 15 years, continue to identify and protect cultural resources on the refuge in accordance with Federal laws and policies.

(Same as Cultural Resources B1, C1, and D1.)

Rationale for Cultural Resources A1. Federal laws and policies mandate the identification and protections of cultural resources on Federal lands. Specifically, section 106 of the National Historic Preservation Act requires all Federal agencies to consider effects on cultural resources before any Federal action. (Same as B, C, and D.)

Strategies for Cultural Resources A1

- Identify historic homesteads to maintain.
- Protect all known gravesites and maintain the cultural resource inventory.

Objectives for Cultural Resources, Alternative B

Cultural Resources B1. Same as Cultural Resources A1, C1, and D1.

Cultural Resources B2. By year 5, develop a step-down plan for the preservation and protection of cultural resources on the refuge.

(Same as Cultural Resources C2 and D2.)

Cultural Resources B3. Within 5 years, identify areas with a high or moderate likelihood of having historic properties.

(Same as Cultural Resources C3 and D3.)

Cultural Resources B4. Within 10 years, survey the moderate and high areas for cultural resources to identify most of the historic properties.

(Same as Cultural Resources C4 and D4.)

Cultural Resources B5. Over 15 years, compile a comprehensive cultural resource overview for the refuge. The overview should describe the nature and extent of past cultural resource investigations, the types of resources known at the refuge, and the interpretive context for these resources.

(Same as Cultural Resources C5 and D5.)

Cultural Resources B6. Over 15 years, develop interpretive materials that explain the refuge's cultural resources.

(Same as Cultural Resources C6 and D6.)

Cultural Resources B7. Over 15 years, develop a system for archiving historic items (including documents, photographs, maps and artifacts in accordance with Department of the Interior policies).

(Same as Cultural Resources C7 and D7.)

Cultural Resources B8. Beginning in year 2, locate individuals with knowledge about the general history of the refuge, the location of sites, or alterations to various buildings and structures.

(Same as Cultural Resources C8 and D8.)

Rationale for Cultural Resources B1–B8. Same as A, plus the refuge contains many historical structures, many of which have not yet been properly surveyed. Additionally, the Missouri River Breaks has a rich history of Native American and Euro-American presence. Identifying sensitive cultural areas and resources will allow staff to better consider cultural resources in planning and would establish the priorities for cultural resource surveys. A cultural resource survey is the best tool available to determine the location of cultural resources at the refuge. Using surveys, both historic and prehistoric resources are identified and key information is gathered that helps for evaluation, planning, research, and educational outreach. There is limited knowledge about cultural resources at the refuge because less than 1,000 acres have been professionally surveyed. Although there are 363 known cultural resource sites, many have very limited documentation.

The overview will outline specific threats to the resources and the ability of future studies to address regional research questions. It will also serve as a planning tool to help encourage consideration of cultural resources during project planning.

To increase the public's appreciation and encourage support for the cultural and paleontological resources, staff needs to interpret the resources. Cultural artifacts and historic structures can provide valuable insight into the settlement of the Missouri River Breaks and the development of the refuge through time and provide the public with a link to the past.

Long-term and past employees, in addition to local residents and members of regional historic societies can be a wealth of information concerning the history of the refuge and the location of specific resources.

Strategies for Cultural Resources B1–B8

- Within 10 years, establish photo documentation and GPS mapping for known significant sites.
- Continue cultural resource reviews of undertakings.
- Improve Service's ability to conduct thorough and timely reviews including more comprehensive consultation.
- Develop a programmatic agreement with Montana State Historic Preservation Office.
- Create a comprehensive list and map of known historic sites.
- Monitor the condition of the resources on a regular basis using a cultural resource professional and, when possible, adverse effects that are compromising their integrity of the resource should be mitigated.
- Provide staff with access to information on historic properties and request updated information on resource condition when they are in the area.
- Create a sensitivity model for cultural resources locations based on previous survey on the refuge and the surrounding areas, consultation with the State Historic Preservation Officer, the Tribal Historic Preservation Office, and other professionals.
- Make the model available to appropriate staff.
- Ground-truth the model when possible.
- Update and refine the model on a regular basis.
- Conduct cultural resource surveys of areas with a moderate to high potential for cultural resources.
- Work with partners such as other agencies, colleges, and universities to conduct surveys and share resources.
- Notify the region 6 archaeologists when unrecorded cultural resources are located
- Identify cooperative opportunities with colleges and universities.
- Secure grants to complete the resources overview.
- Develop a cultural and paleontological resource fact sheet for distribution to refuge visitors.
- Conduct a comprehensive inventory of historic items and an assessment of their condition.
- Determine the informational and artifact value of the items.
- Protect and store the items of value in archiving stable materials under environmentally appropriate conditions.
- Determine the best strategy to make the information/artifacts useful and available.
- Work with current staff and area residents to develop a list of individuals who may have information about the refuge's history.
- Conduct field trips and/or interviews with people identified as having knowledge of the history at the refuge.

Objectives for Cultural Resources, Alternative C

Cultural Resources C1. Same as Cultural Resources A1, B1, and D1.

Cultural Resources C2–C8. Same as Cultural Resources B2–B8 and D2–D8.

Rationale for Cultural Resources C1–C8. Same as B, except with the emphasis of promoting wildlife-dependent uses, the strategies would reflect an additional emphasis on interpretation and education.

Strategies for Cultural Resources C1–C8

Same as B, plus:

- Create additional cultural resource educational and interpretive materials. (Same as D.)
- Develop brochures and kiosks that interpret cultural resources. (Same as D.)
- Collaborate with organizations such as Earth Watch or the Passport in Time program to encourage professionals to work with volunteers to identify or stabilize resources.
- Use interpretive signs to interpret an area (but not a specific location).

Objectives for Cultural Resources, Alternative D

Cultural Resources D1. Same as Cultural Resources A1, B1, and C1.

Cultural Resources D2–D8. Same as Cultural Resources B2–B8 and C2–C8.

Rationale for Cultural Resources D1–D8. Same as B, plus there would be less emphasis on promoting public uses than under alternative C and more of an emphasis on providing quality experiences, but the objectives would be essentially the same. The strategies would slightly differ from alternative B and would include education and interpretation materials.

Strategies for Cultural Resources D1–D8

Same as B, plus:

- Create additional cultural resource educational and interpretive materials. (Same as C.)
- Develop brochures and kiosks that interpret cultural resources. (Same as C.)

PALEONTOLOGICAL RESOURCES

Many paleontological resources have been excavated from the refuge. Among the most recognizable dinosaur fossils finds to come from the refuge include *Tyrannosaurus rex*, *Triceratops*, *Albertosaurus*, *Mosasaurus*, and hadrosaurs (refer to Chapter 4–Affected Environment). A number of the collections are on display at the Fort Peck Interpretive Center. Collection of any fossils is not permitted without a special use permit.

Objectives for Paleontological Resources, Alternative A

Paleontological Resources A1. Over 15 years, continue to issue permits to the Museum of the Rockies or others for collecting paleontological resources and prohibit recreational digging.

(Same as Paleontological Resources B1, C1, and D1.)

Rationale for Paleontological Resources A1. Currently the Museum of the Rockies in Bozeman, Montana has a permit to dig for fossils on the refuge, and providing they met the terms of the permit, this would continue.

Strategy for Paleontological Resources A1

- Monitor operator to ensure compliance with terms of the permit, and monitor and investigate any reports of illegal digging.

Objectives for Paleontological Resources, Alternative B

Paleontological Resources B1. Same as Paleontological Resources A1, C1, and D1.

Paleontological Resources B2. Within 5 years, in cooperation with the Museum of Rockies and USACE, develop a step-down plan for paleontological resources. Ensure plan specifies guidelines for implementing uniform permitting of paleontological research to credible research facilities across the refuge.

(Same as Paleontological Resources C2 and D2.)

Paleontological Resources B3. Within 5 years, interpret and promote the national natural landmarks on the refuge. At a minimum post the plaque and announce the designation.

(Same as Paleontological Resources C3 and D3.)

Rationale for Paleontological Resources B1–B3. Montana State University is evaluating paleontological resources and working on the step-down plan. The plan will include guidelines to decide when and how to issue permits for science and education. Montana State University is the official repository for paleontological resource collected from the refuge.

Two areas on the refuge have been designated as national natural landmarks—Bugg Creek and Hell Creek.

Strategies for Paleontological Resources B1–B3

- Increase law enforcement to protect the paleontological areas.
- Educate the staff on paleontological laws and its implication for management and protection of paleontological resources on the refuge.
- Potentially develop additional educational displays in the field offices, Fort Peck Interpretive Center, and the headquarters to interpret the paleontological resources.

Objectives for Paleontological Resources, Alternative C

Paleontological Resources C1. Same as Paleontological Resources A1, B1, and D1.

Paleontological Resources C2–C3. Same as Paleontological Resources B2–B3 and D2–D3.

Rationale for Paleontological Resources C1–C3. Same as B, except the approach would increase opportunities for research when compatible with protection of resources.

Strategies for Paleontological Resources C1–C3

Same as B, plus:

- Consider increasing education opportunities and permits for universities.
- Consider purchase of inholdings for protection.

Objectives for Paleontological Resources, Alternative D

Paleontological Resources D1. Same as Paleontological Resources A1, B1, and C1.

Paleontological Resources D2–D3. Same as Paleontological Resources B2–B3 and C2–C3.

Rationale and Strategies for Paleontological Resources D1–D3

Same as B, except:

- Limit or manage special use permits when necessary to protect resources.

OBJECTIVES for GOAL
Refuge Operations and Partnerships

REFUGE OPERATIONS

Refuge operations include management of facilities, structures, and other land or water use. The refuge relies on personnel, equipment, and facilities to carry out both the day-to-day operations and the long-term programs such as land acquisition. The below objectives describe how the Service uses funding and personnel to meet the refuge complex goals.

Objectives for Refuge Operations, Alternative A

Operations A1. Continue mineral withdrawal on all refuge lands until 2013, and work to renew withdrawal or acquire minerals.

Operations A2. Over 15 years, work within the Service to adjudicate and define water rights.

(Same as Operations B2, C2, and D2.)

Operations A3. Over 15 years, maintain existing public use facilities (refer to Chapter 4–Affected Environment).

(Same as Operations B3, C3, and D3.)

Operations A4. Over 15 years, maintain refuge personnel at current levels as identified in table 6 (section 3.14 below).

Rationale for Refuge Operations A1–A3. Public Land Order 6997 (1993) withdrew minerals for all the refuge until 2013. Under all the alternatives, the Service would continue to renew and seek to purchase minerals on future acquisitions. This would not include private or State lands where this is exempted. The United States holds Federal reserved water rights on the refuge (refer to Chapter 4–Affected Environment), and the United States is in the process of quantifying these reserved rights with the Montana Reserved Water Rights Compact Commission.

There are approximately 28 full-time equivalent positions and a number of seasonal staff at the refuge (refer to table 6 in section 3.14 below). This includes positions that are funded by general refuge operations funding and fire funding (separate account). While funding and personnel needs can and do change over time; generally, these are personnel levels that would be needed for 15 years.

Strategies for Refuge Operations A1–A4

- Seek to purchase minerals on fee acquisitions.
- Adhere to legal rights-of-way obligations for access to private and State lands including those for oil and gas extractions.
- Maintain select stock ponds.
- Maintain the auto tour route, elk-viewing area, accessible hunting blind and interpretive kiosks.
- Staff the interpretive center at Fort Peck Field Station with refuge personnel.
- Continue to work with the USACE to manage the boat ramps.
- Ensure refuges are signed and that directional signage is in place. Collaborate with the highway department to develop and position signage.

USFWS

A Service employee prepares to release an endangered black-footed ferret on the refuge.

Objectives for Refuge Operations, Alternative B

Operations B1. Same as Operations A1, plus seek permanent withdrawal of all minerals, including oil and gas and other leasable and saleable minerals on all refuge lands and future acquisitions.

(Same as Operations C1 and D1.)

Operations B2–B3. Same as Operations A2–A3, C2–C3, and D2–D3.

Operations B4. Improve facilities as identified under the strategies and as part of implementing the public use objectives identified above.

(Same as Operations C4 and D3.)

Operations B5. Within 5–10 years, add the needed staff including full-time positions, seasonal positions and volunteers to fully carry out the CCP as identified in table 6 (section 3.14 below).

(Same as Operations C5 and D4.)

Rationale for Refuge Operations B1–B5. Same as A, plus specific improvements and additions would be made to public use facilities as part of implementing the objectives for public use and development of the visitor services step-down plan (see specific topic under public use). The exact number of facilities, length of trail, and location would need to be determined based on projected visitor numbers and after more detailed programming occurred with the visitor services plan. There would be a need to increase personnel by about four positions to meet habitat and public use objectives, and one position would be eliminated (trainee).

Strategies for Refuge Operations B1–B5

Same as A, plus:

- Remodel restrooms associated with campgrounds (Slippery Ann) to be made accessible.
- Construct additional facilities (blinds, trails, or tour routes) including a lek blind for sage-grouse and/or sharp-tailed grouse as identified in the visitor services plan.
- Design and map bird-watching trails for public use.
- Fill one outdoor recreation planner position for the Lewistown or Fort Peck field station. If feasible, add a second person.
- Add additional law enforcement personnel for Fort Peck Field Station. (Same as C and D.)
- With an increase in fire funding and through the Refuge Operations Needs System database, continue to work towards increasing permanent and seasonal firefighting personnel by 50 percent. (Same as C and D.)
- Hire a career/conditional position that is knowledgeable in planting crops to start work on the first river bottom on the list.
- Hire staff to complete new monitoring across the refuge. (Same as C and D.)
- Hire seasonal employees for fence removal and professional fence builders for boundary fence construction of remaining fences. (Same as C and D.)

Objectives for Refuge Operations, Alternative C

Operations C1. Same as Operations B1 and D1.

Operations C2. Same as Operations A2, B2, and D2.

Operations C3. Same as Operations A3 and B3.

Operations C4–C5. Same as Operations B4–B5 and D3–D4.

Rationale for Refuge Operations C1–C5. Similar to A and B, except there would be a need to increase personnel by seven to eight positions to meet habitat and public use objectives and one trainee position would be eliminated. (Same as D.)

Strategies for Refuge Operations C1–C4

Same as B, plus:

- Evaluate the possibility of constructing an interpretive center at the Sand Creek Field Station in cooperation with various nongovernmental organizations.
- Develop displays in the field offices and the headquarters to interpret the paleontological resources. (Same as D.)
- Hire two visitor services personnel (outdoor recreation planners) at Lewistown Field Station and Fort Peck Field Station (top priority). (Same as D).
- Hire staff and graduate students to complete habitat inventories. (Same as D.)
- Hire two maintenance employees for UL Bend refuge. (Similar to D.)

Objectives for Refuge Operations, Alternative D

Operations D1. Same as Operations B1 and C1.

Operations D2. Same as Operations A2, B2, and C2.

Operations D3–D4. Same as Operations B4–B5 and C4–C5.

Rationale for Refuge Operations D1–D4. Same as C, except positions could be classified differently because of the different emphasis.

Strategies for Refuge Operations D1–D4

Same as B, plus:

- Evaluate the possibility of constructing a science and interpretive center at the Sand Creek Field Station in cooperation with various nongovernmental organizations.

- Develop interpretive signage at certain historic properties such as Rocky Point.
- Design and map bird-watching trails for public use.
- Develop displays in the field offices and the headquarters to interpret the paleontological resources. (Same as C.)

PARTNERSHIPS

The refuge and its resources are within a larger landscape that is important to the conservation of the natural and cultural resources at the refuge. Partnerships, including agreements with landowners adjacent to the refuge and other interested agencies and groups, are essential to meeting refuge goals.

Objectives for Partnerships, Alternative A

Partnerships A1 (land management). Over 15 years, work cooperatively with USACE to acquire jurisdiction around the lake to enforce regulations.

(Same as Partnerships B1, C1, and D1.)

Partnerships A2 (land management). Over 15 years, maintain existing partnerships and agreements with Federal, State, county, conservation districts, adjacent private landowners and local communities as identified in section 3.11 below.

(Same as Partnerships B2, C2, and D2.)

Partnerships A3 (land management). Over 15 years, continue working with agencies (USACE, BLM, MFWP, DNRC, counties of Fergus, Petroleum, Garfield, McCone, Phillips, and Valley, and tribal governments), conservation organizations (World Wildlife Fund, American Prairie Foundation, Ranchers Stewardship Alliance, and The Nature Conservancy) and private landowners to manage large free-ranging wildlife (elk, mule deer, pronghorn, and sage-grouse) and species of concern (prairie dogs and black-footed ferrets).

(Same as Partnerships B3, C3, and D3.)

Rationale for Partnerships A1–A3 (land management). Currently the Service works cooperatively with many agencies and jurisdictions and these efforts would continue under all alternatives. There are a number of agreements that are currently in place and these would continue. (Same as B, C, and D.)

Strategies for Partnerships A1–A3 (land management)
(None)

Objectives for Partnerships, Alternative B

Partnerships B1–B3 (land management). Same as Partnerships A1–A3, C1–C3, and D1–D3.

Partnerships B4 (land management). Within 2 years, sign a memorandum of understanding with the above groups that outline habitat conservation strategies across the landscape for the species mentioned in Partnerships A3.

(Similar to D4.)

Rationale for Partnerships B1–B4 (land management). Many prairie wildlife species require large tracts of undisturbed prairie. Often these species have large home ranges that cover hundreds of square miles and cross multiple land ownership. Several species (for example, prairie dogs and sage-grouse) are in peril due to a combination of factors including loss of habitat, disease and landowner tolerance. Cooperation amongst adjoining landowners and managers to provide all the seasonal habitat needs is necessary for these species to survive. Loss of grassland nesting cover, winter habitat foods, and economic pressures (converting grassland to crops) are a few of the habitat limitations that impact these sentinel species. Conservation incentives from government agencies or conservation groups would help to foster cooperative conservation practices such as supporting level 1 prairie dog town of 5,000 acres, preserving sage-grouse nesting and winter habitat, and promoting heterogeneity of habitats to support the needs of grassland-obligate birds and other species.

Strategies for Partnerships B1–B4 (land management)

- Develop standardized monitoring strategies to measure habitat conditions, wildlife distribution, and wildlife response to management actions to be used across the area.
- Develop standardized monitoring strategies to measure habitat conditions, wildlife distribution, and wildlife response to management actions to be used across the area.
- Support incentives in the current Farm Bill legislation (Cooperative Conservation Partnership Initiative and Conservation Innovation Grants) that are available to private landowners for habitat conservation for these species.
- Form partnerships and/or memoranda of understanding with private landowners, nongovernmental agencies, local tribes, and BLM to manage for sentinel plant and wildlife species across boundaries.
- Coordinate and cooperate on research and monitoring needs and provide resources to implement adaptive management actions on neighboring lands.
- Manage sentinel wildlife such as prairie dogs to support the full suite of wildlife that rely on prairie dogs and/or prairie dog towns.

Partnerships B5 (volunteers and friends). By year 5, develop a volunteer program and friends group aimed at meeting the refuge's biological and public use objectives.

(Same as Partnerships C5 and D6).

Partnerships B6 (volunteers and friends). Over 15 years, maintain and build partnerships with agencies, communities, and organizations to support and grow public use programs on and off the refuge.

(Same as Partnerships C6 and D7).

Rationale for Partnerships B5–B6 (volunteers and friends). In 2008, about 39,765 volunteers gave 1.5 million hours in support of Service activities, including 3,338 volunteers in region 6 who contributed 131,169 hours (FWS 2009g). People volunteer for a variety of reasons, but they play an important role in helping the Service meet is mission. Friends groups are important allies for the Service, often advocating for a field stations by giving information to local community and elected officials. There are more than 200 friends groups across the Service (FWS 2009g). To implement the refuge's habitat and public use objectives, the Service would establish an active volunteer program and friends group to advance the refuge's programs and establish partnerships with the local communities.

Strategies for Partnerships B5–B6 (volunteers and friends)

- Begin to recruit volunteers.
- Advertise the friend's group and volunteer opportunities on the website, in surrounding communities and within refuge visitor facilities.
- Develop partnerships with wildlife groups and organizations such as Yellowstone Valley Audubon Society and others to market available birding and wildlife opportunities at the refuge.
- Create new partnerships, and maintain and expand existing partnerships with hunters to increase awareness of the importance of bird and habitat conservation.
- Create new partnerships, and maintain and expand existing partnerships with conservation groups and the public to increase public awareness of nonconsumptive bird recreation and bird conservation.
- Seek out partners to establish and promote birding drives.
- Work with partners and volunteers to establish mountain bluebird trails.
- Work with partners to develop an outreach plan as part of the visitor services plan.
- Work with the Montana tourism department to promote the refuges and their resources.
- Work with partners to continue to seek grants to fund events and programs.

Objectives for Partnerships, Alternative C

Partnerships C1–C3 (land management). Same as Partnerships A1–A3, B1–B3, and D1–D3.

Partnerships C4 (land management). Similar to alternative B, except the six counties, tribal governments, conservation organizations (World Wildlife Fund, American Prairie Foundation, Ranchers Stewardship Alliance, and The Nature Conservancy) and interested private landowners would develop habitat management treatments that benefit livestock operators and provide adequate habitat for a suite of prairie species that have large home ranges and/or are species of concern.

Rationale for Partnerships C1–C4. Private ranch operations support a variety of wildlife species. Many species of concern such as prairie dogs and pronghorn are found on lands outside of the refuge. Economic incentives to private individuals for conservation measures benefit both wildlife and local communities. By maintaining intact family ranches, wildlife managers reap the benefits of conservation measures on private lands adjacent to the refuge and conservation organizations. By developing management strategies that benefit livestock operations and certain species of wildlife, all parties benefit. Forming formal partnerships with ranchers for wildlife conservation allows the Service to provide funds and resource to meet conservation objectives on a landscape scale.

Strategies for Partnerships C1–C4 (land management)

- Develop management procedures that will benefit livestock operations and select wildlife species.
- Enter into a formal memorandum of understanding with interested partners to manage lands for sentinel plants and natural ecological process such as historical fire occurrence.
- Manage sentinel wildlife such as prairie dogs to support the full suite of wildlife that rely on prairie dogs and/or prairie dog towns.
- Secure outside funding (Cooperative Conservation Partnership Initiative and Conservation Innovation Grants) for long-term monitoring projects to measure progress of increasing the health and relative abundance of sentinel plants.

Partnerships C5–C6 (volunteers and friends). Same as B5–B6 and D6–D7.

Rationale for Partnerships C5–C6 (volunteers and friends) *(Same as B and D)*

Strategies for Partnerships C5–C6 (volunteers and friends) *Same as B, plus:*

- Over 15 years, develop partnership with photography clubs to provide five nature photography workshops on the refuge.
- Over 15 years, collaborate with other groups to provide three additional web-based cameras or video to local schools.

Objectives for Partnerships, Alternative D

Partnerships D1–D3 (land management). Same as Partnerships A1–A3, B1–B3, and C1–C3.

Partnerships D4 (land management). Similar to Partnerships B4, except with USACE, BLM, MFWP, DNRC, the six counties, tribal governments, conservation organizations (World Wildlife Fund, American Prairie Foundation, Ranchers Stewardship Alliance, and The Nature Conservancy) and interested private landowners to monitor and manage for sentinel plants and heterogeneity of habitats with associated wildlife.

Partnerships D5 (land management). Over 15 years, promote healthy populations of all plants and associated prairie wildlife lands adjoining the refuge's partner focus area.

Rationale for Partnerships D1–D5 (land management). The habitats of the northern glaciated plains evolved with pyric herbivory influences. Hundred years of fire suppression and constant grazing pressure has affected the health and relative presence of numerous plants (sentinel plants) including skunkbush, winterfat, golden currant, and buffaloberry. By improving the health and distribution of these sentinel plants the overall health of various wildlife species will be improved as well. By restoring pyric -herbivory processes and managing for total ungulate populations, the overall health of these plants and habitats will improve and contribute to the overall biological health and ecological integrity. Land management by private landowners and conservation organizations around the refuge affect plant and wildlife distribution on the refuge.

Strategies for Partnerships D1–D5 (land management)
Same as C, plus:

- Implement a pyric-herbivory study and management program on the refuge as a demonstration site for other interested land managers and landowners.

Partnerships D6–D7 (volunteers and friends). Same as Partnerships B5–B6 and C5–C6.

Rationale and Strategies for Partnerships D6–D7 (volunteers and friends)
Same as B, plus:

- Over 15 years, develop partnership with photography clubs to provide two nature photography workshops on the refuge
- Over 15 years, collaborate with other groups to provide one additional web-based camera or video to local schools.

RESEARCH AND SCIENCE

In addition to the research needs described under the habitat, wildlife, and public use objectives, research as part of a partnering effort is described.

Objectives for Research, Alternative A

Research A1. Continue existing research and continue to maintain partnerships with researchers interested in studying refuge resources.

Rationale for Research A1. The Service works with many universities and researchers and this would continue.

Strategies for Research A1 *(None)*

Objectives for Research, Alternative B

Research B1. Over 15 years, encourage universities and other organizations to conduct annual surveys on the effects of public use, wildfire, prescribed fire, and other management strategies throughout the calendar year.

Research B2. Over 15 years, support research of habitat, wildlife, and public use.

Research B3. Over 15 years, work with MFWP to annually study the movement of big game relative to habitat changes (for example, fire and grazing).

Research B4. By year 5, begin monitoring wintering pronghorn on the refuge to meet the executive order.

Research B5. Over 15 years, work with MFWP to conduct research on habitat suitability for bighorn sheep.

Research B6. By year 1, increase visitor counts to determine the number and types of visitors on the refuge, and by year complete a visitor use study.

Rationale for Research B1–B6. Research would support the emphasis of increasing wildlife populations.

Strategies for Research B1–B6

- Evaluate refuge assets that will be affected by climate change.
- Include questions on visitor use study targeted at quantifying the type and amount of public use occurring in the refuge's wilderness.
- Measuring what the refuge's visitors value and how they measure quality public use experiences.

Objectives for Research, Alternative C

Research C1–C6. Same as Research B1–B6.

Research C7. By year 5, initiate research of new species proposed for hunting (for example, mountain lion).

Rationale for Research C1–C7. Same as B, plus before a mountain lion hunt would be implemented on the refuge, additional research would be needed to determine population numbers, food requirements, and the role these predators have on other wildlife on the refuge. This would be necessary before the full package can be submitted to Washington for approval.

Strategies for Research C1–C7

Same as B, plus:

- By year 5, work with MFWP to initiate research on the biological potential of mule deer herd's age structure within the Missouri River Breaks.

Objectives for Research, Alternative D

Research D1–D6. Same as Research B1–B6 and C1–C6.

Rationale and Strategies for Research D1–D6 *(Same as B and C)*

3.9 Foreseeable Activities

Reasonably foreseeable future activities are actions and activities that are independent of the proposed actions for the refuge, but could result in cumulative effects when they are combined with the effects of the proposed alternatives. They are anticipated to occur regardless of any action or alternative that is selected. The effects of those are described in the cumulative impacts sections for each resource in chapter 5.

Reasonably foreseeable future activities within or near the refuge are represented in figure 5 (map of decision and analysis areas) and fall into the following categories:

- Federal land management
- State wildlife management
- Nongovernmental conservation activities
- Regional demographic and economic change
- Infrastructure development

FEDERAL LAND MANAGEMENT

Federal land management activities include those by USACE, BLM, and the Department of the Interior.

Fort Peck Dam/Fort Peck Lake Master Plan (USACE)

The master plan and environmental assessment of 2008 analyzes proposed expansion and upgrades to facilities at existing recreation areas as well as natural resource management improvements. The environmental assessment did not identify any significant effects resulting from the proposed master plan alternative. It did note that expanded shoreline development at Fort Peck West could impact potential piping plover nesting areas, although there are no nests there currently. The environmental assessment also identified localized impacts to air quality, noise, and visual quality due to additional development within existing recreation areas (USACE 2008).

Transfer of Cabin Sites (USACE)

In 2004, USACE cooperated with the Service to complete an environmental assessment reviewing implementation of the Enhancement Act (refer to chapter 1) and found no adverse effects (USACE 2004). Following public comments that questioned the decision to deny conveyance of 12 cabin sites in the South Fork rock Creek area, USACE reexamined the issue and agreed to convey all cabin sites. To offset the effects of this decision to the refuge, USACE agreed to out-grant additional Fort Peck Project lands to the Service (USACE 2005). (Refer to chapter 1, section 1.9–Issues Not Addressed for more information.)

Upper Missouri River Breaks National Resource Management Plan (BLM)

BLM issued a record of decision for its approved resource management plan for the Upper Missouri River Breaks National Monument in December 2008. The plan responds to increasing demands for recreation while providing mitigating measures to manage enhance and protect fish and wildlife habitat and habitat for special status species, including greater sage-grouse and black-tailed prairie dog. Vegetation will be managed to achieve a natural range of native plant communities for a wide variety of long-term benefits including aesthetics, wildlife, recreation, and livestock grazing (BLM 2008).

The approved plan provides diverse recreational opportunities, including both motorized and nonmotorized watercraft use on the Missouri River, with seasonal restrictions on motorized use within the designated wild and scenic river portions. BLM will coordinate with the Service on bank side recreation use and management within the refuge boundaries. The plan includes mitigation measures applied to surface disturbing or disruptive activities to protect important wildlife habitat, including greater sage-grouse, black-tailed prairie dog, bald eagle, bighorn sheep, designative sensitive species and big game winter range. Unavoidable effects of the plan alternatives were limited to localized soil erosion and vegetation impacts resulting from ground-disturbing activities (BLM 2008).

Wilderness Study Areas (BLM)

The BLM has several designated Wilderness Study Areas near or adjacent to the refuge. These include Seven Blackfoot, Burnt Lodge, and Antelope Creek wilderness study areas.

Climate Change Initiative (DOI)

In March 2007, the Secretary of the Interior established the Department of the Interior Climate Change Task Force. That Task Force included subcommittees charged with exploring the potential consequences of climate change on Interior lands and resources, and potential options for addressing them. Based on the findings and recommendations of the Task Force, some of the following issues have the potential for cumulative effects on resources in and around the refuge (DOI 2008):

- changes in water quality and availability
- increased flood risk
- outbreaks of pests, invasive species, and diseases
- changes in wildlife habitat and migration patterns
- changes in wildfire frequency and behavior

Refer to the discussion for the climate change objectives in section 3.8 above.

STATE WILDLIFE MANAGEMENT

Several MFWP wildlife management plans are discussed.

Prairie Dog Conservation Plan

In 2002, the Montana Prairie Dog Working Group developed a statewide conservation plan for prairie dogs, recognizing that current population numbers are much smaller than historical numbers due to eradication programs, conversion of native rangelands, sylvatic plague, and recreational shooting (Montana Prairie Dog Working Group 2002b). The overall goal of the conservation plan is to provide for management and long-term viability of prairie dog populations and associated species. The conservation plan recommends several specific management actions to enhance prairie dog populations.

Big Game Management

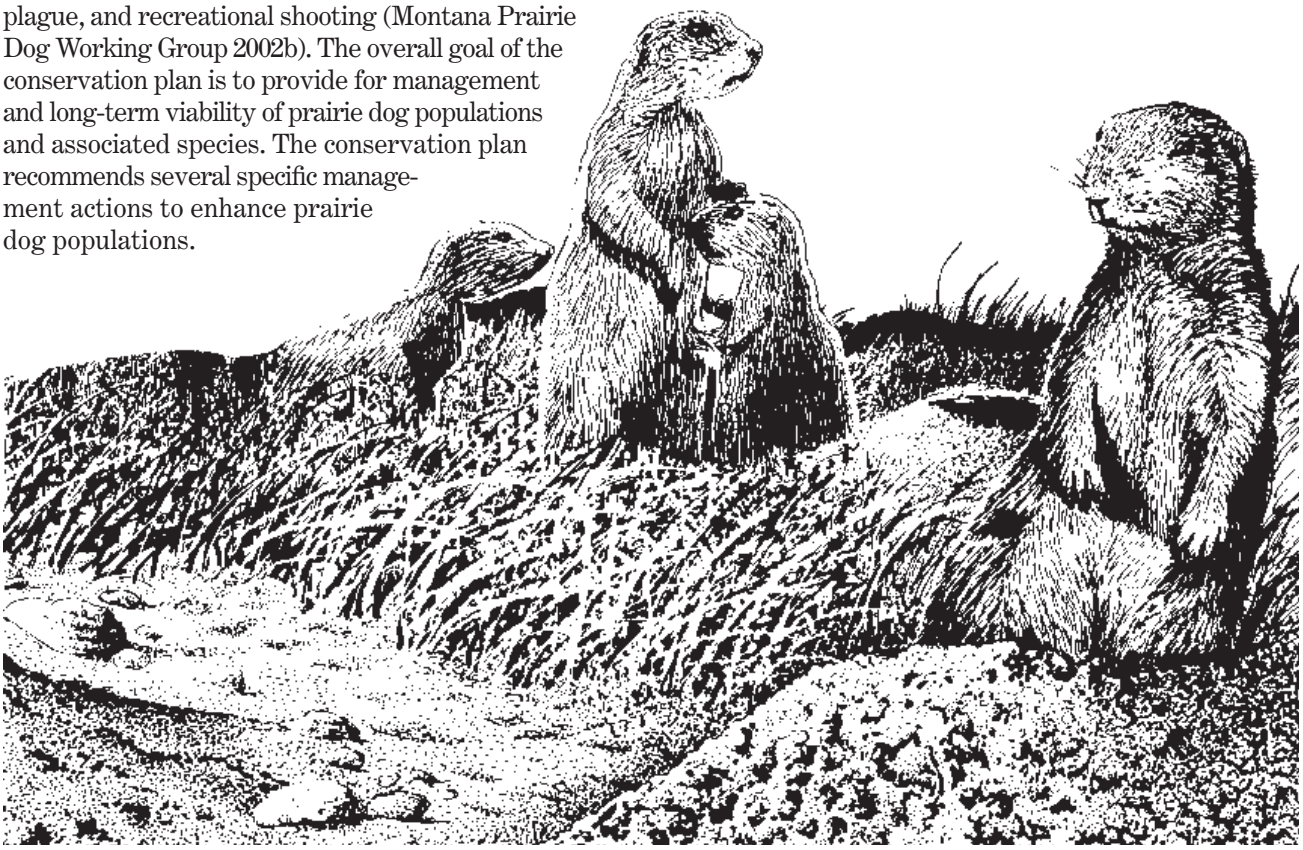
MFWP has completed statewide management plans and conservation strategies for elk (MFWP 2004), mule deer (MFWP 2001), and bighorn sheep (MFWP 2009a). These documents outline guiding principles for management of these species, as well as specific objectives for management units and hunting districts that include the refuge. The elk and bighorn sheep plans outline specific management strategies that include coordination with the Service to achieve herd objectives on and off refuge land.

Fisheries Management

The Fort Peck Reservoir fisheries management plan (MFWP 2002a) includes specific management programs for walleye, sauger, smallmouth bass, lake trout, northern pike, Chinook salmon, forage fish, and fishing tournaments on Fort Peck Reservoir.

Sage-grouse Management

Montana's conservation strategy for sage grouse provides for coordinated management across jurisdictional boundaries and development of community support that will promote successful implementation (MFWP 2005a).



NONGOVERNMENTAL CONSERVATION ACTIVITIES

The American Prairie Foundation, The Nature Conservancy, World Wildlife Fund, National Wildlife Federation, and Ranchers Stewardship Alliance conduct conservation activities on large acreages adjacent to or on the refuge.

American Prairie Reserve

Since 2004, the American Prairie Foundation has been working to create the American Prairie Reserve on private lands adjacent to the north side of the refuge in Phillips County. The mission of American Prairie Foundation is "to create and manage a prairie-based wildlife reserve that, when linked to public lands already devoted to wildlife, it will protect a unique natural habitat, provide lasting economic benefits, and improve public access to and enjoyment of the prairie landscape" (American Prairie Foundation 2008). The foundation has been working on bison restoration, pulling interior fences, conducting stream restoration studies, bison/livestock studies, and other activities. Many stewardship activities are conducted in partnership with the refuge.

The American Prairie Foundation owns or leases 86,962 acres of land. Most of the acreage is public-leased land, while the remainder is deeded private land. The foundation is looking at new properties to expand the prairie reserve through additional leases and acquisitions. Several new properties are under negotiation (Scott Laird, American Prairie Foundation, personal communication on July 23, 2009).

Matador Ranch

The Nature Conservancy manages the 63,000-acre Matador Ranch located north of the refuge near the town of Zortman. The Nature Conservancy purchased the Matador Ranch in 2000 with the intent of conserving native prairie wildlife in the Glaciated Plains of north-central Montana. The ranch is the key element of a grass bank program, whereby grazing land is leased to area ranchers at discounted rates, and in exchange the ranchers agree to conservation measures on their own lands. Management and conservation goals include the protection of habitat for grassland birds, prairie dog colonies, and sage-grouse leks (Barbara Cozzens, Matador Ranch Project Director, The Nature Conservancy; personal communication, October 1, 2009).

Ranchers Stewardship Alliance

"The mission of the Ranchers Stewardship Alliance is to promote the ecological, social and economic conditions that will sustain the biodiversity and integrity of America's northern mixed-grass prairie for present and future generations. They work to support cost-effective, sustainable conservation that features private and public cooperation in a working landscape stewarded by profitable family ranches and thriving rural communities" (Ranchers Stewardship Alliance 2008).

LIVESTOCK GRAZING LEASE ACQUISITIONS

In mid-2009, the World Wildlife Fund and the National Wildlife Federation asked ranchers to submit a bid to voluntarily not apply for future grazing privileges on the refuge. In exchange for cash payment, the ranchers would agree to terminate grazing on the refuge and not renew their permits. Several bids were received, and in late 2009, two agreements were finalized retiring grazing on a total of 45,000 acres. This effort is part of the National Wildlife Federation's Wildlife Conflict Reduction Program, which is intended to reduce grazing conflict with wildlife using marked-based approaches (National Wildlife Federation 2010).

REGIONAL DEMOGRAPHIC and ECONOMIC CHANGE

Demographic and economic trends for the six-county region surrounding the refuge are described in detail as part of the overall socioeconomic context in chapter 4. Some of the reasonably foreseeable trends that could contribute to cumulative effects are briefly described here.

While Montana's population is expected to increase by 34 percent over the next 20 years, the region surrounding the refuge is expected to continue to lose about 13 percent of its population. While overall employment in the region has been steadily increasing, most of those increases are likely due to people working multiple jobs. Travel and tourism will continue to contribute significantly to Montana's economy. However, the region surrounding the refuge has experienced a much smaller proportion of growth in travel and tourism spending compared to the rest of the State. As the demand for outdoor recreation has increased, so has the number of land purchases for hunting, fishing, and other recreational uses in areas surrounding the refuge. This trend is expected to continue. With these changes in demographic, economic, and land ownership patterns are also expected to bring changes in local communities, and prevailing attitudes values regarding wildlife, natural resources, and refuge management.

INFRASTRUCTURE DEVELOPMENT

In 2008, TransCanada Keystone Pipeline, LP, filed an application for a Presidential permit for the con-

struction, operation, and maintenance of pipeline facilities at the border of the United States and Canada for the transport of crude oil across the two countries' international boundary. The proposed pipeline project would deliver crude oil from western Canada to locations in the south-central United States. On April 20, 2010, the U.S. Department of State released a draft EIS for the proposed TransCanada Keystone XL Pipeline Project (U.S. Department of State 2010).

The proposed pipeline corridor would be near or adjacent to the northeastern edge of the Charles M. Russell National Wildlife Refuge but would not be located on refuge land. The draft EIS anticipated general effects associated with ground disturbance and construction. The draft EIS analyzed potential effects on federally listed and candidate species including black-footed ferret, greater sage-grouse, least tern, piping plover, and pallid sturgeon. For all of the listed species, the draft EIS determines that the proposed project is not likely to adversely affect the species. With the pipeline route proposed to pass through about 20 miles of core habitat for the greater sage-grouse in Montana, the draft EIS determined that the project would not likely affect the courtship activities of sage-grouse on leks and would likely result in a minor impact on nesting birds (U.S. Department of State 2010).

3.10 Elements Considered but Eliminated from Further Consideration

During scoping and alternatives development, the Service or interested groups and the public suggested a number of goals, alternatives, or elements of alternatives that were considered but eliminated from further analysis. These elements are discussed below.

DEVELOPING GOALS for LIVESTOCK GRAZING and SOCIOECONOMIC USES

Some interested groups and the public requested the Service have a specific goal that would support livestock grazing because Executive Order 7509 made provisions for livestock grazing once the primary purposes were met. As per 50 CFR 29.1, the Service allows for economic uses on national wildlife refuges (including haying, logging, and grazing) when the uses are compatible with refuge purposes and when they contribute to accomplishing the purposes of the refuges or the mission of the Refuge System. It is not the mission of the Refuge System to provide for economic uses.

The Service manages each refuge to fulfill the mission and, where appropriate, restore the lost elements of biological integrity of each refuge and the Refuge System, as well as achieve the specific purposes for which the refuge was established. Congress also provided for six priority wildlife-dependent public uses to be accommodated wherever possible. The Improvement Act only addressed economic uses in the context of how compatibility standards and procedures should be administered for uses of a refuge (Section 6 under the Improvement Act). In reviewing the Service's compatibility policy (FWS 2000a), it states the following:

> "Economic uses can only be allowed when they do not materially detract from the fulfillment of the Refuge System mission or the purposes of the refuge. Inherent in fulfilling the System mission is not degrading the ecological integrity of the refuge. Compatibility, therefore, is a threshold issue, and the proponent(s) of any use or combination of uses must demonstrate to the satisfaction of the Refuge Manager that the proposed use(s) pass this threshold test."

The Service uses livestock grazing to meet specific wildlife and habitat objectives. Grazing was considered in the objectives and strategies in the alternatives, but it was not considered as a specific goal of the planning process.

Like livestock grazing, the Service did not consider socioeconomic issues as being a singular goal of the planning process but did recognize these issues in the formation of alternatives, objectives, and strategies. Specifically, the Service has considered an alternative (C) that would emphasize and promote maximum compatible wildlife-dependent public uses and economic uses while protecting wildlife populations and habitats to the extent possible. The Service did modify language in the Partnership Goal (refer to Chapter 2–Refuge History and Vision) to include more recognition of the social and economic contribution of the refuge to adjacent communities.

ELIMINATING ALL LIVESTOCK GRAZING

Some interested groups and the public requested the Service consider a no-grazing alternative. Although initially considered, it was eliminated from further analysis.

The use of livestock grazing is consistent with the direction provided in the Improvement Act, which defines conservation and management as "to sustain and, where appropriate restore and enhance, healthy populations of fish, wildlife, and plants, utilizing, in accordance with Federal and State laws, methods and procedures associated with modern sci-

entific resource programs." It is also consistent with the purposes of the refuges.

The northern Great Plains, including much of the landscape in and around the refuge evolved over thousands of years through a complex ecological interaction between fire and grazing (refer to chapter 4). Even if bison (extirpated from the area in the late 1800s) were to be restored to portions of the refuge (a consideration in alternatives B and D if proposed by MFWP), it could take years of coordination and planning to implement. There are many areas within the refuge where fire occurs infrequently or cannot be used because of other factors. Given the complex ecological factors including uncertainties about how climate change could affect wildlife and their habitat, the Service determined that eliminating an important management tool for achieving habitat objectives was not realistic or desired. One alternative (B), considers moving toward prescriptive grazing over most of the refuge in a realistic implementation timeframe. A draft compatibility determination for the use of prescriptive grazing is included in appendix C.

MANAGING ONLY for SHARP-TAILED GROUSE, PRONGHORN, and LIVESTOCK GRAZING

Some interested groups and the public felt the Service should only consider an alternative that only manages for sharp-tailed grouse, pronghorn, and livestock grazing as these were specifically mentioned in Executive Order 7509. Although Executive Order 7509 did single out sharp-tailed grouse and pronghorn for protection in 1936 (in addition to other wildlife), since then there have been a number of executive orders, laws, and policies that have guided the management of the refuge. Not all lands within the refuge were set aside under Executive Order 7509. This includes UL Bend National Wildlife Refuge and other lands acquired through fee title. Many fish, wildlife, and plant species are found on the refuge (refer to Chapter 4–Affected Environment), and although sharp-tailed grouse and pronghorn are named in Executive Order 7509, in only managing for these species, the Service would not meet other refuge purposes, Refuge System mission, or the vision and goals of this planning process.

As stated in chapter 2, the refuge is administered under the provisions of the National Wildlife Refuge Administration Act of 1966 and not Taylor Grazing Act. Several court cases have affirmed this. Under the Refuge System, livestock grazing is used as a management tool for meeting habitat and wildlife objectives, and the four alternatives presented provide for a range of approaches for managing habitat and wildlife.

DEVELOPING a MEMORANDUM of UNDERSTANDING for LIVESTOCK GRAZING

Some interested groups and the public suggested that the Service collaborate with the adjoining conservation districts, either through a memorandum of understanding or through separate contracts for assessment and management of the refuge's grazing allotments. This would include the calculation of AUMs that each habitat unit could support.

Partnerships certainly play an important role in helping the Service to achieve its planning goals for habitat management. The Service is committed to working with many Federal, State, and local governments, tribal governments, private landowners, and other organizations (refer to the partnership objectives for each alternative in section 3.8 above, as well as 3.11 below). However, a memorandum of understanding or contract with a local government agency to assess and manage grazing allotments as proposed would effectively limit a refuge manager's ability to make stipulations or decisions on the compatibility of economic activities in managing habitat for the benefit of wildlife (refer to the above discussion on compatibility about developing goals for livestock grazing and socioeconomic uses). In the Improvement Act, Congress set provisions for "ensuring timely and effective cooperation with Federal agencies and State fish and wildlife agencies during the course of acquiring and managing refuges." Congress did not specify a role for other governmental agencies in managing a refuge's habitat, which seems to be the intent of this suggestion. The Service has considered an alternative that emphasizes public use and economic use while protecting habitat and wildlife; therefore, this suggestion was not analyzed further.

OPENING ROADS in WILDERNESS

A number of interested groups and the public wanted the Service to consider reopening roads that were previously closed through proposed or designated wilderness, either seasonally or permanently. In compliance with the Wilderness Act and Service's Wilderness Stewardship policy (FWS 2008d), the Service did not consider reopening formerly closed roads in existing proposed wilderness units. The Service does use the CCP process to determine if other lands should be recommended for wilderness designation or if other changes should be made to the existing proposed wilderness units.

3.11 Partnerships

Many opportunities exist near the Charles M. Russell National Wildlife Refuge to continue existing partnerships or establish new ones. These include the following:

- Federal agencies including BLM, USDA, USGS, USACE, National Oceanic Atmospheric Administration, Federal Highways Administration, and many others.
- MFWP and DNRC on wildlife and habitat management and other State agencies.
- Conservation districts, county commissioners, fire wardens, weed districts and fire districts, and sheriffs departments.
- Nongovernmental organizations including Rocky Mountain Elk Foundation, World Wildlife Fund, American Prairie Foundation, The Conservation Fund, The Nature Conservancy, Montana Wildlife Federation, Wildlife Conservation Society, Yellowstone Valley Audubon Society, Ranchers Stewardship Alliance, Defenders of Wildlife, National Wildlife Federation, grazing associations, the Wilderness Society, Prairie Wildlife Research, and Stockgrowers Association.
- Adjacent private landowners and local communities.

3.12 Monitoring and Evaluation

Adaptive management is a flexible approach to long-term management of biotic resources. Adaptive management is directed, over time, by the results of ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are carried out within a framework of scientifically driven experiments to test the predictions and assumptions outline within a CCP (see figure 11).

To apply adaptive management, specific survey, inventory, and monitoring protocols would be adopted for the refuge. The habitat management strategies would be systematically evaluated to determine management effects on wildlife populations. This information would be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations would include participation by Service personnel and other partners. If monitoring and evaluation indicate undesirable effects for target and nontarget species or communities, alteration to the management projects would be made. Subsequently, the CCP would be revised.

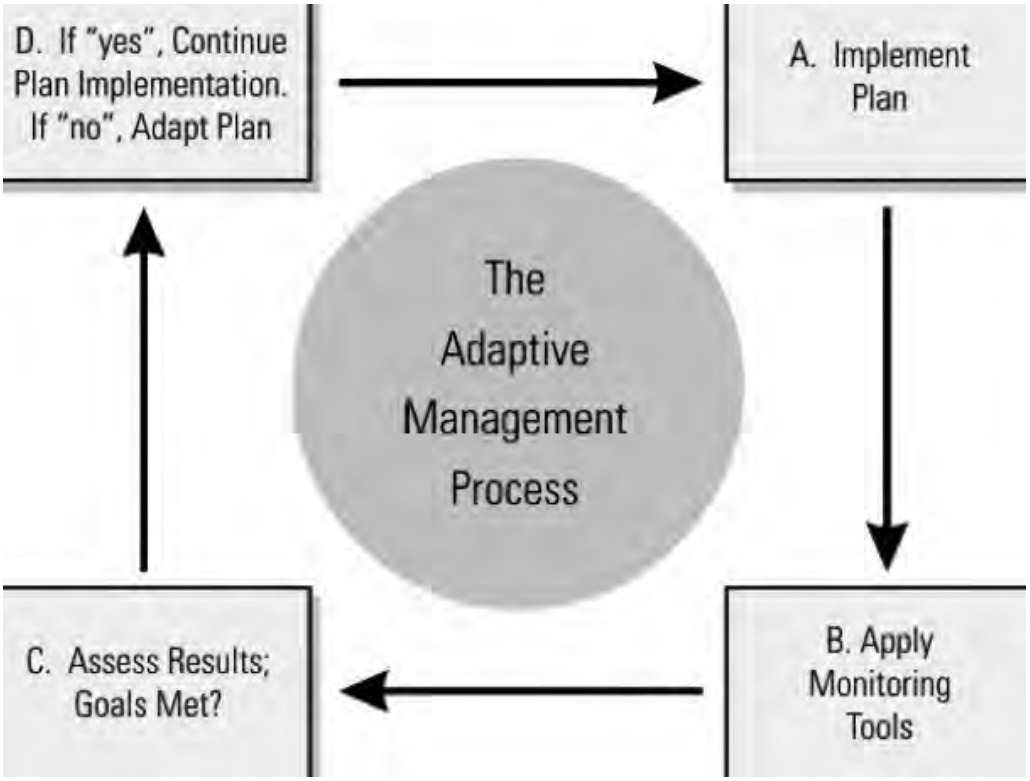


Figure 11. Adaptive management process.

3.13 Plan Amendment and Revision

The final CCP will be reviewed annually to determine the need for revision. A revision would occur if and when significant information becomes available, such as a change in ecological conditions. Revisions to the CCP and subsequent step-down management plans would be subject to public review and compliance with the National Environmental Policy Act. At a minimum, this plan would be evaluated every 5 years and revised after 15 years. Table 3 identifies the step-down plans needed to fully implement the CCP.

Table 3. Step-down management plans for the Charles M. Russell and UL Bend refuges.

Plan	*Year to be Completed**
Cultural resources	2017
Fire management	2014
Habitat management	2015–9
Invasive plant management	2015
Paleontological resources	2017
Public use hunting and fishing fishing and mussels wildlife observation, photography, and interpretation environmental education	2017
Transportation	2017
Wilderness management	2015

**Depends on the preferred alternative selected for the CCP.*

3.14 Funding and Personnel

Refuge budgets generally include ongoing operations funds for personnel, maintenance, and utility needs. Table 4 summarizes the estimated costs for the alternatives over 15 years, and table 5 displays the details used to develop the costs.

Table 6 compares the current personnel plan with the proposed personnel needed under each alternative. Projects required to carry out the final CCP will be funded through two separate systems, as follows: (1) the refuge operations needs system is used to document requests to Congress for funding and personnel needed to carry out projects above the existing base budget; and (2) the Service asset maintenance management system is used to document the equipment, buildings, and other existing properties that require repair or replacement.

R.A. Howard/USDA–NRCS PLANTS Database

Silver Buffaloberry

Table 4. Costs over 15 years to carry out the CCP alternatives for the Charles M. Russell and UL Bend refuges ($1,000).

	Alternative A	*Alternative B*	*Alternative C*	*Alternative D*
One-time cost	7,945	19,569	18,872	20,356
Salaries	41,310	45,193	56,288	56,351
Total cost	49,255	64,762	75,160	76,707

Table 5. Cost analysis for the CCP alternatives for the Charles M. Russell and UL Bend refuges ($1,000).

		Cost Over 15 Years (in thousands of dollars)			
Management Cost Item		Alternative A	Alternative B	Alternative C	Alternative D
HABITAT:	uplands	317	500	626	598
	river bottoms	420	494	350	490
	riparian areas and wetlands	150	213	71	258
	shoreline	0	51	51	51
CLIMATE CHANGE		45	95	95	95
INVASIVE SPECIES		75	120	120	120
FIRE:	prescribed fire	576	2,100	655	2,100
	wildfire	1,190	1,190	1,190	1,190
WILDLIFE MANAGEMENT:	big game	425	500	435	475
	furbearers	100	400	200	400
	threatened and endangered species	150	215	215	215
	bison	0	80	10	80
	other wildlife	0	97	97	97
	birds	35	121	96	121
PUBLIC USE:	hunting	30	265	338	330
	fishing	50	163	189	163
	observation, interpretation, photography	95	279	423	346
	environmental education	15	35	122	47
	outreach	5	15	25	20
	commercial uses and outfitting	15	32	52	32
	recreation sites	50	75	90	90
	access	95	140	360	210
WILDERNESS		15	15	15	15
CULTURAL RESOURCES		10	93	110	110
REFUGE OPERATIONS:	stock ponds, maintenance, etc.	82	162	155	172
VOLUNTEERS and FRIENDS		0	20	33	32
PRIORITY LAND ACQUISITIONS		4,000	4,000	4,000	4,000
INTERPRETIVE CENTER:	building		8,000	8,000	8,000
	exhibits		100	750	500
Subtotal of one-time costs over 15 years		7,945	19,569	18,872	20,356
Salaries over 15 years		41,310	45,193	56,288	56,351
Total Cost		49,255	64,762	75,160	76,707

Table 6. Personnel to carry out the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Alternative A (Current Personnel)	*Alternative B*	*Alternative C*	*Alternative D*
Headquarters (Lewistown, Montana)			
Project leader GS*–14	Project leader GS–14	Project leader GS–14	Project leader GS–14
Deputy project leader GS–13	Deputy project leader GS–13	Deputy project leader GS–13	Deputy project leader GS–13
Pilot/wildlife biologist GS–12	Pilot/wildlife biologist GS–12	Pilot/wildlife biologist GS–12	Pilot/wildlife biologist GS–12
Wildlife refuge specialist GS–9	Wildlife refuge specialist GS–9	Outdoor recreation planner GS–9	Outdoor recreation planner GS–9
Maintenance worker WG*–8	Maintenance worker WG–8	Maintenance worker WG–8	Maintenance worker WG–8
Maintenance worker WG–7	Maintenance worker WG–7	Maintenance worker WG–7	Maintenance worker WG–7
Supervisory wildlife biologist GS–13	Supervisory wildlife biologist GS–13	Supervisory wildlife biologist GS–13	Supervisory wildlife biologist GS–13
**Wildlife biologist GS–12	Wildlife biologist GS–12	Wildlife biologist GS–12	Wildlife biologist GS–12
Wildlife biologist GS–9	Wildlife biologist GS–9	Wildlife biologist GS–9	Wildlife biologist GS–9
Wildlife biologist GS–9	Wildlife biologist GS–9	Wildlife biologist GS–9	Wildlife biologist GS–9
Fire management officer GS–12	Refuge complex fire management officer GS–13	Refuge complex fire management officer GS–13	Refuge complex fire management officer GS–13
Administrative officer GS–11	Administrative officer GS–11	Administrative officer GS–11	Administrative officer GS–11
Administrative assistant GS–6	Administrative assistant GS–6	Administrative assistant GS–6	Administrative assistant GS–6
Administrative assistant (term) GS–4	Administrative assistant (term) GS–4	Administrative assistant (term) GS–4	Administrative assistant (term) GS–4
—	—	Outdoor recreation planner GS–11	Outdoor recreation planner GS–11
Fort Peck Field Station			
Station manager GS–12	Station manager GS–12	Station manager GS–12	Station manager GS–12
Assistant station manager GS–9	Assistant station manager GS–9	Assistant station manager GS–9	Assistant station manager GS–9
Biological technician GS–6	Biological technician GS–6	Biological technician GS–6	Biological technician GS–6
—	Outdoor recreation planner GS–7/9	Outdoor recreation planner GS–7/9	Outdoor recreation planner GS–7/9
—	Law enforcement officer GS–7/9	Law enforcement officer GS–7/9	Law enforcement officer GS–7/9
—	Range technician GS–5/6	Range technician GS–5/6	Range technician GS–5/6

Table 6. Personnel to carry out the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Alternative A (Current Personnel)	*Alternative B*	*Alternative C*	*Alternative D*
Jordan Field Station			
Station manager GS–12	Station manager GS–12	Station manager GS–12	Station manager GS–12
Assistant station manager GS–7/9	Assistant station manager GS–7/9	Assistant station manager GS–7/9	Assistant station manager GS–7/9
Range technician GS–6	Range technician GS–6/7	Range technician GS–6/7	Range technician GS–6/7
Sand Creek Field Station			
Station manager GS–12	Station manager GS–12	Station manager GS–12	Station manager GS–12
Assistant station manager GS–9	Assistant station manager GS–9	Assistant station manager GS–9	Assistant station manager GS–9
Assistant fire management officer GS–9	Assistant fire management officer GS–9	Assistant fire management officer GS–9	Assistant fire management officer GS–9
Biological technician GS–6	Biological technician GS–6	Biological technician GS–6	Biological technician GS–6
Law enforcement officer GS–9	Law enforcement officer GS–9	Law enforcement officer GS–9	Law enforcement officer GS–9
Range technician GS–7	Range technician GS–7	Range technician GS–7	Range technician GS–7
Maintenance worker WG–8	Maintenance worker WG–8	Maintenance worker WG–8	Maintenance worker WG–8
Student Career Experience Program student GS–4	—	***Outdoor recreation planner GS–7/9	***Outdoor recreation planner GS–7/9
UL Bend National Wildlife Refuge			
—	Refuge operations specialist GS–9/11	Station manager GS–9/11	Station manager GS–9/11
—	Technician GS–5/6	Maintenance worker WG–6/7	Technician GS 5/6
—	—	Maintenance worker WG–7/8	Maintenance worker WG–7/8
Seasonal Employees			
1 Fire seasonal GS–5	*Fill to meet needs*	*Fill to meet needs*	*Fill to meet needs*
2 Fire seasonals GS–4	*Fill to meet needs*	*Fill to meet needs*	*Fill to meet needs*
11 Fire seasonals	*Fill to meet needs*	*Fill to meet needs*	*Fill to meet needs*
7 Biological technician seasonals GS–3	*Fill to meet needs*	*Fill to meet needs*	*Fill to meet needs*

**GS=General Schedule employee by pay grade; WG=Wage Grade employee by pay grade.*

***Many of the existing staff have expertise and education in range management. They would qualify as range conser vation specialists and could be put into that position series. Monitoring for range health generally involves looking at the dominant community plants, mostly grasses, and determining if they are viable, versus the refuge's wildlife habitat monitoring program, which includes looking at all the plants that comprise the community and ensuring that they are healthy, vibrant, and able to reach maturity.*

****Dependent on Interpretive Center being built at Sand Creek Field Station.*

3.15 Comparison of Alternatives

Table 7 is a summarized, side-by-side look at the actions for each alternative. An analysis of these actions is in Chapter 5–Environmental Consequences; a summary of the expected consequences of the alternatives is in table 56 at the end of chapter 5.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Goal for Habitat and Wildlife Management: Conserve, restore, and improve the biological integrity, environmental health, and ecological diversity of the refuge's plant and animal communities of the Missouri River breaks and surrounding prairies to support healthy populations of native plants and wildlife. Working with others, reduce and control the spread of nondesirable, nonnative, invasive plant and aquatic species for the benefit of native communities on and off the refuge.			
Goal for Threatened and Endangered Species and Species of Concern: Contribute to the identification, preservation, and recovery of threatened and endangered species and species of concern that occur or have historically occurred in the northern Great Plains.			
Goal for Research and Science: Advance the understanding of natural resources, ecological processes, and the effectiveness of management actions in the northern Great Plains through compatible scientific investigations, monitoring, and applied research.			
Goal for Fire Management: Manage wildland fire using a management response that promotes fire's natural role in shaping the landscape while protecting values at risk.			
Habitat—Upland			
Maintain current habitat regime on 65 habitat units through a fire suppression program, use of livestock grazing (mostly annual grazing versus prescriptive), an emphasis on big game, fencing, and water development. Continue current monitoring of residual cover.	Manage for a diverse plant community of highly productive wildlife food and cover plants emphasizing target species. Create these conditions using natural ecological processes (fire management, grazing by wildlife, or flooding) or active management practices (prescriptive grazing, prescribed fire, or agricultural plantings). Within 3 years, develop new HMPs based on field station boundaries and evaluation of needs of target species. Evaluate success through monitoring of residual cover, sentinel plants, and other measures. Use more intensive manipulation to remove junipers for protection of existing trees from wildfire.	Similar to A, except: Manage the present habitat units for improving range conditions for domestic and wild ungulates using NRCS ecological site conditions and guidelines. Manage habitat to support maximum opportunities for wildlife-dependent recreation, and manage for a plant community that is a compromise between wildlife food and cover and livestock forage needs. Within 7 years, develop new HMPs based on soil characteristics, historical fire occurrence, grazing, and field station boundaries. Include fencing for better livestock distribution, water development, rotational grazing, and other management techniques designed to improve range conditions. In cooperation with NRCS, conduct ecological site evaluations on habitat units, monitoring residual cover and sentinel plant species. Continue current monitoring of residual cover.	Promote ecological resilience (where the land can absorb disturbance and still retain its basic function and structure), restore fire-grazing interactions, promote animal movement with long periods of abandonment to reduce plant species selectivity for sentinel species, and increase landscape species and structural heterogeneity. Mimic and restore natural processes and manage for diversity of plant species within the community. Initially use active management such as manipulation of habitats or wildlife populations using food plots, managing water levels, and relocating wildlife; but move toward using more passive approaches such as allowing natural processes such as fire and flooding and using prescriptive grazing. Mimic ecological processes using fire and herbivory (grazing) by wild ungulates or livestock, or both, as prescribed to maintain plant diversity.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Habitat—Upland (continued)			
			Sustain viable populations of plant species that are first to decline when management practices are injurious (sentinel species). When feasible, restore the natural fire regime through an increased use of prescribed fire to increase diversity of all fire-dependent species where necessary to restore natural processes and conditions. Consolidate 65 habitat units into 3–8 units, and develop new HMPs based on soil characteristics and historical fire conditions.
Habitat—River Bottom			
Restore small acreages of bottomlands when funding allows.	Develop and implement an aggressive approach to treating the bottomlands on a prioritized basis. Treatment would include burning and spraying with herbicides to clear invasive plants and planted with wildlife food crops. Increase fencing where needed to exclude livestock from river bottoms except for developed water gaps where necessary.	Rely on partnerships and cooperators to restore river bottoms. Less aggressive timeframe for restoration of river bottoms than under alternative D and would enable economic benefits from crops produced.	More aggressive timeframe for restoration of river bottoms than C; more emphasis on native plant restoration.
Habitat—Riparian Area and Wetland			
Maintain the current stream riparian habitat managed through a fire suppression program, big game emphasis, and livestock grazing, fences, and water development.	Resurvey the health of streams. Over 15 years, remove all reservoir and stock ponds that do not support species of concern (for example, redbelly and finescale dace). Determine if other stock ponds are needed to meet requirements for target species. Restore properly functioning conditions (support productive populations of native fish species) where feasible.	Resurvey the health of streams. Within 10 years, evaluate current stock ponds and determine which ponds need to be rehabilitated or are needed to meet grazing needs. Within 5 years, determine potential of and prioritize selected sites for streambank stabilization; eliminate bank hoof shearing.	Similar to B and C, except: Over 15 years, provide alternate water sources for cattle where prescriptive grazing is required to accomplish habitat objectives away from riparian areas or sensitive areas. Over 15 years, identify locations along riverbanks for stabilization and revegetation and restore 50%–75% of those locations.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Habitat—Riparian Area and Wetland (continued)			
	Identify and prioritize riverbanks in need of stabilizations and revegetation and restore 50% of those locations. Fence out livestock from all riparian areas with the exception of developed water gaps. Use flooding as tool.	Over 15 years on priority streams, restore using a variety of methods that improve water quality and quantity, stabilize stream banks, improved channeling, etc.	Over 15 years, restore natural hydrology to five first-, second-, and third-order streams that would normally flow into the Missouri or Musselshell. Use exclosures in riparian areas. Manage for diversity of plant species within the stream riparian community using natural processes. Study and preserve areas where with longer fire intervals (refugia). Conduct research on site hydrology and restore dynamic hydrological processes where possible.
Habitat—Shoreline			
Continue to combat invasive plants (mostly saltcedar). If Fort Peck Lake levels rise to historical levels, revisit treatment of shoreline areas.	Increase efforts to combat invasive plants through partnerships, etc. Plant native species in treatment areas. Manipulate shoreline by mechanical means as necessary to improve populations of fish, birds, or other wildlife.	Same as A, plus: Work with USACE to ensure access to Fort Peck Lake for recreational activities as lake levels vary.	Same as B, plus: Encourage growth of native vegetation. Enhance opportunities to benefit plovers and terns, and other species of Federal and State concern along the shoreline.
Habitat—Invasive Species			
Continue to use the weed strike team. Continue to update invasive species mapping. Maintain existing invasive species control programs including mapping program of existing and invasive species, biocontrol research project with USDA, releasing of at least two biocontrol agents, weed-seed-free hay requirements. Maintain active bottomland restoration program. Continue partnership to provide free car washes for refuge visitors.	Same as A, plus: Aggressively reduce weeds and replace with native plants. Convert former croplands infested with weeds into food plots >3000 acres. Consider crop rotation in bottomlands. Continue cooperative effort with USACE on saltcedar removal. Emphasize visitor education about weeds and aquatic invasives (for example, zebra mussels) and increase public awareness and enforcement. Consider additional weed-free restrictions for outfitters and permittees.	Same as B, plus: Emphasize visitor education about weeds. Increase public awareness and enforcement. Implement controls and education programs, and increase awareness of the growing problem of aquatic invasives (for example, zebra mussels).	Same as B and C, plus: Evaluate the biological potential and economical feasibility to use more biological control measures when proven safe and effective and less chemical control to reduce weed infestations.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Habitat—Water Resources			
Continue restoring riparian habitat and adhere to standard watershed management practices as funding allows. Continue working with USGS and the State on water quality studies and standards. Maintain and rehabilitate select stock ponds. Continue to cap artesian wells to prevent depletion of groundwater. (Same as B, C, and D.)	Restore water quality for fish and wildlife by addressing soil erosion from overgrazing, roads, or other sources, and contamination from recreational or economic use (for example, excessive livestock use of streams and human use of camping areas). Retain ground cover across the refuge to increase groundwater flow into streams, and reduce runoff and soil erosion and protect riparian corridors. Encourage natural water development within streams such as increased flow, pools, and beaver ponds and artificial water such as dugouts to benefit wildlife populations. Evaluate current and future stock dam needs especially in high functioning watersheds to determine cumulative impacts on stream flow fish and riparian conditions. Evaluate current and future water development on a site-specific basis and consider effects (positive and negative to all resources).	Balance water quality restoration with public use and economic needs. Restore water quality for fish and wildlife by addressing soil erosion from overgrazing, roads, or other sources, and contamination from recreational or economic use (for example, excessive livestock use of streams and human use of camping areas). Retain ground cover across refuge to increase groundwater flow into streams, and reduce runoff and soil erosion and protect riparian corridors. (Same as B.) Encourage natural and constructed water sources for livestock and public fishing and hunting opportunity. Evaluate current and future water development on a site-specific basis and consider effects (positive and negative) to all resources.	Restore water quality for fish and wildlife by addressing soil erosion from overgrazing, roads, or other sources, and contamination from recreational or economic use (for example, excessive livestock use of streams and human use of camping areas). (Same as B.) Retain ground cover across refuge to increase groundwater flow into streams, and reduce runoff and soil erosion and protect riparian corridors. (Same as B.) Reference riparian research and publication for guidance on restoring or improving water quality in identified areas. Assess the needs of current reservoirs and restore historical hydrologic condition of reservoirs no longer needed for livestock or wildlife. Maintain and rehabilitate select stock ponds.
Habitat—Water Rights			
Adjudicate, define, and quantify water rights.	Same as A, plus: Pursue acquiring water rights associated with purchasing in-holdings and obtaining senior upstream water rights only when approached by landowner or current water right holder.	Same as B.	Same as B.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Habitat—Grazing			
Continue to manage 65 habitat units with livestock (1986 EIS). (In 2009, 55 units have active permits.) Retire livestock grazing permits as they become available (i.e., ranch changes ownership, but this would not include generational transfer). Maintain fencing. Gradually move toward prescriptive grazing to manage grazing (defined as use of specific, written directions to achieve a desired outcome) as units become available, and/or habitat evaluations are completed, and action is necessary to meet wildlife or habitat objectives.	Actively work toward reducing livestock grazing permits to only use prescriptive grazing as a management tool to achieve specific habitat or wildlife objectives, or where use of other management tools may not be feasible. Remove livestock grazing from all habitat units that are fenced separately from surrounding lands. Use only prescriptive grazing. Within 4–7 years, prescriptive grazing would be developed for 50%–75% of the refuge. Remove interior fencing where appropriate. Fence boundary to exclude common pastures and allow the Service to affect management treatments to meet wildlife objectives.	Take a passive approach in gradually moving toward a prescriptive grazing program as current grazing permits become available due to a ranch changing ownership (this would not include generational transfer). Up to 50% of the refuge would be under prescriptive grazing. If monitoring reveals that populations of the first-to-decline sentinel plant species for grazing and browsing are not viable, balance reductions in livestock permit numbers and wild ungulates numbers. Consider designating administrative use-only roads for livestock management where appropriate and allowed by policy and laws.	Adopt an active approach to using prescriptive grazing as a management tool (less aggressive than B). Shift from traditional annual permitted grazing to prescriptive grazing to enhance habitats for wildlife. Within 6–9 years, develop 50%–75% of the refuge for prescriptive grazing. If monitoring reveals that the first-to-decline grazing and browsing sentinel plant populations are not viable, initiate changes in livestock permits (reduce AUMs or retire a permit). Remove interior fences to facilitate long-distance animal movements and use of prescribed fire. Fence boundary. Allow for generational transfer to continue under a prescriptive program.
Habitat—Prescribed Fire			
Continue the fire suppression policy. Manage habitat with minimal use of prescribed fire.	Increase use of prescribed fire to enhance wildlife populations and habitat and reduce hazard fuel. Monitor the effects of prescribed fire on the habitat and wildlife populations. Work with partners to address wildland-urban interface areas at the Pines Recreation Area and other USACE recreation areas.	Same as B, except: Use prescribed fire to create a balance between enhanced wildlife habitat and improved forage for livestock.	Use patch burning (burn patches of varying sizes, within historical fire-return intervals, and on a rotation to create a mosaic of habitats) to restore heterogeneity (diversity) within landscapes, preserve fire refugia and associated plant species, enhance food resources for wildlife, and ensure biological diversity and integrity and environmental health. Move toward allowing fire to play its natural role in shaping the ecosystem in adherence with the fire management plan. Monitor the effects of fire on the habitat and wildlife populations. (Same as B.) Work with partners to address wildland-urban interface areas. (Same as B.)

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Habitat—Wildfire			
Continue fire suppression using a management response strategy that evaluates the response to a wildfire based on a number of factors including risks to firefighters, the public, property, and other resources.	Identify and take the appropriate and necessary fire management actions, according to an approved fire management plan and maintain or improve wildlife habitat during a wildfire.	Use aggressive initial attack to minimize economic loss from wildfire. Increase prescriptive grazing to minimize fuel loading.	Using historical fire frequency data, manage naturally occurring wildfire for multiple objectives and implement actions in accordance with an approved fire management plan. Monitor the effects of fire on the habitat and wildlife populations.
Habitat—Climate Change			
Maintain current efforts to reduce the carbon footprint including maintaining a wind turbine, recycling, building energy-efficient facilities, and using energy-efficient vehicles. Consider what conditions precipitated by climate change the refuge may have to deal with: increased drought, longer fire season, hotter fires, loss of plants and animals, increase of other plants and animals, change of migration patterns, and relocation of species.	Same as A, plus: Based on climate change predictions, identify species of plants that are likely to be first to decline; animals that are associated with these plant species including insects, birds, and mammals; and species of plants and animals that would increase. Design science-based long-term monitoring protocols to document changes in plant and animal composition or health due to climate change. Coordinate with adjoining agencies and partners to immediately alleviate the declines (and increases) on sites with appropriate modification of ecological processes (management action) such as herbivory, fire, or flooding. Cooperate with national and international projects to maintain biological diversity, integrity, and environmental health on global basis. Replace all vehicles with fuel-efficient vehicles. Upgrade offices to “green” standards. Install solar panels and wind turbines. Provide recycling bins. Encourage teleconferencing instead of driving, turning off lights, recycling, and turning down heat.	Same as B.	Same as B.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Wildlife—Big Game			
Improve and/or maintain elk, mule deer, pronghorn, and bighorn sheep in good to excellent condition. Continue to manage for 10 mule deer per square mile, 2.5 elk per square mile.	Coordinate surveys and research with MFWP. Manage elk and mule deer populations at highest levels possible without negatively affecting habitat or other wildlife species. Manage harvest levels for herd sex and age ratios similar to unhunted or lightly harvested populations. Monitor pronghorn abundance and distribution. Expand huntable population of bighorn sheep in suitable and unoccupied habitat (east of Timber Creek and south of the Missouri River into the Seven-Blackfoot, Snow Creek, and Hell Creek areas). Determine mountain lion population levels.	Manage elk and deer populations at levels consistent with MFWP objectives and landowner tolerance. Manage pronghorn and bighorn sheep similar to alternative B. Within 10 years, implement a mountain lion hunt if monitoring data shows it is warranted.	Develop cooperative monitoring programs with MFWP for big game populations and habitat by 2015 to establish desired population levels, herd composition targets, and harvest strategies for elk, deer, and bighorn sheep. Determine mountain lion levels and consider harvest if monitoring shows it could be sustained.
Wildlife—Furbearers and Small Predators			
Continue to allow coyote hunting at the start of pronghorn season through March 1. Maintain active predator management by the U.S. Department of Agriculture on a limited basis. Allow no predator hunting or trapping.	Manage predatory species as an important component of the wildlife community. Eliminate active predator management by the U.S. Department of Agriculture.	Increased predator management through an expanded predator-hunting program to benefit economic uses and provide more public recreational opportunities. Consider allowing trapping.	Ensure that the top-down effects of predation on prey species and plant species is a functioning component in restoration of biological diversity, integrity, and environmental health. Eliminate active predator management by the U.S. Department of Agriculture.
Wildlife—Reintroductions			
No new reintroductions. Past reintroductions: black-footed ferrets, prairie dogs, bighorn sheep, and elk (1950s). Turkeys reintroduced by MFWP adjacent to the refuge.	Cooperate with partners on potential reintroductions of black-footed ferrets, swift fox, pallid sturgeon, bighorn sheep, and prairie dogs (if necessary due to plague). Cooperate with State and partners on the potential reintroduction of bison as wildlife in the landscape.	Cooperate with partners on the reintroduction of and expansion of the bighorn sheep population for expanded hunting. Consider no other reintroductions.	Cooperate with partners to restore the biological integrity and ecological processes of the site where practical for reintroduction of extirpated species. Cooperate with the State to consider species reintroductions when the landscape has been prepared and accepted by the public.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Wildlife—Birds			
Maintain habitat to support 30 spring-breeding sharp-tailed grouse per square mile when conditions permit. Maintain riparian areas to benefit waterfowl, kingbird, mourning dove, American kestrel, ring-neck pheasant, and turkey. Improve waterfowl habitat on all suitable ponds. Maintain two peregrine falcon eyries.	Complete a baseline inventory of the relative abundance of birds using the refuge. Establish a monitoring program for at least 75% of the highest priority bird species (top 7–10 species), completing management plans tied to the habitat management program.	Similar to B except establish a monitoring program for 50% of the highest priority bird species. Specifically, look at greater sage-grouse and sharp-tailed distribution and how they are affected by habitat objectives.	Similar to B except establish a monitoring program 90% of highest priority bird species.
Wildlife—Other Wildlife			
Little to no monitoring or management.	Within 2 years, assess the need for baseline inventory plans or research for fish, reptiles, amphibians, invertebrates and small mammals. Prioritize the highest needs (top 7–10) for research, particularly those species that support the habitat-monitoring program. Within 15 years, complete 75%–100% of the highest priority inventory plans.	Similar to Alternative B on monitoring and research. Work with partners to enhance fishing opportunities.	Same as B.
Threatened and Endangered Species and Species of Concern			
Continue to inventory and monitor threatened and endangered species and implement recovery plans. Listed species include black-footed ferret, least tern, pallid sturgeon, and piping plover. The grizzly bear and gray wolf are listed species that occur in Montana, but none are found on refuge. Continue efforts in black-footed ferret recovery including the release of animals, intensive monitoring, and disease and habitat management.	Same as A, plus: Actively manipulate habitats to promote the recovery of threatened and endangered species. In critical habitat areas for select threatened and endangered species, ensure listed species are given highest priority. Develop management plans for the grizzly bear and gray wolf in accordance with Federal and State regulations and plans for management of these species should natural migration to the refuge occur.	Same as B, except: Less intensive manipulation of threatened and endangered species habitat. Balance threatened and endangered species needs with public and economic use needs.	Same as B, except: Protect current listed species/habitat, and work collaboratively with partners to prevent other species from being listed by restoration of biological diversity, integrity, and environmental health throughout the landscape.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Threatened and Endangered Species and Species of Concern (continued)			
No current plan for managing wolves should they migrate to refuge. Work with MFWP and others when reports of depredations by wolves occur around refuge. Continue surveying for State species of concern: mountain plover, least tern, sage-grouse, paddlefish, swift fox, and prairie dogs.			
Goal for Public Use and Education: Provide all visitors quality education, recreation, and outreach opportunities that are appropriate and compatible with the purpose and goals of the refuge and the mission of the Refuge System while maintaining the remote and primitive experience unique to Charles M. Russell National Wildlife Refuge.			
Public Use—Hunting			
Maintain current hunting programs, which includes ungulates, upland birds, and waterfowl is currently allowed. Maintain a limited coyote season. Shooting of nongame species is not allowed. Trapping is not allowed. Shed hunting (collecting antlers) is not allowed. Protect all other wildlife.	Work with MFWP to provide quality hunting opportunities that maintain sustainable populations of big game and habitat for nongame species.	Work with MFWP to provide maximum hunting opportunities and expand the following: —hunting programs to include new species and traditional/niche (primitive weapon) —hunts for young people —mule deer season —predator hunting and allow for trapping	Work with MFWP to provide hunting opportunities that maintain big game and other species at levels that restore biological diversity and integrity, and environmental health. Consider a limited predator hunting and trapping program.
Public Use—Fishing			
Continue to follow State regulations. Continue cooperation with MFWP to regulate paddlefishing.	Provide opportunities for quality fishing that maintains both sustainable populations of game and nongame fish.	Provide increased fishing access to areas not accessible due to changing lake level. Consider permitting vehicular shoreline access to ice fishing in the winter. Stock select livestock reservoirs to create more fishing opportunities. Increase participation by youth and fishing groups.	Cooperate with other agencies and partners to enhance fishing opportunities that maintain game species and other species at levels that restore biological diversity and integrity, and environmental health where possible within the refuge.
Public Use—Wildlife Observation, Photography, and Interpretation			
Maintain elk-viewing areas, trails, auto tour route, and other facilities that provide opportunities for wildlife observation, photography and interpretation to support 40,000 visits.	In 5 years, develop and complete visitor services plan and visitor experience survey; hire one outdoor recreation planner.	In 5 years, develop a visitor services plan and conduct a visitor experience survey; hire two outdoor recreation planners.	In 5 years, develop and complete a visitor services plan and conduct a visitor experience survey; hire two outdoor recreation planners.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Public Use—Wildlife Observation, Photography, and Interpretation (continued)			
	Over 15 years, increase participation in nonconsumptive uses by 5%–10% annually (2,000–4,000 more visits). Over 15 years, increase the quality of and number of facilities by 5%–10% over alternative A. Provide more viewing or photography opportunities by sustaining high populations of wildlife (migratory birds, big game, prairie dogs, etc.). Update existing signage, website and other interpretive media and facilities as needed. (Same as C and D.)	Over 15 years, increase participation in nonconsumptive uses by 20%–50% annually (8,000–20,000 more visits). Over 15 years, increase the quality and number of facilities and programming by 5%–15% over alternative A. Develop new facilities that expand opportunities for wildlife observation and photography. Identify new areas for wildlife viewing. Increase opportunities for ecotourism. Consider ways to encourage more youth to visit the refuge (such as geocaching or other Internet tools). Increase interpretation of paleontological resources.	Over 15 years, increase participation in nonconsumptive uses by 15%–25% (6,000–10,000) more visits. Over 15 years, increase the quality and number of facilities and programming by 10% over alternative A. Provide for opportunities to see a diversity of healthy habitats that sustain the full spectrum of plant and animal species found in the area.
Public Use—Environmental Education			
Maintain limited environmental education programming (for example, school visits and fair booths). Maintain interpretative center, kiosks, and other facilities. Continue to serve as a destination for troubled youth groups.	Expand environmental education program by 5% (program elements identified in the visitor services plan) based on wildlife biology and habitat requirements. Work with additional partners to expand interpretive and educational opportunities.	Expand environmental education program by 25% and focus on threatened and endangered species, reintroduced species and restoration, and aquatic invasives. Increase programming levels for troubled youth groups.	Expand environmental education program by 10% and focus on ecological processes, biological diversity and integrity, environmental health.
Public Use—Opportunities for Visitors with Disabilities			
Continue to provide an accessible blind for persons with disabilities. Continue support for USACE's closure of an area to provide deer hunting opportunities for persons with disabilities.	Same as A, plus: Adaptively manage wildlife-dependent recreation opportunities to meet the needs of visitors with disabilities.	Same as B, plus: Collaborate with other agencies to increase accessibility for wildlife recreation. Provide additional accessible facilities.	Same as B, plus: Upgrade existing facilities to meet current standards for accessibility and increase accessibility where appropriate. Adaptively manage for an aging hunting population.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Public Use—Other Activities in Support of Priority Public Uses			
Continue allowing the following uses: —horseback riding throughout the refuge and all-terrain vehicle use on public roads within the refuge —biking on numbered roads, which include seasonally closed roads —permit public planes to land only on water or ice determined by USACE's plan	Same as A, except: Use adaptive management as various uses increase. Disallow new secondary recreational uses unless it facilitates a wildlife-dependent recreational use.	Same as A, except: Use adaptive management as various uses increase.	Same as C.
Public Use—Access			
(Alternative A only.) Maintain existing refuge roads (670 miles). Keep roads closed in the proposed and designated wilderness. Continue the limited seasonal closure of roads when necessary. Continue to work with USACE on management of boat ramps (In 2009, 9 out of 15 boat ramps have access to water). Rock Creek is only boat ramp under Service jurisdiction. Develop a travel management plan (step-down plan) in cooperation with partners to ensure secured public access. Allow current access to private inholdings to continue.	Similar to A, except or plus: Reduce some existing roads to benefit wildlife populations. If deemed necessary to close 106 miles of road to meet habitat objectives, manage roads and access to promote more harvest opportunities and larger wildlife populations. Promote nonmotorized access, but consider allowing motorized access on existing roads for retrieval only. Restrict access on a seasonal basis to sensitive areas by river and road. Monitor all-terrain vehicle use on numbered trails and manage if document disturbance issues (both wildlife and visitor use). Work with USACE and other agencies to monitor boat use and determine if disturbance is an issue, then work with cooperators and users to manage access to certain areas (for example, harden ramps) to limit disturbance to wildlife along river corridor.	Similar to A, except or plus: Manage access to benefit public and economic use. Consider expanding access (establish new roads) in some areas and closing other areas seasonally, especially in Fort Peck for protection of habitat and to provide a diversity of experience. Improve access to boat ramps. Promote nonmotorized access, but consider allowing motorized access on existing roads for retrieval only. Work within existing policies to allow livestock permittees to manage infrastructure and stock within habitat units. Evaluate creating trails that are open for bicycle use.	Similar to A, except or plus: Manage access to benefit natural processes and habitat. Close 23 miles of road as needed to encourage free movement of animals, permit prescribed patch burning, harvest of wild ungulates, or other activities that contribute to biological diversity, integrity, environmental health, or historical conditions. Work with USACE and other agencies to monitor boat use and determine if disturbance is an issue, then work with cooperators and users to manage access to certain areas (for example, harden ramps) to limit disturbance to wildlife along river corridor. Monitor all-terrain vehicle use on numbered trails and manage if document disturbance issues (both wildlife and visitor use). Continue to restrict bicycles to numbered roads only including seasonally closed roads.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Public Use—Recreation Sites			
Continue allowing camping within 100 yards of roads.	Same as A, except: Use adaptive management as use increases. Manage vehicular camping to fit the use (i.e., paddle-fishing and concentrated camping vs. big game hunting and dispersed camping) and ensure protection of surrounding habitat. Permit backcountry camping.	Same as A, except: Use adaptive management as use increases. Establish new campsites and campgrounds. Look to create designated horse camps and evaluate the need for designating campsites along the lake to meet increased demand and lessen the impact on shoreline habitat.	Same as A, except: Use adaptive management as use increases. Evaluate and address camping needs as use changes on the refuge. Use adaptive management to address camping demand (for example, harden frequently used sites to minimize erosion and impact to habitat). Limit camping to within 100 yards of numbered routes.
Public Use—Commercial Recreation			
Continue to offer 11 outfitting permits for hunting. Commercial outfitting for coyote hunting is illegal.	Permit commercial recreation when it benefits fish and wildlife populations. Develop additional commercial backcountry outfitting permits for hunting that accomplish habitat/wildlife objectives.	Permit commercial recreation when it benefits public or economic use. Increase commercial opportunities and increase the promotion of ecotourism tours and experiences. Increase outfitting permits to the point that they do not impact public hunting.	Only permit commercial recreation when it benefits natural ecological processes or habitats (e.g., allow commercial activities in roadless areas that facilitate big-game harvest to meet wildlife and/or habitat objectives).
Goal for Wilderness: Conserve, improve, and promote the wilderness quality and associated natural processes of designated and proposed wilderness within Charles M. Russell National Wildlife Refuge for all generations.			
Wilderness			
Manage UL Bend Wilderness as class 1 air shed. Within 2 years, submit a final report on the wilderness study to Washington. Follow Service policy to manage proposed wilderness. Evaluate use of all tools in wilderness.	Same as A, except: Over 15 years and on approval by the Department of the Interior, expand proposed wilderness units totaling about 25,037 acres.	Same as A, except: Over 15 years and on approval by the Department of the Interior, eliminate four proposed wilderness units totaling 35,881 acres.	Same as A, except: Over 15 years and on approval by the Department of the Interior, expand six wilderness units totaling 18,559 acres and eliminate three units totaling 26,744 acres.
Goal for Cultural and Paleontological Resources: Identify, value, and preserve the significant paleontological and cultural resources of Charles M. Russell National Wildlife Refuge to connect refuge staff, visitors, and the community to the area's prehistoric and historic past.			
Cultural Resources			
Identify and protect significant cultural resources according to the National Historic Preservation Act and other laws. Identify a sample of homesteads to be protected and interpreted.	Same as A, plus: Create a sensitivity model and conduct surveys in areas with a moderate or high potential for resources. Conduct oral histories to find out about structures.	Same as B, plus: Increase opportunities for ecotourism (nonconsumptive) through tours of historic sites.	Same as B.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Cultural Resources (continued)			
Protect known gravesites. Maintain road closures through sensitive cultural resource areas. Maintain the cultural resource inventory. Provide a brochure about the prehistory and history of the refuge.	Complete a comprehensive cultural resources overview. Identify potential preservation projects; work with partners to find funding and implement. Locate and properly curate collections. Develop additional interpretation materials.	Develop brochures and kiosks that interpret cultural resources. Use more interpretive signs (would not identify specific archaeological resources). Partner with others to identify or stabilize resources.	
Paleontological Resources			
Continue to issue permits to professional paleontologists for the collection, curation and study of the resources. Continue to prohibit recreational digging.	Same as A, except: Work with professional paleontologists to develop a step-down plan for the identification, study, and protection of resources. Increase protection and law enforcement.	Same as A, plus: Promote the creation of documentaries and increase educational opportunities. Consider purchase of inholdings for protection.	Same as A, except: Limit or manage special use permits to protect resources.
Goal for Refuge Operations and Partnerships: Through effective communication and innovative use of technology and resources, the refuge uses funding, personnel, partnerships, and volunteer programs for the benefit of natural resources while recognizing the social and economic connection of the refuge to adjacent communities.			
Refuge Operations			
Continue mineral withdrawal until 2013 and work to renew withdrawal. When possible, continue to purchase minerals on fee acquisitions. Adhere to legal obligation for right-of-way for access to private and State lands (includes right-of-way for oil and gas extractions and development of minerals). Personnel—Maintain current personnel levels. Equipment and facilities—Maintain current number of facilities and equipment. Maintain agreements with USACE and cooperate to acquire jurisdiction around the lake to enforce regulations.	Same as A, plus: Personnel—Increase personnel by adding an outdoor recreation planner and additional full-time law enforcement officer and fire specialist on the east end of the refuge, and an assistant manager at Jordan Field Station. Equipment and facilities—Same as A. Land acquisition—Acquire inholdings from willing sellers. Minerals—Same as A, plus seek permanent withdrawal of all minerals, including oil and gas and other leasable and saleable minerals on all refuge lands and future acquisitions.	Same as A, plus: Personnel—Increase personnel by adding an outdoor recreation planner at Fort Peck Field Station and Lewistown Field Station, a full-time law enforcement officer on the east end of the refuge, an assistant manager at Jordan Field Station and manager at UL Bend refuge, and two maintenance positions and a fire specialist on the east end of the refuge. Equipment and facilities—Expand facilities at Jordan Field Station and more office space at Jordan and Sand Creek field stations. Land acquisition—Same as B. Minerals—Same as B.	Same as A, plus: Personnel—Increase personnel by adding an outdoor recreation planner at Fort Peck Field Station and Lewistown Field Station, a full-time law enforcement officer on the east end of the refuge, an assistant manager at Jordan Field Station and manager at UL Bend refuge, and two maintenance positions and a fire specialist on the east end of the refuge. Equipment and facilities—Expand facilities at Jordan Field Station and more office space at Jordan and Sand Creek field stations. Land acquisition—Same as B, plus look to facilitate exchange of State lands within boundary where feasible. Minerals—Same as B.

Table 7. Comparison of actions for the CCP alternatives for Charles M. Russell and UL Bend refuges.

Alter-native A—No Action	*Alternative B*—Wildlife Population Emphasis	*Alternative C*—Public Use and Economic Use Emphasis	*Alternative D*—Ecological Processes Emphasis (Proposed Action)
Partnerships—Land Management			
Maintain existing working relationships and outreach with private landowners and land managers. Examples of landscape management include wildlife movement, habitat management, travel planning, fire suppression, bison, oil and gas lease, and other species of concern (sage-grouse and pronghorn).	Same as A, plus: Emphasize wildlife populations. Emphasize working relationships and outreach with private landowners and land and wildlife managers to improve management of land and wildlife across boundaries. Consider impacts of management actions that affect landscapes within and outside refuge boundaries. Look for opportunities to exchange, consolidate and/or obtain habitat.	Same as B, except: Emphasize public and economic uses. Look at landscape-scale management of all ungulate species in and around refuge to benefit all wildlife species and promote private conservation easements to benefit species diversity and ecological integrity.	Same as B, except: Emphasize habitat and ecological processes. Look at landscape-scale management of all wildlife species in and around refuge to benefit wildlife diversity and health work with local landowners to promote private conservation easements and/or conservation incentives to benefit species diversity and ecological integrity.
Partnerships—Collaboration			
Maintain existing partnerships as described in chapter 3: —Federal agencies —MFWP and DNRC on wildlife and habitat management and other State agencies —Conservation districts, county commissioners, fire wardens, weed districts, fire districts, and sheriff departments —Nongovernmental organizations —Adjacent private landowners and local communities Continue to work with partners to promote the refuge as an ecotourism destination.	Same as A, plus: Revisit partnerships and adapt as needed based on new management direction. Work with the USACE on lands that could be transferred to the Service for primary jurisdiction. Pursue additional opportunities for joint management of fire suppression, prescribed fire, and habitat manipulation. Explore land exchange opportunities as they become available (e.g., State, BLM, private, nongovernmental organizations). Develop a road management plan (Federal, State, and county). Look for additional partnerships and money to support increased invasive species control. Develop a friends group.	Same as B, plus: Develop partnerships with the Chamber of Commerce and State tourism board. Work with these and other partners to highlight refuge resources through promotional materials. Work with nongovernmental organizations interested in developing ecotourism opportunities. Develop additional partnerships with various sporting organizations that would support public uses (e.g., Mule Deer Foundation). Explore additional commercial activities such as guided fishing and hunting. Establish more detailed agreements with the fire district for fire suppression. Develop a friends group and expand volunteer groups and provide staff to manage.	Same as C, plus: Revisit partnerships and adapt as needed based on new management direction. Work with the USACE on lands that could be transferred to the Service for primary jurisdiction. Pursue additional opportunities for joint management of fire suppression, prescribed fire, and habitat manipulation. Explore land exchange opportunities as they become available (e.g., State, BLM, private, nongovernmental organizations). Look for additional partnerships and money for increased invasive species control. Work with these and other partners to highlight refuge resources through promotional materials.

4—Affected Environment

This chapter describes the characteristics and resources of the refuge and how existing or past management or influences have affected these resources. It specifically addresses the physical environment, biological environment, special land designations, recreational opportunities, cultural and paleontological resources including a history of human use on the site, and the socioeconomic environment. Service data and other information, both published and unpublished, was used to quantify what is known about refuge resources. Additionally, other sources were used including data and information from other agencies or other scientific studies.

4.1 Topics Not Analyzed Further

The affected environment describes those portions of the natural and human environment that could be affected by implementing any of the management alternatives. The following topics or species were dismissed from further consideration because there would be no effects, or effects would be negligible or not detectable, as discussed below.

MOOSE

Moose have occasionally been observed on the refuge, often young dispersing bulls from central Montana mountain ranges or southern Canada. Although there are substantial willow communities in the Missouri River floodplain, the area is generally not considered suitable moose habitat. Nonetheless, in recent years moose appear to be expanding their range in portions of eastern Montana and in many places in the North Dakota prairies, and could potentially extend their range onto the refuge, but currently they are not a common species on the refuge.

BLACK BEAR

A few black bear sightings have been reported on the refuge over the years, but none have become established residents and the Missouri River Breaks are not considered suitable black bear habitat.

USFWS

The elk-viewing area is popular, particularly during the fall months.

4.2 Physical Environment

The following sections discuss the physical environmental resources that could be affected by the implementation of the CCP. Physical characteristics include climate, air, visual resources, soundscapes, geography, soils, and water resources.

CLIMATE

The climate of the refuge region is typical of the high plains in North America with moderately cold winters (average January lows are near 0 °F) and occasional cold periods exceeding –20 °F. Summers are generally pleasant (averaging in the 80s during afternoon hours) with occasional hot periods exceeding 100 °F. Low humidity, high temperatures, and moderate to strong winds cause rapid loss of soil moisture. Mean annual precipitation is 12–13 inches with about 70 percent occurring from April–September. Due to the dominantly heavy-textured soils, runoff is rapid, often exceeding 50 percent of the total precipitation. The average frost-free period is about 120 days. The refuge is also subject to intense lightning storms from late July to early September, often resulting in wildfires.

Climate Change

In 2001, the Secretary for the Department of the Interior issued Secretarial Order 3226 (DOI 2001) requiring Federal agencies under its direction that have land management responsibilities to consider potential climate change effects as part of long-range planning endeavors. Recently, this order was replaced by Secretarial Order 3289 (DOI 2009). It left intact many of the planning requirements of Secretarial Order 3226, reiterating the need to analyze climate change effects but made organizational changes to enable the bureaus and agencies to fulfill the planning requirements (refer to Chapter 1–Introduction).

The U.S. Department of Energy report, "Carbon Sequestration Research and Development," concluded that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere (U.S. Department of Energy 1999). The report defines carbon sequestration as "the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

The increase of carbon dioxide (CO^2) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as "global warming." In relation to comprehensive conservation planning for Refuge System units, carbon sequestration constitutes the primary climate-related effect to be considered in planning. Vegetated land such as what occurs on the refuge is a tremendous factor in carbon sequestration. Large, naturally occurring communities of plants and animals that occupy major habitats—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and in acting as biological "scrubbers" of atmospheric CO^2.

Recently, the U.S. Global Change Research Program released a comprehensive report (Karl et al. 2009) synthesizing information from a wide variety of scientific assessments regarding what is known about the observed and projected consequences of climate change in the United States. Global temperatures are expected to rise at least 1 degree Fahrenheit over the life of the CCP. In the Great Plains, temperatures could increase more by 2–4 °F. Additionally, there could be increases in both evaporation and drought stressing limited water supplies. Invasive weeds would likely increasingly compete with native vegetation on rangelands (Karl et al. 2009). Precise estimates of how climate change would affect the refuge are not known.

AIR QUALITY

The UL Bend Wilderness is a class I air quality area, and receives special protections against air pollution under the Federal Clean Air Act. The refuge is a member of the Interagency Monitoring of Protected Visual Environments (IMPROVE) network, a cooperative program of Federal and State agencies whose primary purpose is to protect visibility in class I areas and to characterize regional haze. This program was established to aid in the implementation of the 1977 Clean Air Act goal of preventing future and remedying existing visibility impairment in class I areas (national parks, wilderness, and wildlife refuges). At the UL Bend refuge, a monitoring station filters the air every third day, collecting fine particles in three modules and larger particles in one of the modules. The filters are changed on a weekly basis and sent to a laboratory in Davis California where the data is analyzed. The lab looks at visual obscurity due to particulate matter and long-term trends of 50 years or more. The laboratory was not able to provide information as to whether the UL Bend monitoring site had ever exceeded class I standards (Jose Mojica, Crocker Nuclear Laboratory; personal communication, December 2, 2009).

Prescribed fires are conducted under strict smoke and air regulations as established by the Montana/Idaho Airshed Group. The purpose of this group is to reduce the effect of particulate matter within specific air sheds throughout the two States. The group was formed in 1978 and all prescribed fires conducted on the refuge have met permitted requirements. The refuge is assessed a fee based on tons of particulate matter produced by prescribed fires.

VISUAL RESOURCES

The National Environmental Policy Act requires that measures be taken to "assure for all Americans … aesthetically pleasing surroundings." Visual resources are those qualities of the resource that often inspire people and contribute to their overall experience. There are several land designations found on the refuge that are intended to preserve or even capitalize on the refuge's scenic values. These include the Wild and Scenic River designation along the western boundary, the Lewis and Clark historic trail along the entire Missouri River, and the designated and proposed wilderness designations. There are sweeping views of the prairie, forested coulees, deep river canyons, broad mesas, badlands, and river bottoms. Throughout its human history explorers, writers, photographers, and visitors have penned, photographed, or painted vibrant descriptions of the refuge's abundant wildlife resources and its rugged and picturesque scenery.

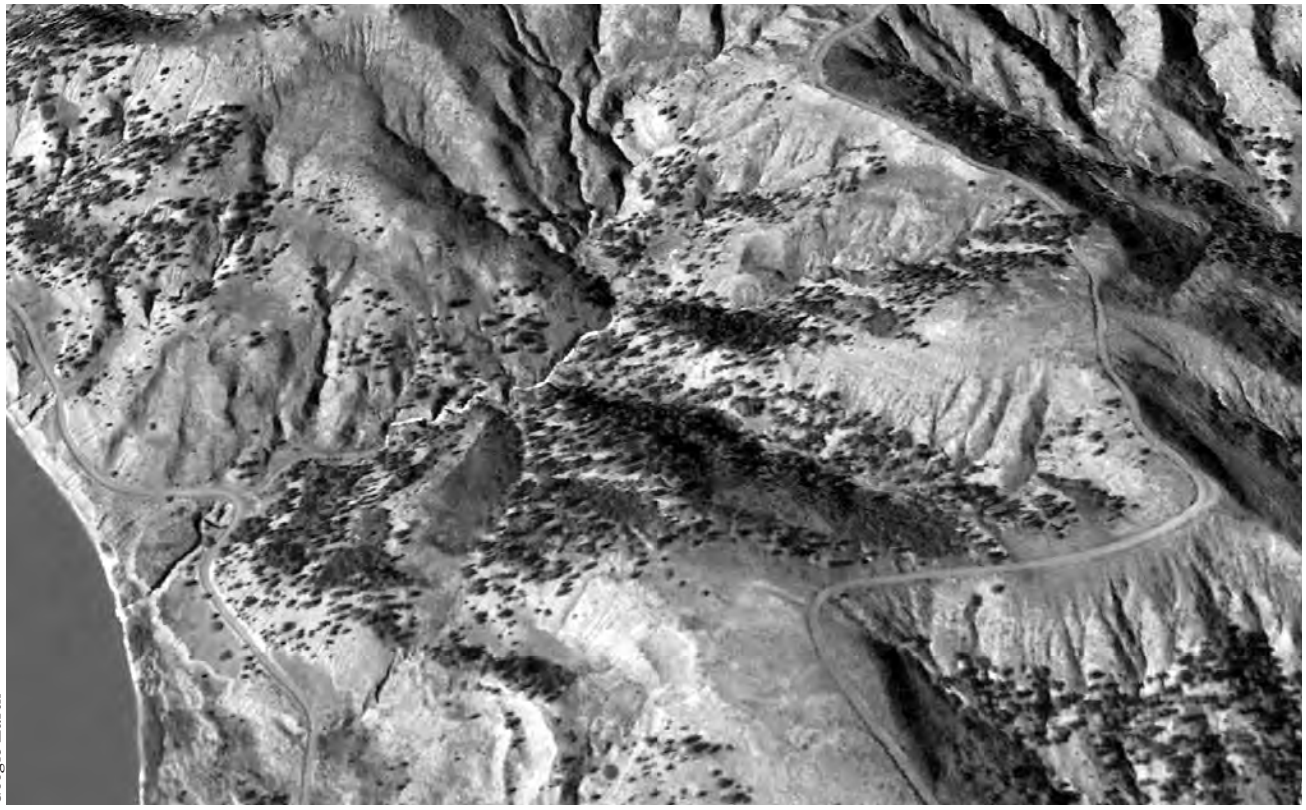
Three categories were used to address potential effects on visual resources: (1) facilities and structures such as roads, buildings, fencing, and developed areas; (2) management activities like livestock grazing, including the use of water impoundments and use of prescribed fire or other activities; and (3) other indirect factors like wildfires, drought, and invasive species. These categories are also addressed in greater detail later in this chapter under other topics, and only the visual aspects are addressed here.

Facilities, Structures, and Developed Areas

Roads, buildings, and developed camping areas provide access and amenities, but potentially affect the visual resources.

Roads. The refuge covers a vast remote area with about 670 miles of road that crisscross the refuge and provide vehicle access that would otherwise only be accessible by foot or horseback (refer to access under visitor services in section 4.4 below). A road borders several of the proposed wilderness units as boundaries were often drawn around roads. The majority of the refuge's roads are primitive, nongraveled roads that are inaccessible during wet periods; nonetheless, refuge roads are highly visible in some areas, particularly from bluffs, ridges, and other viewpoints as the aerial photo below shows. In places, roads have become heavily rutted and braided, which potentially degrade scenic and resource values.

In 2009, the Wilderness Society conducted a spatial analysis (The Wilderness Society 2009) assessing the visibility of roads on the refuge from various distances ranging from 0.25 mile to 10 miles. Using Geographic Information System (GIS) software, points were plotted along refuge roads to assess how visible a road could be from any location on the refuge. Figures 12 and 13 show the potential visibility of roads from a distance of 1 mile and 3 miles. Although this was a modeling exercise and may not represent the actual visibility from all locations, the analysis



Google Earth

Roads often follow ridges, bottomlands, and drainages.

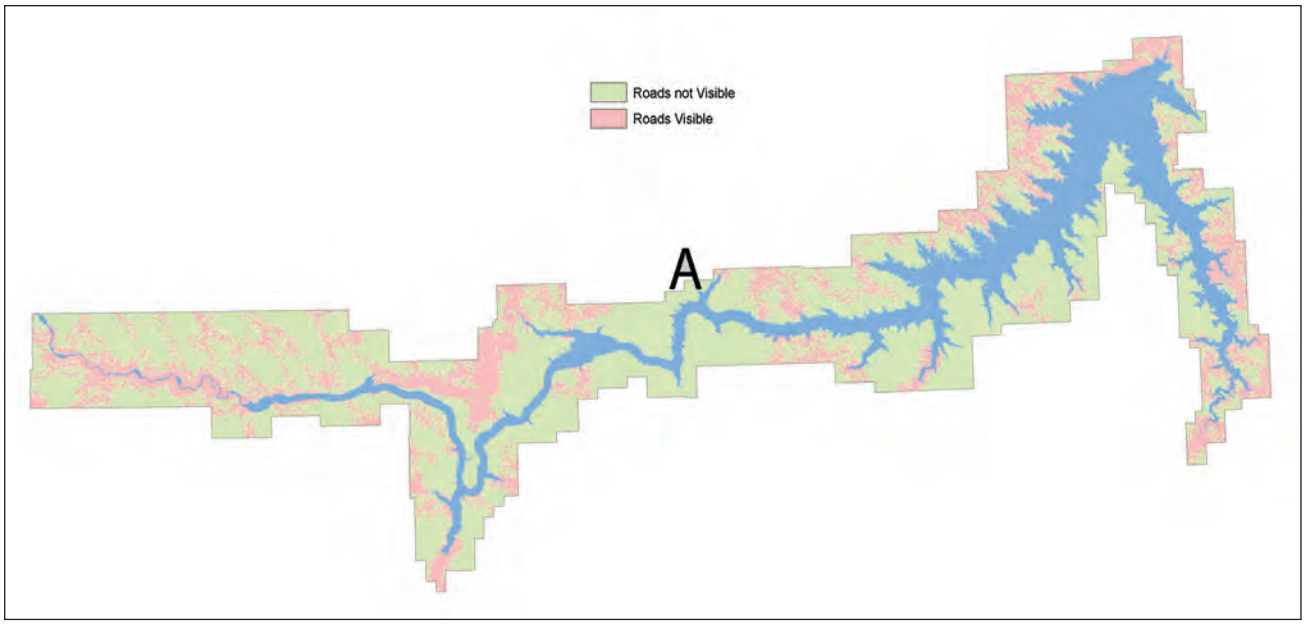
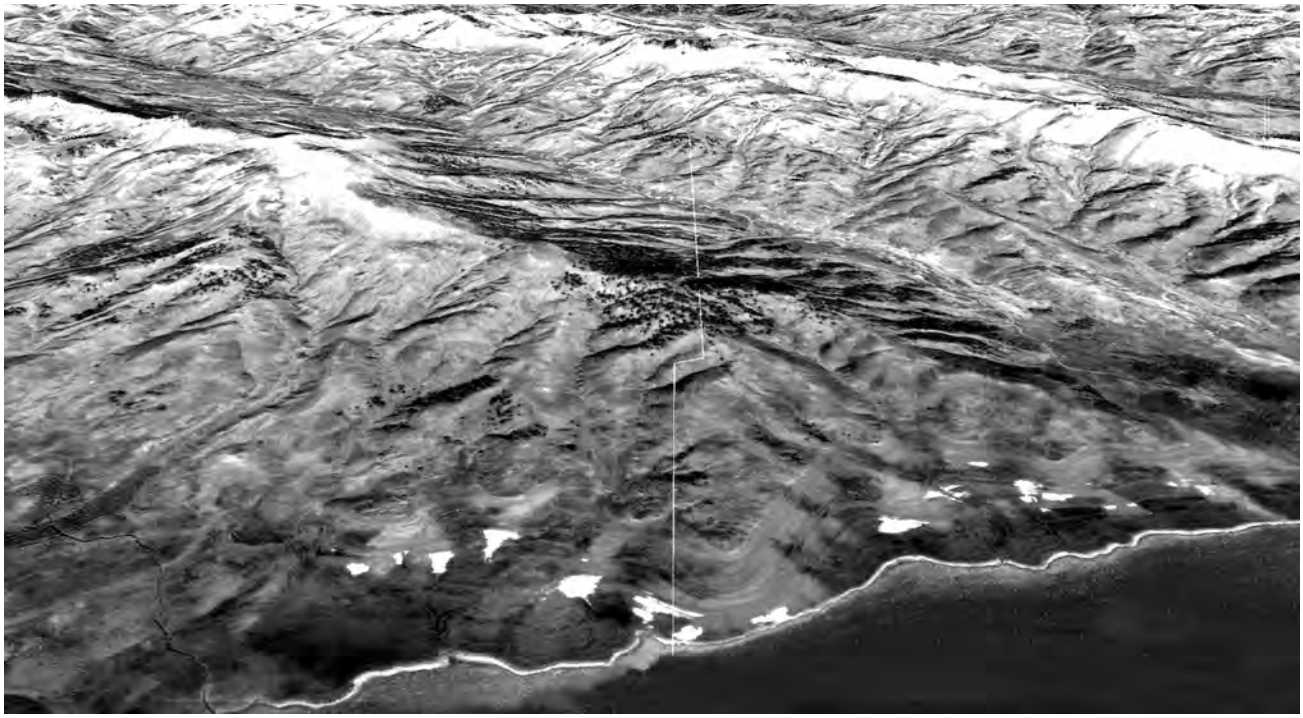


Figure 12. Map of potential visibility of roads at 1 mile along the Charles M. Russell and UL Bend refuges. Pink indicates that roads are likely to be visible and green indicates roads are less likely to be visible.

is instructive in showing where road density is lowest with fewer visible roads versus where road density is highest and roads are more visible. The aerial photo provides an overview of the area marked as "A" in figure 12, which has some of the least road density on the refuge. Several proposed wilderness units are located adjacent to this area.

Roads are likely more visible from further away than close in to the resource (for examples, ridges and viewpoints). Figure 14 summarizes the number of road segments that are likely to be visible from various sight distances across the refuge including nonwilderness and wilderness.

Other Facilities and Structures. Fencing is used across the refuge to fence livestock pastures including common pastures with BLM, riparian areas, and for delineating the refuge boundary (refer to uplands


Google Earth

An aerial photograph shows the low density of roads in a wilderness unit. (Near the same area marked as "A" in figure 12.)

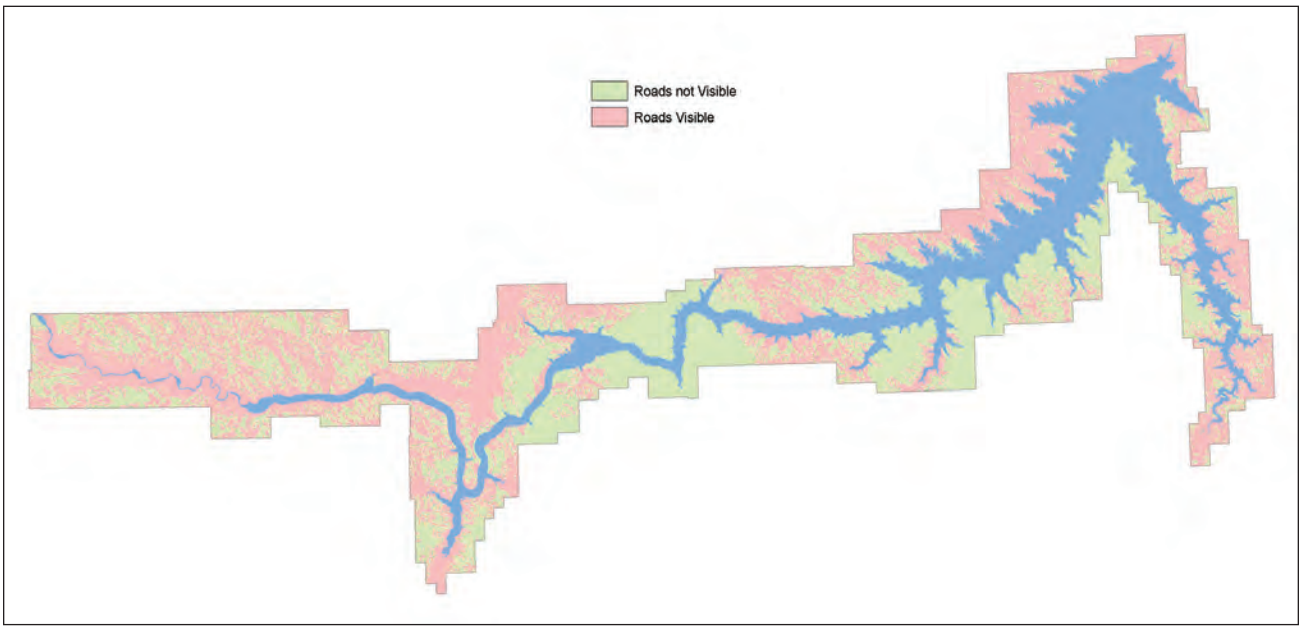


Figure 13. Map of potential visibility of roads at 3 miles along the Charles M. Russell and UL Bend refuges. (From further away, roads could be more visible.)

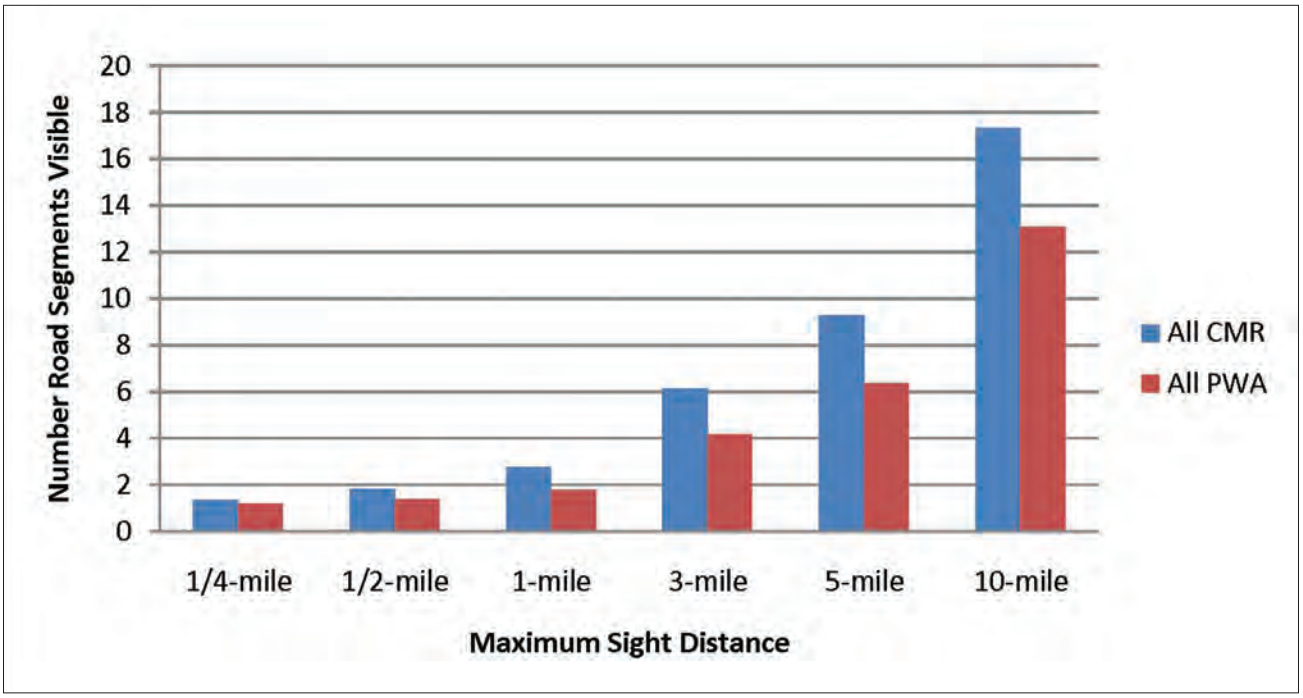


Figure 14. Chart of the number of road segments visible across the Charles M. Russell and UL Bend refuges and from proposed wilderness units.

in section 4.2 below). In addition, there are a few ungulate exclosures for monitoring purposes. Refuge fences are typically a three-strand wire with a t-post and commonly found throughout the west. The ungulate exclosures are wire fences approximately 8 feet high. Although refuge fencing is generally unobtrusive and not visible from any great distance, in places, it could potentially affect view in the foreground (for example, a photographer who was photographing wildlife could have a fence visible in the picture in some locations, whereas in a landscape photograph, a fence would be less visible).

The developed areas (both USACE and Service) are generally found along the Missouri River and Fort Peck Reservoir and are associated with boat ramps, roads, and campsites. Some are visible from ridges and other viewpoints, but generally, they are small with few facilities and are scattered along 134

miles of river. The east end is more developed. A few of the existing proposed wilderness units directly border or are near one of USACE's developed recreation areas (for example, Crooked Forchette, and Hell Creeks). The Service does not have primary jurisdiction over the USACE developed areas, and these are not analyzed further. The camping areas that the Service manages are primitive, consisting of camping area and a vault toilet (see figure 15). Additionally, there are a number of historic homesteads found across the refuge; these are unobtrusive and are slowly fading into the landscape, or even add to the view. There are several areas with Service buildings across the refuge, including Sand Creek Field Station, UL Bend, and Fort Peck Field Station, and they make up a small footprint.

Management Activities

Habitat and wildlife management practices or other public use activities can also affect visual resources. Sanderson et al. (1986) looked at the effect that intensive management activities on public lands have on scenic beauty and recreational activities. They found some recreationists placed a great emphasis on the visual qualities while others did not. They also found that dispersed recreationists do perceive differences in visual resources. In addition, perception about visual qualities differs among subgroups of recreationists.

Livestock Grazing on Wilderness and Nonwilderness Lands. Livestock grazing occurs across much of the refuge, but due to changes in ranch ownership, or because there were never AUMs allocated, some areas are not currently grazed (for example, most of UL Bend refuge). Grazing occurs in some but not all of the proposed wilderness units. Some areas are grazed more heavily than others (see figure 16). Artificial water impoundments are also scattered across the refuge. Livestock are fenced out of some riparian areas along the Missouri and Musselshell Rivers, but in other riparian areas it is difficult to keep cattle out (for example, Big Dry Arm). Livestock congregate along water resources on the refuge, and monitoring has shown many of these areas to be degraded both in the biological and physical sense (refer to riparian areas and wetlands in section 4.2 below).

A number of studies have looked at visitor perceptions about livestock grazing on public lands, specifically how grazing relates to visitor experiences. Johnson et al. (1997) surveyed more than 1,000 visitors from different backgrounds to five wildernesses in Colorado and Utah. The proportion of visitors who accepted livestock grazing in wilderness and on public lands (43 percent) was similar to the proportion to those who considered grazing unacceptable (40 percent). However, a majority of visitors surveyed reported that direct encounters and livestock impacts detracted from their wilderness experience. Wilderness visitors were more tolerant of grazing on nonwilderness public lands if properly managed to protect ecosystems like riparian areas. Many visitors made their judgments on issues related to what they observed. Mitchell et al. (1996) found varying attitudes from users in the Uncompahgre National Forest in Colorado. They concluded that as long as livestock are kept out of developed campgrounds and adjacent riparian areas used for fishing and dispersed camping, visitors to those locations are likely to be less offended by livestock grazing. Brunson and Gilbert (2003) found differences in the type of visitor seeking recreational experiences along with demographic characteristics. Hikers were more likely than hunters to have negative opinions about livestock management in a protected area, but hunters were more likely to report seeing moderate to heavy vegetation impacts as they were more likely to venture off trails. Sanderson et al. (1986) examined the effect of grazing intensity on scenic quality and found that anglers were the most vocal in responding to management activities that had a negative effect on riparian habitat. Similar to the study by Brunson and Gilbert (2003), they also found that the visual effects of livestock grazing did not bother hunters as long as it did not affect their chances for success.

Prescribed Fire. Very little prescribed fire currently occurs on the refuge (refer to prescribed fire under vegetation in section 4.2 below). Fire management is a significant issue in this planning process and one that could affect visual resources. Several alternatives would increase the use of prescribed fire. This topic is described in detail under vegetation.

Following Service policy (FWS 2000b), the Service uses prescribed fire in accordance with fire management plans and have appropriate approvals. Smoke management is always a concern in using prescribed fire, and planning for prescribed fires requires notification to local and State agencies (refer to air quality above). Substantial planning occurs in advance of a prescribed fire to limit the effects to visual resources (FWS 2000b) and to notify local agency officials. Prescribed fire is used to reduce vegetative litter and improve the vigor and health of plants, thus improving scenic values.

Airplanes and Motorboats

Although the visual sight of airplanes and motor boats could negatively affect some users, information about the aircraft and motorboat use is described under soundscapes below and under Access later in this chapter.

back of Figure 15 west

INSERT 11x17
Figure 15 west

INSERT 11x17
Figure 15 east

INSERT 11x17
Figure 16 west

INSERT 11x17
Figure 16 east

blank back of Figure 16
east

Other Conditions Affecting Visual Resources

Invasive species, severe drought conditions, and wildfires are other factors that potentially affect the refuge's scenic values. Saltcedar infestations along the shoreline of the large rivers are pervasive. The USACE conducts treatment below the high-water mark, but infestations move into the upland areas. Some former agricultural areas (river bottoms) have been heavily infested with invasive plants (refer to discussion under vegetation).

Wildfires, generally lightning-caused, occur frequently across the refuge during the summer months (refer to wildfires under uplands in section 4.2 below). At times, there has been significant visible smoke during large wildfires, most recently during the large fires in 2003 and 2006.

SOUNDSCAPES

A soundscape refers to the natural acoustic environment consisting of sounds such as wildlife vocalizations and weather events. The disruption of natural sounds can affect visitors and wildlife. An important quality of the refuge as identified by the public and staff is the opportunity to experience a remote recreational setting not available in other places (refer to Chapter 2–Refuge History and Vision). A tangible and intangible aspect of wilderness is maintaining soundscapes, whereby solitude is enhanced by the absence of distractions such as unnatural noise (FWS 2008d). Although the refuge is considered remote, there are a number of sources of noises found on the refuge that could affect a visitor's experience including:

- Motor vehicles including four-wheel drive vehicles, ATVs, quadricycles, and snowmobiles.
- Management activities associated with developed areas such as camping areas, restoration projects, and equipment.
- Motorboat activity on Fort Peck Reservoir and the Missouri River.
- Airplanes.
- Military overflights (This issue is outside the scope of this CCP and EIS and is not discussed further. Refer to Chapter 1–Introduction for more information.)

Motor Vehicles

Most vehicle access occurs during the summer and fall months with most activity occurring during the hunting season. Snowmobiles are allowed on the frozen surface of Fort Peck Reservoir during the winter. All vehicles must be licensed to travel on refuge roads, and under Montana law noise emissions cannot exceed 96 decibels for all off-highway vehicles including snowmobiles.

Management Activities and Developed Recreation Areas

Activities associated from management activities and other recreation include equipment (such as generators), tractors, chain saws, and other machinery. Few of the proposed wilderness units are in close proximity to developed areas or bottomland restoration areas.

Motorboats

From the refuge's western boundary to the Fred Robinson Bridge, the Missouri River is designated as a unit of the Upper Missouri National Wild and Scenic River. Travel is limited upstream of the bridge from June 15 through September 15. Downstream travel is restricted to idle speeds only with no wake from Thursday through Saturday, and no motorized boats can travel downstream to the bridge on Mondays and Tuesdays.

As with motor vehicles, Montana law limits noise emissions for motor boats (less than 86 decibels).

Within the next few years, the Service will be initiating a study to assess the amount of boat use that occurs along the Missouri River, particularly during hunting season. The Service believes that more hunters are accessing the refuge from the river, but there is not enough information to assess the effects, if any, on wildlife populations.

© Diane Hargreaves

Restrictions are in place on motorboats, which limits impacts to soundscapes, along the wild and scenic river portion of the refuge.

Airplanes

Aircraft can only land in designated landing zones in accordance with the USACE and the refuge's seaplane landing plan (USACE 1995). There are no landing zones or landing areas west of Crooked Creek, but some landing zones and areas border or are near edges of proposed wilderness units (for example, Crooked Creek, Forchette, and Bone Trail). Landing zones are located near USACE developed recre-

ation areas. In addition, there are a number of other landing areas on Fort Peck Reservoir. The number of aircraft flying over the refuge on an annual basis is unknown.

Hunting

Nearly 100,000 hunters participate in hunting every year on the refuge including big game, small game, and migratory birds (refer to socioeconomic analysis in chapter 5). Gunshots could potentially be heard. The distance that any weaponry could be heard varies greatly with the terrain and other factors.

LAND FEATURES, SOILS, and GEOLOGY

Many of the topographical and water sources in this section are identified on figure 15. The Missouri and Musselshell Rivers flow through deep valleys with narrow floodplains lying 500 to 1,000 feet below the average elevation of surrounding uplands. Elevations vary from slightly over 2,000 feet above mean sea level near Fort Peck Dam to over 3,200 feet in the Seven Blackfoot area (see figure 15). Three main landforms—uplands, breaks and floodplains dominate the refuge and surrounding area.

Uplands are level to rolling prairies dissected by intermittent streams flowing toward the Missouri River in a generally eastward direction. These are the sagebrush-grassland plains typical of eastern Montana.

The breaks lying adjacent to the Missouri River are typified by rough terrain often culminating in spectacular badlands. Badlands are arid, eroded land "breaks" of uplands that are dissected into steep slopes and grassy floodplains. This topography along the Missouri River varies from low, barren hills of the Big Dry area south of Fort Peck to severely eroded coulees of the scenic Seven Blackfoot and Burnt Lodge areas and the juniper, pine, and grassland ridges on the western half of refuge. Approximately 40–50 percent of lands within refuge consist of steep ridges and eroded coulees.

Floodplains occur along the Missouri and Musselshell Rivers at upper extremities of Fort Peck Reservoir and along some of the larger drainages. These developed from pre-glacial river and stream alluvium and are characterized by heavy clay soils, deciduous trees, sagebrush, and grassland. These floodplains are comparatively flat and vary in width from 25 yards to 2 miles.

The Judith River formation outcrops west of Rock Creek in Phillips County in major stream valleys. It is composed of several hundred feet of interbedded shale, siltstone, and sandstone with scattered beds of lignite and bentonite. This formation has good stability, but its outcrop area is limited to steep slopes.

Bearpaw shale underlies more of refuge than any other formation. The breaks west of UL Bend refuge are almost entirely composed of this shale as are lower slopes east of UL Bend, except in the central and southern parts of Big Dry Arm. Bearpaw shale is almost entirely composed of dark gray, clayey shale and includes thin beds of bentonite. The predominant particle size of this formation is clay, and the predominant clay mineral found in Bearpaw shale is montmorillonite. As a result, this unit swells when exposed in steep slopes and erodes rapidly at many locations.

Fox Hills sandstone is composed of yellowish gray sandy shale, claystone, siltstone, and/or very fine-grain sandstone and grades upward into relatively thick beds of resistant fine and medium-grain yellowish brown sandstone. This formation is generally found in areas of high relief along Fort Peck Reservoir such as Larb Hills, Harper Ridge, and much of Garfield County. Along Big Dry Arm, Fox Hills sandstone is found south to Rock Creek (east).

The Hell Creek formation is generally found above 2,500 feet in elevation in the central and eastern parts of refuge. It is composed of unconsolidated fine sediments such as claystone, shale, siltstone, and sandstone. Some of the clay and silt-rich zones of the formation tend to shrink and swell during excavation or when exposed to water. The Fort Union formation is found in Garfield and McCone Counties, east and west of Big Dry Arm and south of Rock Creek (east). It is also found in the highest parts of Larb Hills. Tullock member, most widely found subunit of the Fort Union formation of refuge, is light gray to dark gray shale alternating with sandy shale and gray to buff sandstones. Lignite beds are also found in association with this member. This formation responds similarly to the Hell Creek formation to most development activities.

Glacial till is found at scattered locations, particularly between Rock Creek (west), Phillips County, and Valentine Creek. This is dense, clay-like material with characteristics similar to Bearpaw shale. Outwash and related deposits are found west of UL Bend on low benches and in the Missouri valley, in the lee of bedrock ridges. These latter deposits are porous and stable.

Exposed rock found on the refuge dates to almost 80 million years bp (before present) or Late Cretaceous. Sedimentation dominated the area until about 58 million years bp. For the next 55 million years, sediments were successively eroded away as the plains and surrounding areas were sporadically uplifted. In the past 3 million years, glaciers advanced over the area, the most recent retreating northward about 20,000 years bp.

Ice jams caused the highest levels of flooding on major streams such as the Missouri River, Big Dry Creek, and Musselshell River. Snowmelt runoff causes the greatest flood flow volumes on these

same streams. High flows can occur on these streams any time from January to August. Rainstorms cause major flooding on smaller drainages.

All stream channels flowing through unconsolidated material meander over time. The Missouri River upstream of Fort Peck Reservoir has shifted as much as 2,000 feet over about 65 years, at average rates up to 30 feet per year. The Fort Peck Reservoir delta is the area of greatest channel change and sedimentation; other areas of channel change and bank erosion are found on most upstream portions of most stream bottoms.

Areas of current and past landslide activity cover about one-third of the surface area of the refuge. Steeply sloping areas in the western Bearpaw breaks, Garfield County, Larb Hills, and Harper Ridge have the most significant number of landslides. Landslides are of several types; slump-earth flows are the most common. Rapidly moving debris flows also occur, especially in the western Bearpaw breaks. Piping is an important erosional process in the Hell Creek formation and in landslide deposits. Pipes may collapse or create general ground instability.

There are no known gravel deposits on the refuge. Gravel used for road improvements in the Hell Creek area was hauled a considerable distance, making transportation costs a significant issue for future road improvements. Results of a mineral report (BLM 1990) indicate that parts of the area have a low to moderate bentonite potential and low diatreme gem potential. These located minerals have no economical mineral potential. The mineral estate was withdrawn in 1993 (Public Land Order 6997) for 20 years on the Charles M. Russell refuge and was permanently withdrawn on the UL Bend refuge in 1970 (Public Land Order 4826). There is no oil or gas development occurring on the refuge.

WATER RESOURCES

Water resources on the refuge include large rivers like the Missouri and Musselshell Rivers and many smaller streams and tributaries many of which are intermittent. In addition, there are livestock ponds scattered across the refuge (see figure 15).

Hydrology

The watershed of the Missouri River defines the Charles M. Russell and UL Bend refuges. The river and its tributaries create a series of badlands or "breaks" consisting of rolling uplands, steep bluffs, and grassy floodplains. The river flows easterly through the refuge, with average mean daily discharge of 8,915 cubic feet per second (cfs) at the entrance of refuge (USGS station Missouri River near Landusky, Montana, No. 06115200). Peaks at this site since 1934 have ranged from 8,460 cfs (2000) to 137,000 cfs (1953). The Missouri River leaves the refuge below Fort Peck Dam with an average mean daily discharge of 9,284 cfs. Peaks since 1934 have ranged from 7530 cfs (1958) to 51,000 cfs (1946). The river itself flows about 300–500 feet below the refuge's uplands.

Upland areas on the refuge are drained by perennial (flows generally 90 percent of the time), intermittent (flows during wet months, generally only 50 percent of the time), and ephemeral (flow only in response to storms) streams. The channels are deeply entrenched with floodplains being 15–20 feet above the water during low water/dry periods, and exhibit steep gradients in many areas. Clay from the Bearpaw and Lance shale erodes easily from the stream action, breaking, collapsing, and rolling into flows creating turbid waters and dynamic channels. Stressed riparian areas erode rapidly, with active gullying and active headcutting present in many watersheds. In 1995, the riparian health of 113 reaches on 73 separate streams was assessed (refer to riparian under vegetation for more information). All of the reaches assessed on 40 of the 73 streams were found to be "nonfunctional." Only five streams had all parts of the riparian zone at proper functioning condition. The water statistics in table 8 are from streams on or near the refuge.

The Musselshell River flows northerly through the refuge into the Missouri at Fort Peck Reservoir. The USGS station at Mosby just upstream the refuge has an average mean daily flow of 254 cfs. Peak flows during 1934–2007 range from 90 cfs to 18,000 cfs. Being a snowmelt-fed stream, the Musselshell River floods in the spring until mid-June, when flow begins to decrease. The low discharges in late summer and fall are dependent on groundwater base flow and releases from reservoir storage. Occasional summer peaks appear in response to thunderstorms. MFWP lists 40 miles of the river from Mosby to its confluence with the Missouri as chronically dewatered each year. Water quality can also be an issue, as irrigation return flows bring salts flushed out of the irrigated fields.

Due to the vastness and remoteness of most of the refuge watersheds, studies have been done to obtain better estimates of stream discharge and hydrograph behavior. USGS published several studies describing surface-water statistics for gauged and ungauged basins in and around the refuge. Omang and Parrett (1984) used regional gauging station data to develop regression equations that describe mean annual stream flow for ungauged basins. Parrett and Johnson (2003) developed regression equations to estimate peak flows having recurrence intervals of 2, 5, 10, 25, 50, 100, 200, and 500 years for ungauged sites for all of Montana. Sando et al. (2009) used data more specific to the refuge and pub-

Table 8. Average daily discharge and peak flows for six USGS water stations on or near the Charles M. Russell and UL Bend refuges.

Name and Location	*USGS Station Number*	*Average Daily Discharge (cubic feet per second [cfs])*	*Lowest Peak on Record (cfs)*	*Highest Peak on Record (cfs)*	*Period of Record (cfs)*
Armells Creek near Landusky, Montana	06115270	8.5	192	2910	2001–4
Duval Creek near Landusky, Montana	06115300	0.09	0	640	2001–4 (mean daily) 1963–2007 (peaks)
Rock Creek near Landusky, Montana	06115350	2.36	12	1660	2001–4
Hell Creek near Jordan, Montana	06130650	2.23	120	1700	2001–4
Nelson Creek near Van Norman, Montana	06131200	1.5	5	1750	1976–2008
Big Dry Creek near Van Norman, Montana	06131000	47.9	47	24600	1940–2006

lished Estimation of Streamflow Characteristics for Charles M. Russell National Wildlife Refuge, Northeastern Montana. By using data from five gauging stations on the refuge, as well as long-term gauging stations near the refuge, the publication provides methods of estimating the long-term median stream flow, 2.33-year peak flows thought to be bankfall- or "channel-forming" and maintenance flows, as well as monthly and annual 90-, 80-, 50-, and 20-percent exceedence stream flows. (An exceedence flow means there is an "×" percent chance the actual flow will exceed the given value. For instance, an 80-percent exceedence monthly flow for July is low in value and represents a "dry" year, since there is an 80-percent chance the actual July value will be higher. In addition, the study provided monthly and annual mean stream flows for ungauged watersheds.

Higher stream flows typically occur from February through August, and lower flows occur September through January. The highest mean monthly volumes generally occur in March and April, due to snowmelt runoff. April and May flows decrease as snowmelt amounts diminish. Late spring and summer rainstorms create fast rising and diminishing flood peaks in June and July. Flows in August and autumn are low or zero, and frequently are only a result of ground-water base flow.

Groundwater occurs at shallow depths in the Hell Creek-Fox Hills Sandstone Strata. The hydrostratagraphic sandstone intervals yield small quantities of water suitable for livestock and wildlife. These strata occur north of Fort Peck Reservoir and in the southeast part of Phillips County. At lower depths, ground water occurs in the Judith River Formation. Water-bearing sandstone strata can yield fair amounts of ground water; however, quality can be an issue due to salinity levels. Artesian pressure created by the thick layer of impervious Bearpaw Shale overlying the formation allows wildlife and stock wells to flow without the aid of pumps.

Water Rights

The United States holds Federal reserved water rights appurtenant to land withdrawn pursuant to Executive Order No. 7509, dated December 11, 1936, which established the refuge. The reserved right has the priority of the 1936 withdrawal.

The United States also holds Federal reserved water rights appurtenant to land withdrawn pursuant to Public Land Order 4588, dated March 25, 1969, which established UL Bend National Wildlife Refuge. This order removed some reserved lands from the refuge and included them within the UL Bend refuge, and also withdrew additional lands from the public domain for the new refuge. The reserved right has the priority of the 1969 withdrawal.

The United States is in the process of quantifying these reserved rights with the Montana Reserved Water Rights Compact Commission. The Commission was created by the Montana legislature in 1979 to "conclude compacts for the equitable division and apportionment of waters between the State and its

people and the several Indian Tribes claiming reserved water rights within the State (MCA 85-2-701), and between the State and its people and the Federal Government claiming non-Indian reserved waters within the State (MCA 85-2-703)."

The United States has already successfully achieved compacts for the Black Coulee, Benton Lake, and Red Rocks Lakes National Wildlife Refuges. The United States anticipates the compact for the refuge including UL Bend National Wildlife Refuge will be modeled in a similar manner, with protection of existing private rights, protection of enough water to carry out the primary purpose of the refuge, and dove-tailing in refuge water protection with operations of the Service's sister agency, and largest land-holder up-gradient of the refuge, BLM. The Service's 1936 Federal reserved water right is senior to most BLM water rights. The United States has until July 1, 2013 to complete the compact.

In addition to Federal reserved water rights, the United States also holds State-based water rights. Prior to July 1, 1982, and in accordance with the Montana Water Use Act, the Service filed Statements of Claim to water rights appurtenant to the refuge and with priority dates prior to July 1, 1973. Claims were filed for water rights vested on acquired land as well as land reserved from public domain. Since 1982, the State of Montana has proceeded with examining and adjudicating many of these claims. The basins the refuge covers, and each basin's adjudication status, are as follows:

- 40EJ, Missouri River, between Musselshell River and Fort Peck Dam: Not yet examined.
- 40E, Missouri River, between Musselshell River and Fort Peck Dam: Temporary Decree.
- 40O, Milk River, below Whitewater including Porcupine Creek: Preliminary Decree.
- 40S, Missouri River, below Fort Peck Dam: Preliminary Decree.
- 40C, Missouri River, Musselshell River, below Roundup: Temporary Decree.
- 40D, Dry Creek: Preliminary Decree.
- 41S, Judith River, Temporary Decree.

Temporary (decrees for areas that have Federal or tribal reserved water rights but where the rights have been left out until they are affirmed) and preliminary decrees (decrees for areas that do not have Federal or tribal reserved water rights) are issued to allow for interested parties to file objections if they disagree on the merits of a claim. Objections to Statements of Claim are resolved by the Montana Water Court, which then issues a final decree. Entry of the final decree begins the appeal-filing period where appeals are decided by the Montana Supreme Court. Some very small areas of the refuge are in basins with preliminary decrees but the United States has not waived its Federal reserved rights in those basins. The following are the number of claims filed by the United States:

Charles M. Russell National Wildlife Refuge

Basin 40E =142 claims
Basin 40EJ = 127 claims
Basin 41S = 2 claims
Basin 40S = 4 claims
Basin 40O = 6 claims
Basin 40D = 4 claims
Basin 40C = 12 claims

UL Bend National Wildlife Refuge

Basin 40EJ–15 claims
Basin 40E–36 claims

Most of the claims were for small water-storage impoundments used for wildlife and stock watering. Two-hundred and sixty claims were filed for ponds, which retain a total of 2,234.66 acre-feet. One-hundred and forty claims were filed for other pre-1973 water diversions such as wells, springs, dikes, and stream/lake pumps.

Private individuals also filed claims to pre-1973 stock water rights on refuge lands. The United States filed objections against all of these claims, asserting prior case law and statutes precluded and preempted the establishment of such rights. In June 2005, in Case No. 40E-A, the Montana Water Court ruled private State-based stock water rights could exist on Federal land. Since this ruling, the United States has reviewed the validity of each claim and is in the process of settling. Prior court decisions have affirmed the United States' position that ownership of these stock water rights appurtenant to Federal land does not grant grazing access to Federal land, nor does being refused grazing privileges constitute a taking of the private property water right.

In addition to claims for pre-1973 water rights and Federal reserved water rights, the refuge also holds permits and/or certificates to post-1973 water rights.

Water Quality Monitoring

Water quality conditions on the Missouri River inflow to Fort Peck Reservoir were monitored in the Missouri River near Landusky, Montana. Monthly monitoring (May–September from 2004 through 2008) indicated no major water quality concerns (USACE 2009b) although the human health standard for arsenic was exceeded. There were also high levels of iron and manganese that are believed to be a natural condition associated with the geology and soils of the region.

Water quality on the lower Musselshell River exceeds State Water Quality Standards for total dissolved solids, including sodium and alkalinity (Mus-

selshell River Basin Water Management Study (U.S. Bureau of Reclamation 1998). This study was established to monitor changes in water quality, quantity, and aquatic habitat as they relate to management. Best management practices were implemented on a watershed wide basis along the Lower Musselshell River: off-site stock water tanks, riparian fencing, rotational grazing, and improved irrigation efficiencies including land smoothing and installation of gated pipe and sprinkler systems.

Long-term monitoring sites were established along the 72 miles of river from 8 miles south of Mosby, Montana to the refuge at Fort Peck Reservoir (Hollow et al. 2001). Nine water quality sites were established and samples were taken three times per year for 2 years. Of the 71 miles of river, 20 miles were inventoried. The Musselshell River was listed by the Montana Department of Environmental Equality 303(d) list a "moderate" priority waterbody in need of total daily maximum loads development for the 1998–2000 biennium. The Lower Musselshell River was listed as a "high" priority waterbody under the 2000–2002 biennium 303(d). It was listed as impaired for chronic dewatering and riparian habitat alteration and in need of total daily maximum loads development. The DNRC has determined that the Musselshell River meets the criteria for designation as a chronically dewatered watercourse. Lower portion of the Musselshell River is a fourth order, perennially flowing waterbody. Flow peaks in spring after snowmelt and diminishes by late summer.

In 1999–2000, the refuge contracted with the University of Montana's Riparian and Wetland Research Program and Dr. Paul Hanson to conduct water quality analyses for nutrients, fecal coliform, total dissolved solids, total suspended solids, and flow on the refuge. Conductivity, pH, and temperature were also measured at each of nine established water quality sites. Macroinvertebrate sampling and periphyton sampling were performed. The analyses of periphyton populations indicated no impairment and full support of aquatic life uses. In particular, the siltation index indicated that sediment was not a cause of impairment. Periphyton is considered an appropriate indicator of water quality because of the naturally high number of species and their ability to respond rapidly to both exposure and recovery from pollution events. The siltation index evaluates the percentage of diatoms that are mobile. Their abundance is thought to reflect the amount and frequency of siltation. The Lower Musselshell River had a siltation index 32.84–49.26. The causes of pollution in the Lower Musselshell River are attributed to flow alteration and riparian degradation. The Water Quality Restoration Plan includes voluntary implementation for irrigators and landowners to implement best management practices by land smoothing, converting flood systems to sprinklers, improving irrigation ditches, and installing gated pipe, upgrading management of irrigation water and installing flow measuring devices, and utilizing soil moisture monitoring methods. Grazing operations' and landowners' recommendations include implementing best management practices by installing cross fencing, stock water pipeline with off-site water facilities and developing grazing plans on rangelands.

On the refuge, the Riparian and Wetland Research Program's Lotic Inventory form was used to evaluate and characterize the function and present condition of selected reaches of the Musselshell River within the riparian corridor. Health scores range from 77 percent (functional at risk) to 44 percent (not functioning). The Riparian and Wetland Research Program's Lotic Health Assessment for Large River Systems was used to evaluate the general functioning condition of 20 miles of the river. Ninety-two percent of reaches inventoried showed a range of ratings from 60–80 percent (functioning at risk), and 8 percent scored less than 60 percent (not functioning). Reasons for low health score included low cover of woody species, presence of invasive plants, lack of native graminoids, and dewatering. Some positive findings included lack of human-caused bare ground, few exotic woody species, high shrub regeneration and high cottonwood regeneration as well as high densities of dead/decadent woody species.

Healthy riparian systems enhance water quality by filtering out organic and chemical pollutants (Ehrhart and Hansen 1997). Water quality is closely related to soil erosion and sedimentation. These can be associated with vegetation cover, concentration of livestock grazing, and geologic erosion. High concentrations of sediment loads, and fecal coliforms can have a major effect in altering an existing stream ecosystem or even creating an entirely new ecosystem (Kauffman and Krueger 1984).

4.3 Biological Resources

The following sections describe the biological resources that may be affected by implementation of the CCP. Biological characteristics include vegetation communities (often referred to as habitats) and wildlife including big game, furbearers, small predators birds, bison, other wildlife (amphibians, reptiles, fish, and small mammals), and threatened and endangered species and species of concern. Unless otherwise noted, much of the following information is from unpublished Service data located in files at the refuge office.

Habitat for wildlife is the combination of vegetation and topography that provides the water, food, and protection that is necessary for their survival.

The diverse vegetation provides thousands of habitat types supporting hundreds of wildlife species (see figure 17) across the nearly 750,000–800,000 acres of land found on the refuge. Habitat needs for some species are very general, while others are very specific. This section initially discusses the disturbance factors that have affected the major ecological processes on the refuge. Following this, the discussion is organized into four broad categories of vegetation: uplands, river bottoms, riparian areas, and shoreline vegetation. Invasive species are discussed at the end of this section.

Vegetation types are traditionally classified into plant communities with specific characteristics and defined boundaries. While plant communities are useful for describing dominant vegetation types and constructing maps, they do not illustrate the complexity, integrity, and management needs of individual areas. For example, general plant community descriptions do not adequately represent sub-dominant plant species that are more sensitive to change and disturbance, are more difficult to detect yet are more important for biological integrity (sentinel species). Recognizing the complexity of vegetation and habitats and the importance of sentinel species as an indicator of environmental health, the Service strives to manage the refuge for biological integrity, diversity, and function rather than generalized plant communities. For this reason, the Service does not classify vegetation into traditional plant communities. For the discussion in the draft CCP and EIS, vegetation types are grouped into the four broad categories listed above. Refer to appendix F for a list of important sentinel species.

DISTURBANCE FACTORS AFFECTING MAJOR ECOLOGICAL PROCESSES

Fire, herbivory (grazing by all ungulates), and predation (including hunting) are key factors that have affected the plant species' populations on the refuge. Other disturbance factors include invasive species, roads, and other public use activities such as hunting. The legacy of these natural and human caused disturbances has resulted in the vegetation and habitat mosaic that exists today. Understanding these factors, their history, and their influences on the landscape is a key component of the CCP, its alternatives and its implementation. The following discussion includes a brief history of ecological change on the refuge, followed by descriptions of the key disturbance factors.

The Great Plains have evolved over time through ecological disturbances like fire and grazing. These disturbances can be described as "pulse" and "press." A pulse occurrence occurs sporadically but still occurs; whereas a press disturbance is constant. Historically on the refuge, the interaction between fire and grazing can be viewed over the following periods (see figure 18):

- 1700–1882—Fire and wild ungulates interacted to create constantly shifting mosaic patches of land influenced by grazing and abandonment. Predation by wolves, grizzly bears, and humans occurred yearlong. There was a decrease in predators and wild ungulates during the last years. The last large buffalo herd was destroyed in 1882 (FWS 2010).
- 1882–1910—This period saw the end of free-ranging wild ungulate herds and the shifting mosaic of grazing and abandonment with the beginning of fences and constant excessive grazing by cattle and sheep (no more periods of abandonment), the end of large predators, and a great reduction in fire.
- 1910–1986—This period saw a constant grazing by livestock with no abandonment, a continued low fire frequency due to suppression and lack of fuel, increase in wild ungulates; in later years, no large predators.
- 1986–present—This period has seen a reduction in livestock grazing, an increase in wild ungulates, continued fire suppression, few large predators, an increase in fine fuel, and an increase in wildfire size and intensity after 2000.

Fire

Wildfire, historically a pulse or sporadic disturbance, occurs over much of the refuge. Depending on the site, the average frequency of occurrence of fire in pre-European settlement times ranged from every decade or less (in many sites) to once a century in a few sites (Frost 2008). As shown in the timeline above, since European settlement the frequency of fire has been dramatically reduced because of a lack of fuel (due to livestock grazing) and fire suppression. Fire-intolerant plant species such as big sagebrush and Rocky Mountain juniper have spread from their original fire refugia (areas with longer fire-return intervals) and now occupy a much larger portion of the landscape. Exceptions have been the recent large fires in 2003 and 2006 in the middle of the refuge. These fires were likely due to recent reductions in livestock grazing, resulting in more fuel, and changing climate patterns.

Prescribed fire has been used sparingly on the refuge. Only 15 burns have been ignited since 1992, treating 3,077 acres. Except for the King Island burn in 2008, all have been in the river bottoms, prairie dog towns, or on the lakeshore. The specific prescribed fire objectives were to reduce Russian knapweed infestations and enhance habitat suitability for prairie dogs or piping plover. The King Island burn

was the refuge's initial treatment of a 1,000-acre unit with fire to reestablish a more natural fire regime, enhance upland habitat, and promote pyric herbivory (grazing enhanced by fire).

Herbivory

Like fire, ungulate grazing (herbivory) was originally a pulse disturbance. Prior to 1882, there were many years with periods of abandonment (rest) by ungulates where less grazing took place due to its interaction with fire. Since 1882, it has become a constant (press) disturbance because of fences and fire control. As a result, highly palatable species (particularly shrubs and forbs such as chokecherry and white prairieclover) have dramatically declined. These species evolved with and are highly adapted to grazing when combined with several-year periods of abandonment for recovery. Palatable shrubs require several years to grow from seed to seed-bearing maturity and are alive above ground (or vulnerable to damage from grazing) 12 months of the year. Present-day livestock grazing systems typically only rest pastures for 1 entire year or less from livestock use (with no rest from wild ungulate use).

Livestock and wild ungulate numbers have had an additive impact on ecological systems. Even though each herbivore species has a different diet, some plant species such as Maximilian sunflower and saltbush (sentinel species for herbivory) are eaten by all. Thus far, the management of each herbivore species on the refuge and elsewhere has been independent of the others, leading to overuse of sentinel plant species.

Predation and Hunting

When Lewis and Clark first traveled through the refuge in the early 1800s (Moulton 2002), they reported seeing grizzly bears and other predators. Historically, in the Missouri River Breaks ecosystem, wolves, grizzly bears, and Native Americans once slowed the growth rates of ungulate populations in between unfavorable climatic events, which also curtailed population numbers. This helped keep ungulate populations from destroying many plant species. Presently hunting is the only tool used to control the ungulates found on the refuge.

Fencing

As of 2009, over 700 miles of fences have been constructed on the refuge with about 425 miles constructed since implementation of the 1986 EIS. Fencing is used to delineate the refuge boundary, fence between pastures, fence off riparian areas, or exclude wildlife and cattle for monitoring purposes. Fences have been used to exclude livestock in several riparian areas (for example, Rock Creek in Phillips County and Bobcat Creek in McCone County). Fences are generally about 42 inches high, 3-strand with 12 inches between wires with bottom wire about 18 inches above the ground to allow pronghorn to pass under. Most cattle exclosures are generally four-strand barbed wire, with the bottom wire being 16 inches above the ground and the top wire being about 44 inches high. There are two types of total exclosures used on the refuge. One type is built with woven wire and the second type is built with modified portable stock panels. Both are about 8 feet tall and designed to keep out all ungulates. There are roughly 40–50 cattle exclosures on the refuge and about the same number of total exclosures.

Fencing is a management tool that can be used to improve the health of landscapes or harm them. It is often an unnecessary impediment to wildlife movement. Fencing, together with heavy grazing, and fire suppression effectively ended the historical fire grazing interaction. Grazing animals were no longer able to move freely to fire and abandon other locations, allowing other areas to rest for multiyear periods. On the refuge, boundary fences have improved the health of many plant species by controlling or eliminating excessive livestock influences from surrounding lands.

Water Development

Impoundments for livestock water have been developed throughout the refuge. There are 215 reservoirs listed in the Service's real property database storing more than 705 acre-feet of water. These reservoirs impact riparian areas and prairie stream functions by impounding water that would have supplied these areas down to the rivers. These artificial water resources also concentrate livestock, which severely impact vegetation within about 1 mile of these water sources. When livestock are present plant species and thus wildlife habitats are often damaged in large areas surrounding the impoundments. Impoundments are unnecessary for wild ungulates. They can easily travel to stream water sources when they have not been destroyed. Water in streams has been reduced by these impoundments, by irrigation off the refuge, by loss of beaver foods (and beaver) due to livestock grazing, and by livestock trampling and use of riparian stream catchments.

Roads

Roads (also discussed under public use and visual resources) are not a natural part of landscapes and destroy the native plants that were present or could be present on the road site. Roads, because they are artificial firebreaks, have contributed to the reduction in fire frequency and loss of the fire/herbivory interaction. Most invasive plant infestations on public lands are found along side of the roads and adjacent to roads where hunters camp and/or associated with illegal off road use (USFS 2003). They also result in habitat fragmentation, which has been

blank back of Figure 17
west

INSERT 11x17
Figure 17 west

INSERT 11x17
Figure 17 east

INSERT 11x17
Figure 18 west

INSERT 11x17
Figure 18 east

blank back of Figure 18
east

USFWS

Roads can become braided and unsightly, particularly during wet periods.

shown to exacerbate the problem of habitat loss for grassland birds (Johnson 2001).

Invasive Plant Species

Numerous noxious or invasive plant species have affected habitats on the refuge. This topic is addressed in detail at the end of the vegetation section.

UPLANDS

Uplands make up most of the refuge. The uplands comprise grassland, shrub land, and forest. The grassland and shrub land communities compose more than 60 percent of the upland area, and forest communities cover about 30 percent of the uplands.

Common grass species include western wheatgrass, bluebunch, wheatgrass, green needlegrass, and blue grama. Western wheatgrass and blue grama have increased while the other species have declined over time. With the reduction or elimination of summer grazing, bluebunch, and green needlegrass have responded positively and are increasing. Japanese brome has invaded all grasslands, especially those in poor condition. The forbs associated with grassland and shrub land in excellent condition include white prairieclover, purple prairieclover, dotted gayfeather, purple coneflower, and stiff sunflower. These forbs continue to decline even in the best-condition grasslands and, for the most part, have been eliminated from fair-condition grasslands.

Shrubs important to wildlife include big sagebrush, silver sagebrush, juniper, chokecherry, golden currant, redosier dogwood, and silver buffaloberry. Shrubs across the refuge are not found where they once were. All shrubs—except for big sagebrush and juniper, which are in better health in areas with low herbivory (grazing)—have declined in historical distribution, density, and plant height.

Key upland trees include ponderosa pine, Douglas-fir, and some limber pine. Over time, ponderosa pine and Douglas-fir have increased across the refuge, especially in the western portion; some trees are several hundred years old. A few green ash and cottonwood trees are scattered in the upland coulees (ravines), and aspen trees dot the sheltered coulees.

The refuge's total plant community contains more biomass of grasses than of other plant groups. Generally, the land can support a high biomass of large ungulates such as elk, bison, and domestic cattle based primarily on these grasses. However, sentinel shrubs and forbs, which have been affected by ungulate numbers and altered fire-return intervals, disappear long before grasses.

Sentinel Plant Species

The Service has found that some species are beginning to diminish or vanish on the refuge—these species are known as sentinel species. In the uplands, plant species grow within ecological systems primarily along temperature, moisture, and physical gradients. Sentinels are the plant species that are likely the first to vanish due to the direct and indirect influences of natural disturbances such as wildfire and herbivory by ungulates. Sentinel species exhibit a quick response to these natural processes.

Gary A. Monroe/USDA–NRCS PLANTS Database

Golden Currant

W.L. Wagner/USDA–NRCS PLANTS Database

Winterfat and golden currant, both shrubs, are two of several sentinel plant species identified for refuge habitats.

It may take many decades for plant communities to change in response to processes; in some cases, there is no change at all. If sentinel species' populations that represent opposite extremes of environmental conditions (such as frequent fire and no fire) are viable, other plant and animal species' populations in the middle are also likely to be viable. Ensuring that the plant populations at the foundation of a food web are viable is perhaps the single most important focus for monitoring and management of all wildlife habitats, especially when time and money are limited.

Grasses

Grasses are important foods for the largest herbivores, such as domestic cattle and bison. They are not a major food for pronghorn or for bird species such as greater sage-grouse, sharp-tailed grouse, or migratory songbirds. Grasses furnish protection for many species such as Baird's sparrow and upland sandpiper. Grasses are fire-adapted, returning from roots or seeds. Unlike forbs, shrubs, or trees, grasses have low growing points, making them exceedingly well-adapted to herbivory. Grasses are not considered first-to-decline sentinel species.

Two of the taller and most palatable grasses are bluebunch wheatgrass and green needlegrass; these grasses dominate the better soils when grazing is light. Under the current practice of constant grazing, when these two grasses decline from overuse, in localized areas, palatable shrubs and forbs are reduced to remnants or locally eliminated. In some areas, as bluebunch wheatgrass and green needlegrass have declined, there has been an increase of low-growing grasses such as blue grama and Sandberg bluegrass that now cover much more area than what was described by NRCS for ecological site potentials. This change is probably the result of constant grazing and overuse by ungulates.

Forbs

Forbs are broad-leaved, nonwoody, flowering plants (for example, sunflowers). The leaves and seeds of forbs furnish food for many species of wildlife. Species that depend on forbs include greater sage-grouse (spring and summer food), pronghorn, and goldfinch. Forbs are perhaps the most important hosts for pollinating insects. In turn, insects are essential foods for most migratory and resident birds. Forbs are fire-adapted, meaning they return from their roots or seeds after fire. Unlike grasses, their growing points are on the tips of their stems. Several species are sentinels—among the first to decline from herbivory—including white prairieclover, purple prairieclover, and Maximilian sunflower.

In some areas of the refuge, palatable forbs, including white prairieclover and Maximilian sun-

flower, have been reduced to remnants or locally eliminated. The reduction in populations is likely due to constant selective grazing, fire suppression, and competition from less palatable native species or invasive species. Palatable forb populations historically benefited from fire and periods of less grazing pressure.

Shrubs and Trees

Shrubs and trees furnish protection and food for many of the refuge's wildlife species—fruit for sharp-tailed grouse and cedar waxwing, browse for mule deer and pronghorn, and nesting sites for the red-tailed hawk and Bullock's oriole.

First-to-decline, fire-intolerant species of trees and shrubs were historically confined to places that have little fuel or are difficult for fire to reach (refugia) (Frost 2008). Fire refugia are common due to the refuge's poor soils and rough topography. Fire suppression and constant herbivory pressure has benefited big sagebrush, junipers, ponderosa pine, and Douglas-fir. Ponderosa pine is usually killed by fire when it is young, but older trees have thick fire-adapted bark that often prevents death in a low-intensity fire that does not reach the crown. Wildfire, after long periods of fire suppression, can burn in these refugia areas due to crowning and spotting caused by heavy fuel loading and ladder fuel. Low-intensity prescribed fire can be used to preserve the heterogeneity that naturally resulted in the fire refugia.

Shrubs and trees that are the first to decline due to grazing and browsing by ungulates (herbivory) are usually fire-adapted species. These species have the ability to resprout after disturbances such as fire and herbivory. Examples of sentinel shrubs and trees that are suppressed by constant herbivory include saltbush, winterfat, golden currant, green ash, and chokecherry. Furthermore, shrubs and trees are particularly sensitive indicators because they are alive aboveground 12 months of the year and, thus, vulnerable to damage. Also, unlike grasses, their growing points are on the tips of stems. Shrubs and trees are very useful for monitoring because the history of past years' growth is visible and measurable.

In the past, fire and herbivory occurred more sporadically. These natural processes benefited fire-adapted shrubs and trees such as silver sagebrush, green ash, chokecherry, golden currant, and saltbush by reducing competition and providing long periods of abandonment. In addition, historical juniper, pine, and big sagebrush populations were not as prevalent on the refuge as they are currently.

Fire Ecology of the Uplands

The Missouri River Breaks has had a long and rich history of wildfire occurrence—fire was one of the natural forces maintaining northern grasslands. It has long been suggested that treeless grasslands are a product of repeated fire, sometimes as a direct result of human activities. Research within the past few decades has confirmed that fire has been an important natural component of many grassland communities. Prior to European settlement, fire was the most common and widespread influence on the landscape in the Intermountain West (Gruell 1983). Natural fire replaced fire-sensitive woody species with species that were more fire-adapted (Gruell 1983).

Lightning-set fires were common in the United States and Canada; however, fires set by native peoples were the type mentioned most often in historical journals, diaries, and other accounts including the journals of Lewis and Clark (Moulton 2002, Higgins et al. 1986). The reduction in Native Americans' use of fire after 1875 (Higgins et al. 1986), the break-up and reduction of fuel caused by the livestock grazing and cultivation that came with European settlement, and then the introduction of organized fire suppression have caused a drastic decrease in fire occurrence and size (Gruell 1983, Swetnam and Betancourt 1990).

Lightning is an integral part of climate, and the frequency and return interval of lightning-set fires undoubtedly played an important role in the species composition and ecology of the northern grassland plains. Fire-scar data collected by the refuge in the mid-1990s indicated a fire frequency of 10–20 years in the fire-prone ponderosa pine and Douglas-fir habitats before settlement by homesteaders. These data do not indicate the source of ignition; however, fire-scar evidence dropped off dramatically once the area was settled, which indicates an increased emphasis on human suppression of the numerous lightning starts that occur throughout the summer. (Bill Haglan, former wildlife biologist at Charles M. Russell National Wildlife Refuge; personal communication, fall 2009).

Fire exclusion has had the most marked effect on ecotones between two different vegetation types. With the omission of fire as a dominant ecological factor on some sites, there have been many changes in vegetation—successional changes that have occurred on some sites may not have occurred in the pre-European-settlement environment, where frequent fires suppressed woody vegetation (Gruell 1983). As a result, an increase in density of woody species has occurred on some sites, as well as the invasion of woody species into sites where frequent fire used to preclude their dominance.

As indicated previously, grassland and shrub land compose most of the upland area and the areas devoted to livestock grazing. These are also the primary habitat types for use of prescribed fire. The

effects of wildfires on specific species within each habitat type are well documented and can be found in the Fire Management Information System (USFS 2009). In general, the effect of fire on grasses depends on the growth form (low-growing points or stem-tip growth); in addition, the effects depend on how fire influences and is influenced by soil moisture and other environmental conditions. Many grass species are fire resistant and can produce new shoot growth even after moderate- to high-severity burns. When desirable understory plants are present within the sagebrush community, prescribed fire can release the growth of these species. Spring or fall fires are most desirable and effective, because the soils are moist and cool and fire effects are not as severe. Sprouting shrubs such as bitterbrush and mountain snowberry respond favorably, and perennial grasses also benefit. Wildfire can be used to increase edge effect and increase plant diversity (Wright and Bailey 1982).

Shrubs are generally less tolerant of fire than grasses. However, the season and intensity of fire on shrub land also determines the effects of fire. Sagebrush is the most common category of shrub land on the refuge, with Wyoming big sage and silver sage as the dominant species. Fire history of the shrub lands has not been firmly established, but fire was probably uncommon on drier sites because of sparse fuel; fire was more frequent, averaging every 32–70 years, on moister sites with more vegetation (Wright et al. 1979).

Recent Fire History

A recent fire history study of the refuge shows fire frequency intervals are extremely variable across the refuge (figure 18), ranging from 8 years to more than 200 years between fires (Frost 2008). About 30 percent of the refuge is a forested conifer community, with Douglas-fir and ponderosa pine being the dominant species. Fire records show this community type to be the most subject to wildfire occurrence. Fire exclusion in this forest type can lead to accumulation of dead woody fuel, as well as the establishment of dense understory regeneration (ladder fuel). Ladder fuel alters fire behavior dramatically, oftentimes creating high-intensity crown fires. Forest succession has been substantially altered due, in part, to fire exclusion. Exclusion of fire allows the less fire-tolerant species to replace the more fire-tolerant species. This can be seen on the refuge with the increased abundance of juniper and higher densities of Douglas-fir. Low- to moderate-intensity wildfire in this community type sets back succession, promotes establishment of mature ponderosa pine forest, and retards encroachment of juniper and Douglas-fir (Keane et al. 1990).

In the refuge's early annual narratives, staff mentioned large wildfires, but specific information about these fires is lacking. Formal fire records started in the 1960s and have documented great variety in the annual number of wildfires—from 1 fire in 1975 to 44 fires in 1988. Since 1982, when records were initially entered into the national Fire Management Information System database, about 87 percent of the wildfires have been caused by lightning and occurred from mid-May through the end of September. Fires during that period ranged in size from one-tenth of an acre to as large as 21,967 acres. In 2003 and again in 2006, several lightning-ignited wildfires occurred on and around the refuge, mainly in Garfield County. When finally extinguished, two fire complexes (Missouri River complex and Black Pulaski complex) were in excess of 130,000 acres each. These fires were the direct result of significant, dry lightning storms that ignited multiple fires, followed by cold frontal passages 1–2 days later that produced winds of 40–60 miles per hour.

Most fires are directly influenced by local and general winds and have the potential to exhibit extreme fire behavior. Generally, a large fire will make an initial run until it hits a natural barrier or burns into an area of little or no vegetation. For example, in 1994, the CK Creek fire made a run of 6 miles in one afternoon and burned more than 11,000 acres before burning into sparse vegetation.

Early in the history of the refuge, great emphasis was placed on putting out wildfires at the smallest acreage, regardless of cost, habitat management strategies, or land designation such as wilderness. Not until the Leopold Report of 1963 (Leopold et al. 1963) was the public informed that protecting plant communities from fire can lead to these negative effects: (1) catastrophic, stand-replacing wildfires; (2) decadent shrub and grass communities; (3) encroachment of shrubs and trees into grasslands; (4) increased infestations of disease and insects; (5) lack of diversity in plant and wildlife species; and (6) devastating wildfires that cannot be controlled with any amount of resources (Wright and Bailey 1982).

In the late 1970s and early '80s, land managers at the refuge began to look at alternatives to putting all fires out at the smallest acreage. With the signing of the record of decision for the 1986 EIS, managers had the option of using modified suppression. Modified suppression is based on an evaluation of each wildfire for the resources at risk, and if the risk does not justify the cost of full suppression, alternate suppression tactics can be used. Suppression strategies may allow a fire to burn into clay ridges, gumbo knobs, alkali flats, and the Missouri River or Fort Peck Reservoir. As a result, portions of some wildfires might burn for more than one burning period.

Based on fire records for the past 28 years, 364 wildfires have burned 180,230 acres on the refuge

USFWS

Smoke billows from the Black Polaski wildfire in 2006.

(data from the 2008 Fire Management Information System database and archived DI–1202s). Fire size has increased significantly over the past decade as shown in table 9. Possible causes may be changes in land management, climate change, natural wildfire cycles, or a combination of all three.

The Mickey Butte fire burned nearly 3,200 acres of prime habitat for Rocky Mountain bighorn sheep in 2003. The fire burned close to Mickey Butte, which is the core of the home range for upwards of 50 bighorn sheep. In 2005, the Brandon Coulee, Heartland, Sheep, and Shore fires burned an additional 15,647 acres of sheep habitat on the Mickey-Brandon Butte and Iron Stake ridges.

Livestock grazing in habitat units is restricted for 2 years following large wildfires. This occurred after the CK fire of 1994, the Missouri Breaks complex of 2003, and the Black Pulaski complex of 2006. In such situations, the Service gives permittees the option of taking nonuse of their permits or temporarily moving their livestock to habitat units that no longer have annually permitted grazing.

Prairie dog towns are effective natural barriers for wildfire during all but the most extreme fire conditions. To promote population expansion, refuge staff applied prescribed fire to 1,435 acres of prairie dog habitat during summer 2007 and 2008 in the Locke Ranch area of the UL Bend refuge.

Table 9. Historical fire data for the Charles M. Russell and UL Bend refuges.

Timeframe	*Number of Fires*	*Acres Burned*	*Average Acres per Fire*
1981–9	132	25,642	194
1990–9	120	35,643	207
2000–8	112	118,945	1,062
Peak number of fires in a single year—1988	44	12,953	—
Peak number of acres burned in a single year—2006	22	69,737	—

Livestock Grazing

In 1954, there were 25,673 cattle, 3,365 sheep, and 700 horses permitted on the refuge. Wildlife estimates for the same period were 140 elk, 8,000 deer, 800 pronghorn, and 54 bighorn sheep. Records indicate livestock wintered on river bottoms from December to March, and they grazed in the uplands in the summer. As a result, the river bottoms were heavily impacted. Although the BLM did not issue winter permits, according to a refuge report, "BLM was aware of the fact that it had been the practice for a number of large ranches to run cattle on the range during the winter months." After considerable urging by refuge staff, BLM did not eliminate winter grazing but added it to the permit.

The first range survey of actual livestock numbers was conducted in 1953–4. Initially, there were few limits on the number of AUMs grazed on the refuge. Following the first range surveys conducted by BLM, the number of AUMs slowly decreased. However, the number of AUMs permitted were not the same number as actual AUMs. By 1962, there were 26,820 cattle, 11,481 sheep, and 950 horses. The bighorn sheep herd reported in 1954 had vanished by 1962. By this time, the Service and BLM relationship was strained. The record from a 1962 inspection of the refuge by the Service's Washington office staff stated, "The land of the Fort Peck Game Range has literally been raped and this despoiling is accelerating." Although much of this past use came from BLM-managed lands, about 150,000–200,000 AUMs were grazed annually on the refuge in the 1950s. At least part of the overuse of grazing on the refuge was a result of how the program was carried out; for example, in one BLM unit management plan that included a refuge pasture, there were 3,400 AUMs permitted, which was equivalent to the 1953–4 range survey numbers. However, BLM allowed flexibility of up to 10,000 AUMs to be permitted yearly without application. The numbers permitted on paper did not equate to what was occurring on the ground.

The 1986 record of decision established new livestock grazing levels. Of the 100,000 AUMs estimated to be supported by available forage, about 40 percent of this forage is allocated for livestock on 62 different habitat units through 73 grazing permittees. Livestock forage allocations range from 0 to 78 percent of the available forage. These allocations were based on a 1978 range survey. All lands were stocked at the recommended stocking rate of the then-Soil Conservation Service (now the Natural Resources Conservation Service). Slope and distance-to-water deductions were applied to Service lands but not to State or private lands. This resulted in a 33-percent reduction in overall livestock AUMs on the refuge—an almost unprecedented action on western grazing lands. Generally, the livestock capacity of State and private lands increased. In pastures such as the West Indian Butte Habitat Unit (see figure 16) that includes non-Federal lands, this increase totally offsets the Federal reduction. Livestock stocking rates on the eastern part of the refuge typically are higher, reflecting the flatter terrain and nearness to Fort Peck Reservoir, as compared to the western part of the refuge that has steep, rugged coulees and where the distance to water is greater. Livestock allocations in Fergus and Petroleum Counties are the lowest (number of AUMs), McCone and Garfield Counties have the highest number of AUMs, and Valley and Phillips Counties have intermediate levels of AUMs. Garfield County is stocked at twice the level per acre as Petroleum County. There is a direct correlation between the forage allocation for livestock and conflicts with wildlife habitat.

Permitted use in 2003 was 22,304 AUMs—17,000 AUMs less than the 1986 record of decision level and 36,000 less than the 1976 level. The lower AUM levels are due to a variety of reasons including higher grazing fees and not automatically transferring permits (refer to chapter 1, section 1.9 Issues Not Addressed, and to chapter 3, rationale for Upland Objective A7). Additionally, livestock supervision and permit enforcement have ensured that actual use approaches what is permitted today. Livestock numbers on the refuge are currently lower than anytime in the past century.

There are approximately 740,030 acres of potential grazing acreage on the refuge; current livestock grazing units are shown in figure 16. About 409,849 acres are lands grazed under annual permit. Prescriptive grazing occurs on about 252,706 acres, and 77,475 acres are not grazed (former grazing unit). Under annual grazing, a permittee can graze a set number of AUMs every year. There are some limits placed on when and where they can graze. Under prescriptive grazing, the Service determines the habitat objectives for an area, and then sets the number of livestock needed to achieve those objectives. This does not include grazing on other State or private lands—inholdings within the refuge boundary.

About 86 percent of the forage is allocated to livestock within 0.5 mile of water on slopes of less than 10 degrees. Extensive water development has resulted in many upland sites, moist areas, and riparian areas being heavily impacted by livestock. Forage in riparian areas is almost exclusively allocated to livestock. Because of gentle terrain and available water, some habitat units along Big Dry Arm have as much as 50–78 percent of the forage allocated to livestock. In one unit, 40 percent of the livestock forage comes from 18 percent of the land—those lands within 0.25 mile of the creek. Riparian habitats reflect the livestock allocation; fieldwork conducted by the Univer-

sity of Montana in 1995–6 documented the poor state of riparian habitat on the refuge.

State and Private Lands

There are about 36,000 acres of State school lands within the refuge (figure 16). The draft CCP and EIS only directly affects lands under the management authority of the Service. However, the implementation of prescriptive grazing could indirectly impact DNRC to meet their statutory obligations of generating revenue for local schools.

Vegetation Monitoring in the Uplands

Since the implementation of the ROD for the 1986 EIS, the Service has monitored grass cover. In recent years, the Service has also been increasingly emphasizing sentinel plant monitoring as an indicator of biological integrity and health. The results of both residual cover and sentinel species monitoring have provided an important indicator for the overall health of upland habitats and the long-term effects of wild and domestic ungulates.

Residual Cover. Since 1986, one of the primary purposes of monitoring residual grass cover has been to ensure nesting and roosting cover for sharp-tailed grouse and other grassland obligate birds. Livestock exclosures have been developed in many of the existing 65 habitat units. The goal of habitat management on the refuge has been to provide, outside the exclosures, at least 70 percent of the grass cover that is inside the exclosures. Measurements are taken after the grazing season. A cover pole or height-density pole (HDP) is observed from set distances and angles at points along transects, in and out of the exclosures, to measure the comparison.

Habitat monitoring across the refuge has varied annually. Several units were not monitored in the late 1990s to early 2000s. Since 2005 almost all units grazed by livestock have been surveyed for residual grass cover. In 2008, Service personnel conducted 27 HDP surveys across the refuge: 8 for Jordan (5 failed), 10 for Fort Peck (4 failed) and 9 for Sand Creek (all 9 failed). Eighteen of the 27 units failed to meet objectives established in the 1986 Record of Decision). Most of the habitat units that failed in 2008 have not met objectives or improved since monitoring began. All three of the habitat units in Jordan that passed were not grazed in 2008.

Figure 19 provides an example of one habitat unit—East Indian Butte—that failed to meet objectives for residual cover in every year between 1990 and 2007. Figure 19 displays residual cover information collected from the East Indian Butte Habitat Unit (see figure 16). The monitoring data show that this unit does not meet the baseline objective of 70 percent residual cover (red line on graph). This habitat unit is grazed by livestock in common (no separating fences) with private, State, and BLM land.

Residual cover monitoring has indicated that many habitat units, like the East Indian Butte example, are not meeting objectives and are showing impacts from long-term ungulate grazing.

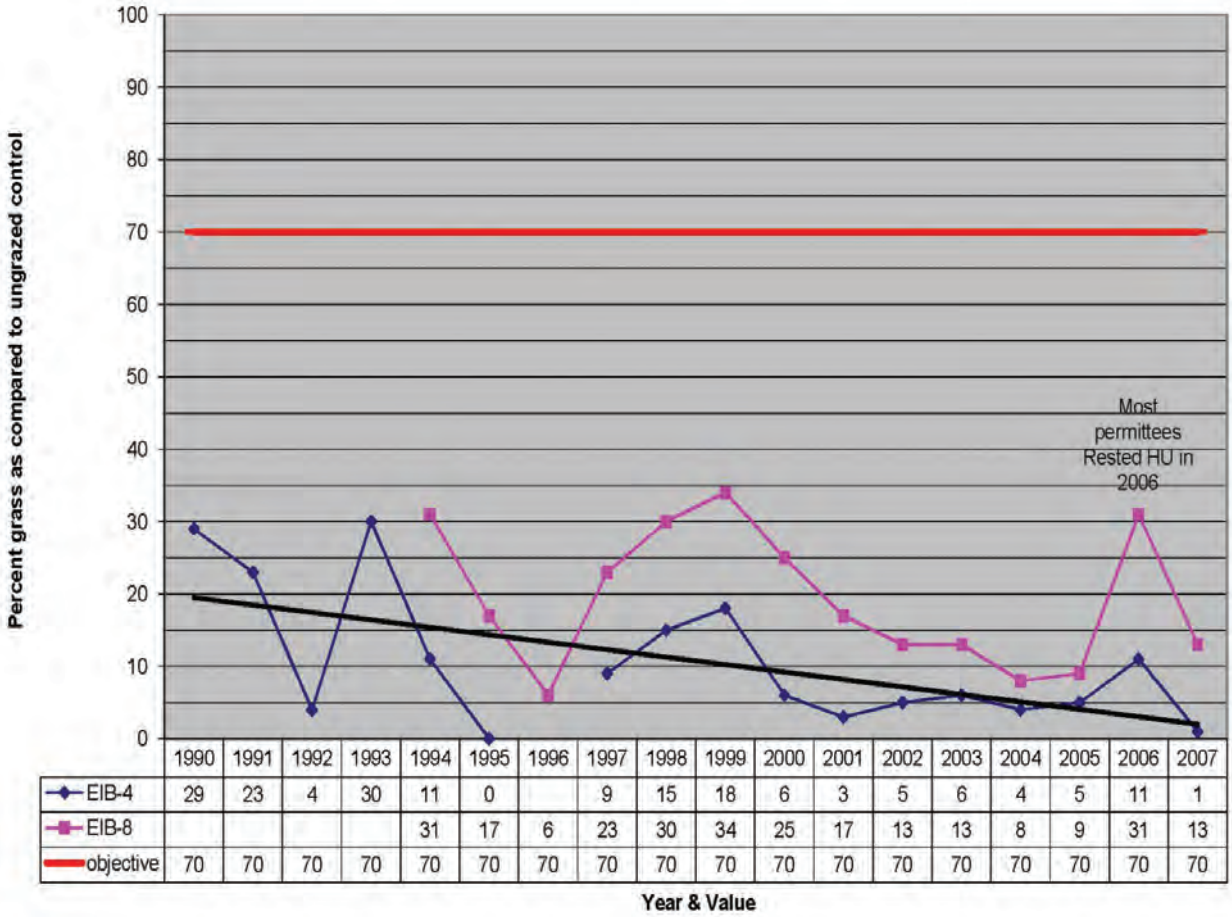
Sentinel Species. The Service is increasingly emphasizing sentinel plant monitoring as an indicator of biological integrity and health. The refuge has been monitoring sentinel plant species populations in and out of exclosures since 2003. Since 2004 biologists have been working on new survey methods to incorporate with current HDP monitoring to fully assess habitat conditions. Sentinel plants (plants that are the first to decline due to grazing pressure) will be identified and monitored across the refuge to determine overall grazing pressure on these plants. Subsequently, the refuge staff uses this information to influence planning and adaptive management of ecological processes.

Currently the Service is working with West, Inc., and Dr. Sam Fuhlendorf from the University of Oklahoma to develop a statistically sound standard operating procedure for monitoring sentinel species' response to the adaptive management of fire and herbivory, and these are anticipated to be completed in 2010. Below are detailed descriptions of results from a chokecherry site and an aspen site, as well as brief descriptions of monitoring results for other sentinel species (silver buffaloberry, grey rubber rabbitbrush, and saltbush). All of these examples demonstrate the effect of grazing pressure on sentinel plant species on the refuge.

Chokecherry. Chokecherry is a sentinel species of riparian zones and moist, north-facing slopes across the refuge. Formerly, this species was much more common. Populations of this shrub have been reduced by herbivory—chokecherry is highly preferred by all ungulates—and by competition from juniper and pine.

Chokecherry fruit is important to many species of resident and migratory birds. Fruit production is perhaps more affected by herbivory than height growth; many species, including chokecherry, produce fruit only from stems not browsed in the previous year. Furthermore, fire often stimulates chokecherry growth, resulting in fruit production a few years after a fire.

In 2006, refuge staff constructed two types of exclosures to monitor chokecherry fruit production on a site that burned in 2005: (1) one type excluded both large ungulates and cattle; and (2) the second type excluded cattle but not other large ungulates. In 2009, the average chokecherry plant in the total ungulate exclosures produced 312 berries; chokecherries in the cattle exclosure averaged 103 berries;



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EIB-4	29	23	4	30	11	0		9	15	18	6	3	5	6	4	5	11	1
EIB-8					31	17	6	23	30	34	25	17	13	13	8	9	31	13
objective	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70

The dark blue line shows information collected from HDP transect EIB-4, which is about 1 mile from water.
The pink line shows information collected from HDP transect EIB-8, which is about 2 miles from water.
The red line shows the objective set by the 1986 record of decision for habitat units—70-percent residual cover.
The black line is the overall trend at 1 mile from water.

Figure 19. Graph of residual cover after grazing in the East Indian Butte Habitat Unit of the Charles M. Russell National Wildlife Refuge (1990–2007).

and chokecherries outside of exclosures averaged 5 berries.

In addition, monitoring showed that grasses in the exclosures were mostly not grazed. Even the most palatable grasses are not first-to-decline sentinel species.

Aspen. Aspen is one of the first species affected by herbivory—a sentinel species. Occurring in scattered relic groves, aspen is highly preferred by livestock and all species of wild ungulates. In addition, aspen is fire-adapted and dependent on fire to occasionally remove fire-intolerant conifers, which are more competitive over long periods of time without fire. Within the refuge, aspen is also a climate-sensitive sentinel. It only occurs in pockets of the landscape such as coulee bottoms that are moister than the landscape in general. Aspen would likely be affected first by a warming climate with less soil moisture.

In 2005, the refuge staff constructed an exclosure within an aspen site in a coulee in the Soda Creek watershed. At that time, the new growth of plants both in and out of the exclosure was similar (about 14 inches) and the plants were heavily impacted by browsing and were unable to grow taller. This site burned in a wildfire in 2006, eliminating all above-ground growth both in and out of the exclosure. In subsequent years (2007, 2008, and 2009), aspen growth within the exclosure has exceeded the growth outside of the exclosure, with averaging about 7, 34, and 52 inches, respectively, compared to about 4, 12, and 15 inches outside of the exclosure. Current browsing levels prevent the plants outside the exclosure from growing taller.

It is likely that aspen will disappear from this aspen site in the future except for those in the exclosure and possibly a few in highly protected

locations—areas that are steep and covered with fire-killed juniper. It is likely that other relic aspen sites disappeared after constant grazing by all ungulates and a lack of fire.

Other Sentinel Species. Other examples of sentinel species monitoring include a silver buffaloberry site in the Rock Creek West Habitat Unit, a grey rubber rabbitbrush site in the East Indian But Habitat Unit, and a saltbush site in the Rock Creek East Habitat Unit. Results of monitoring the average annual plant growth (height to base of current year's growth) at these sites are summarized below.

- Buffaloberry (2005–9): About 9 inches within the exclosure, compared to about 6 inches with no exclosure
- Rabbitbrush (2003–9): About 10 inches within the exclosure, compared to about 2 inches with no exclosure
- Saltbush (2004–9): About 10 inches within the exclosure, compared to about 3 inches with no exclosure

RIVER BOTTOMS

Bottomlands or river bottoms are found in the floodplains of the Missouri river above maximum lake level. They occur only on the west end of the refuge.

There are about 16 river bottoms on the west end of the refuge (see figure 20). The total area covered by these river bottoms is estimated at between 5,000 and 7,000 acres. A diverse mixture of native trees, shrubs, forbs, and grasses characterizes the river-bottom plant community. Trees and shrubs present are green ash, box elder, redosier dogwood, silver buffaloberry, golden currant, western snowberry, Woods rose, chokecherry, sumac, plains cottonwood, sandbar willow, peachleaf willow, and a couple of other willow species. Native forbs present include Maximilian sunflower and American licorice. Native grasses present are: bluebunch wheatgrass, green needlegrass, prairie cordgrass, basin wildrye, western wheatgrass and reed canarygrass.

The most significant threat to river bottom health is from exotic species such as tamarisk (saltcedar), Russian olive, smooth brome, crested wheatgrass, quackgrass, leafy spurge, Russian knapweed, and Canada thistle. Invasive species have been increasing in many areas largely because of two reasons: (1) lack of seed source to establish native plants that would compete with or out-compete the invasive weeds; and (2) extensive browsing on sentinel plants that are established.

Historically many of the river bottoms on the refuge were cleared; native plant communities were plowed, and nonnative agricultural crops were planted because these were the most productive areas. Farming the river bottoms occurred for decades, but has now been eliminated. The last home-

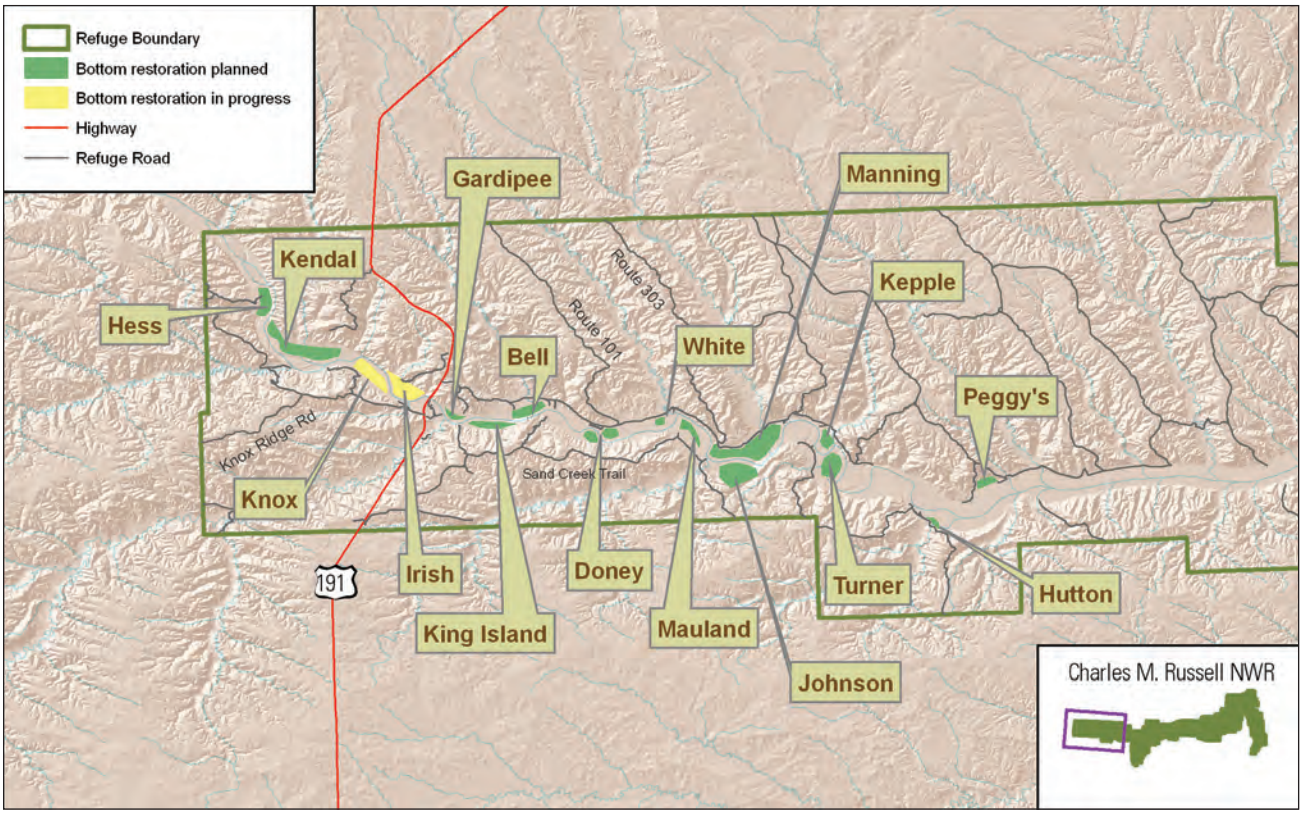


Figure 20. Map of river bottoms in need of restoration at the Charles M. Russell and UL Bend refuges.

steader on the refuge stopped farming in 1983–4, and the last two bottoms to be planted to crops have not been farmed since 1985–6. The plant communities left existing on the river bottoms have now predominately been invaded by Russian knapweed, leafy spurge, smooth brome, and quackgrass, which have very little value to wildlife. Native plant communities that once existed on these bottoms have been unable to reestablish themselves. The Service is currently consulting with experts from the NRCS and State agencies to determine what would be the best methods to restore these bottomlands back to healthy native plant communities. Establishing and maintaining healthy native plant communities is an important way to slow or prevent reestablishment of weeds after they have been treated mechanically, chemically or with biological control (Montana Native Plant Society 2004). The Service has begun restoration work on two bottomland areas (Irish and Knox Bottoms already). Figure 20 shows the river bottoms in need of restoration.

Use of Prescribed Fire

Prescribed fires were used to treat Kendall Bottoms (55 acres) and Leclair Bottoms (74 acres) in 1992. In 1993, Forchette Creek (50 acres), Doney Bottoms (8 acres), Manning Dog Corral (50 acres), Hawley Creek (200 acres), Irish Bottoms (110 acres), Mauland Bottoms (30 acres), and White Bottoms (30 acres) were treated as well. The objectives were to reduce invasive plant invasion and reestablish native vegetation. Prescribed fire continues to be used as a tool to treat river bottoms and has proved to be very effective in preparing the seedbed for native planting.

RIPARIAN AREAS and WETLANDS

Riparian habitat areas include wetland and upland vegetation associated with rivers, streams, and other drainage ways. The riparian areas of the refuge occupy a relatively small portion of the landscape, but wildlife and livestock utilize these areas disproportionately more than any other habitat type (Kaufman and Krueger 1984, Mosconi and Hutto, 1982, Johnson et al. 1977, Ames 1977). Riparian and wetland areas provide important habitat for a wide variety of wildlife species, ranging from reptiles and amphibians that are solely dependent on streams and wetlands, to upland mammals that depend on riparian areas as a source of water, foraging habitat, and cover. Riparian areas are also important for many bird species, providing nesting and breeding habitat for migratory songbirds, open water habitat for waterfowl, and foraging and nesting habitat for some raptors. Besides wildlife habitat, riparian and wetland habitats also provide important functions that sustain the ecosystem, including sediment filtering, stream bank development, water storage, aquifer recharge and energy dissipation from streams (Hansen et al. 1995).

Riparian systems play an important role in maintaining the ecological function of the entire refuge, from aquatic habitats to uplands. This section describes the general composition of riparian habitats, the historical influence of beaver, wildlife diversity, ongoing riparian monitoring, the influence of livestock grazing, and water quality considerations.

Riparian Habitat Composition

Riparian vegetation and habitat has historically been found along most of the small streams and rivers on the refuge. Vegetation within the larger riparian systems (such as the Missouri and Musselshell Rivers) is dominated by mature forests of plains cottonwood with an understory of shrubs, grasses, and wetlands. Other trees and shrubs include green ash, red-osier dogwood, common chokecherry, and silver sagebrush, while the riparian understory includes grasses (redtop, inland saltgrass, western wheatgrass, and foxtail barley) and a variety of forbs, sedges, and rushes. Smaller streams and coulees with a healthy riparian area are generally similar in species composition but at a smaller scale.

Many of the cottonwood riparian areas along the Missouri River are in a degraded condition, with limited shrub understory, limited cottonwood regeneration, and an overabundance of monotypic nonnative grasses (such as smooth brome). This change in riparian structure along the Missouri River is likely due to a combination of livestock grazing and changes in river flows. Hansen (1989) found the overall ratio of replacement to mature trees is 54 percent, suggesting a future decline in the riparian forests and the habitat they provide.

Several studies have be done on the riparian vegetation along the Missouri River from west of the refuge boundary to Fred Robinson Bridge (Auble et al. 2005; Auble and Scott 1998; Dixon et al. 2008; Scott and Auble 2002, 2003; Scott et al. 1993, 1994, 1997). Flows in this reach of river are influenced by a number of dams and diversions, most importantly, Canyon Ferry and Tiber Dams. While the timing of the average high and low river flows has not been substantially altered, their relative magnitudes have. Scott et al. (1993, 1994) found that cottonwood establishment occurred in years with a peak mean daily flow greater than 49,434 cubic feet per second (1,400 cubic meters per second) or in the 2 years following such a flow. These years include 35 out of the 111 years of record and account for establishment of 47 of 60 trees examined.

Seedlings become established most years on bare, relatively low surfaces deposited by the river. The high elevation of establishment of all trees dat-

ing to before 1978 (relative to the normal river stage elevation) indicates that only individuals established on high flood deposits are able to survive subsequent floods and ice jams. Highest flows almost always occur during the ice-free period and establishment is more likely to occur during ice-free flooding. Mortality is higher for those cottonwoods established in relatively low channel positions.

Bovee and Scott (2002) developed a flow model to reconstruct unregulated daily peak flows in the National Wild and Scenic reach of the Missouri River. To maximize establishment of cottonwoods, a threshold of 65,333 cfs would be necessary. Floods this size lead to establishment of cottonwood seedlings above the zone of ice-drive disturbance. Cottonwood is a pioneer, disturbance-dependent species that establishes from seed on bare and moist surfaces during a brief period following seed dispersal.

Three human-caused factors have contributed to the riparian changes on the refuge, (1) beaver have been eliminated from tributary streams, (2) cattle have been stocked at high densities in riparian areas during the growing season, and (3) upland reservoirs have altered the water flow in major drainages (FaunaWest 1996).

Many of the smaller streams on the refuge are in a degraded condition due to the combined effects of these factors, which have, in general, resulted in narrower riparian corridors, fewer wetlands, and less robust riparian vegetation across the refuge. In some areas, riparian vegetation has disappeared from extended reaches of stream. However, the construction of fencing to exclude livestock from several important riparian areas (such as Rock Creek and Bobcat Creek) has allowed conditions in these areas to improve.

Influence of Beaver on Riparian Areas

Historical literature suggests that beaver were a dominant feature in parts of the original bottomland landscapes of the refuge before trapping reduced them to numbers too low to support their wetland mosaic. Trapping on the refuge dates prior to 1840 when trappers worked in the area. Hundreds of thousands of "wolf and beaver skins and pelts of the deer and elk were brought to Fort Benton by Indian and white from the far North, from the South, from the Rockies and the vast extent of plains surrounding it, and were later shipped down the river to St. Louis" (Schultz 1901). Sometime between 1877 and 1882 Schultz worked at a fur trading post on the refuge at Carroll bottom (Turkey Joe) where one winter he mentions that they took in 300 beaver skins. By 1901, beaver were so scarce that trapping was illegal, but this did little to stop the continued exploitation. There are historical records of beaver system collapse after trapping. In addition to trapping, much of the water from the upper watershed of Armells Creek was used for agriculture by 1900 (Frost 2008). It is likely that they maintained a now-collapsed wetland system along at least three major streams, (1) Armells Creek with headwaters in the Judith Mountains; (2) Musselshell River with headwaters in the Crazy, Little Belt, and Judith Mountains; and (3) Big Dry, which has a much smaller watershed. Beaver also maintained wetlands in the lower ends of several minor streams on the refuge (Frost 2008).

Beaver modify second- to fifth-order streams by as much as 20–40 percent by (1) modifying channel geomorphology and hydrology; (2) retaining sediment and organic matter; (3) creating and maintaining wetlands; (4) modifying nutrient cycling and decomposition dynamics; (5) modifying plant species composition; (6) influencing the timing, rate and volume of water and sediment movement downstream; and (7) through the creation of pools and backwaters generating new fish and wildlife habitats, which results in significant increases in biodiversity (Ohmart 1996). Currently, water quickly runs out of beaver impounded water streams like Armells Creek. The more beaver wetland created, the longer the water is retained after snowmelt and rain events. As a result, these systems acted as sponges, slowly releasing water from one pond to the next below, and certain streams should have been sustained as permanent wetlands. These systems, lying in the lowest and coolest parts of the landscape, would not have been expected to dry up (Frost 2008).

Beaver

Importance of Riparian Areas for Wildlife

Wildlife use riparian zones disproportionately more than any other habitat type, and fish, depend on the structure and inputs to this zone (Fitch and Adams 1998, Hubbard 1977, Ohmart 1996). In a study within the Great Basin of Southeastern Oregon, 82 percent of the terrestrial species known to occur are either directly dependent on riparian zones or use them

more than other habitats (Thomas et al. 1979). There are similar findings for nesting bird species (Johnson et al. 1977, Kauffman and Krueger 1984). In a recent study on the refuge, riparian forest edge habitat accounted for the highest bat activity (Stewart 2007) and might be a limiting factor to bat distributions and abundance on prairie landscapes.

Closer to the refuge, Tewksbury et al. (2002) compared deciduous riparian areas with surrounding upland communities, and repeatedly found breeding bird diversity and density to be greater in riparian communities. The ungrazed Missouri River sites were located on the refuge and grazed survey locations were in a 40-km stretch of river bordering the refuge to the west. In grazed locations, about 70 percent of species were less abundant, 13 species were significantly less abundant, and only one species was more abundant (Tewksbury et al. 2002). Knowles and Knowles (1994) found twice the abundance of birds in the ungrazed area of Rock Creek on the refuge compared to grazed area of Siparyann Creek. They found birds that have an affinity to grasslands do well in a grazed area, whereas those birds associated with riparian forests were more abundant in the ungrazed area. The most common bird in Rock Creek was the yellow warbler, and in Siparyann it was the mountain bluebird.

Bats serve a variety of ecological roles such as insect predators, prey, pollinators, and seed dispersers. Because of their sensitivity to pollution and habitat disturbance, they also serve as indicators of habitat health. Several species of bats use rock crevices and caves adjacent to riparian corridors for maternity colonies and possible year-round roosts, and use the riparian corridor to forage (Lausen and Barclay 2002). In addition to providing important foraging habitat, cottonwood riparian zones along the Missouri River most likely provide important roosting habitat. Along the Missouri River on the refuge, Stewart (2007) detected a high intensity of use adjacent to all riparian forest habitat types from big brown, silver-haired, and hoary bats as well as the "40 kHz group" made up of long-legged myotis, little brown myotis, small-footed myotis, and eastern red bat. Stewart (2007) also found riparian habitat and complexity were significant factors influencing bat activity. Activity and foraging attempts were highest for entire bat community adjacent to riparian forest edge compared with more open habitat and Russian olive stands. Overall bat activity was also high adjacent to the center of riparian forest habitat.

Livestock Grazing and Riparian Monitoring

Historical grazing by large herds of bison and other ungulates included long periods of rest after intensive disturbance such as drought, fire, and grazing. Bison did not linger in riparian areas (Fuhlendorf et al. [in press], Van Vuren 1981) and did not use an area all season long. Cattle spend a disproportionate amount of time in riparian areas: 5–30 times longer (Ehrhart and Hansen 1997).

Streams and their watersheds function as units and are inseparable. Riparian health is affected by off site factors operating at the landscape level, including upland range conditions that affect runoff timing and sediment delivery to the channel and headwater impoundments that divert water from the channel downstream. (Thompson and Hansen 1999, Belsky 1999). The desired riparian-wetland habitat of a watershed should dictate the grazing management of the surrounding uplands.

The proper management of livestock grazing in riparian-wetland areas requires a recognition that: (1) grazing management practices that improve or maintain upland sites may not be good management practice for riparian-wetland areas; and (2) season-long grazing is not a viable option to improve deteriorated riparian-wetland areas or to maintain a healthy riparian-wetland zone. To maintain necessary riparian function, grazing management must provide for adequate cover and height of vegetation on the stream banks and overflow zones to permit the natural stream functions to operate successfully (Ehrhart and Hansen 1997). Currently, the refuge is working with cooperators above the refuge to enhance river flow, which will potentially aid riparian restoration.

Over the past 15 years, several studies were conducted to evaluate riparian conditions on the refuge. These include a broad-scale stream assessment from 1995–7 with follow-up assessments in 2009, exclosure monitoring on Rock Creek, monitoring along the Lower Musselshell River, restoration recommendations along Telegraph Creek, a 5-year USGS study to gage streams on the refuge, and water quality sampling conducted on the refuge by the Montana Department of Environmental Quality in 2006–7 (Cook et al. 1996, Parker et al. 1996, Sando et al. 2009, Thompson et al. 1999). The findings of some of these key studies are described in detail below.

From 1995 to 1997, the Riparian Wetland and Research Program assessed 82 streams across the refuge, selecting 203 segments representing 79 river miles. Of the selected segments, 10 percent were found to be functioning as healthy riparian areas, 31 percent were functioning at risk, and 59 percent were scored not functioning or unhealthy, signifying they could no longer properly filter out sediment from the water, build and retain erosion-resistant stream banks and store adequate amounts of water throughout the summer (Thompson and Hansen 1999). In 1997, Neppl surveyed 2,000 feet of Duck Creek and Brown Pass Coulee using the Riparian and Wetland Ecological Evaluation Form (Hansen et al. 1993), and both were found to be not functioning.

Ecological Solutions Group (2009) resurveyed most of the same locations in 2009 as in 1995–7 (see figure 21). However, the Service requested additional survey areas where management changes have occurred such as Armells Creek, Rock Creek (west), and Bobcat Creek Habitat Unit and reduced survey points in habitat units where management changes have not occurred such as CK Creek and Beauchamp Creek. Ecological Solutions Group (2009) found riparian health has greatly improved since 1995. Most of the gains have come on physical site factors (soil and hydrology). Increased precipitation promoted vegetation growth and sediment for floodplain building. Additionally, changes in management have allowed the increased vegetation cover to remain on site. Much of the gain in health rating due to increased vegetation cover is offset by the negative further invasion by noxious weeds. Recruitment of woody plant species (for example, willows, cottonwoods and other trees and taller shrubs), is not widespread enough to affect the overall average riparian health ratings.

While the overall average of riparian health across the refuge has improved, not every stream or local area has shared this improvement. Woody draws located east of the Big Dry on the eastern edge of the refuge, have suffered significant decline. Streams that remain in the lower edge of "Functional At Risk" category include CK Creek and the Pines Recreational Area. Table 10 summarizes the riparian health assessment findings and compares these to 1995–7.

A contracted firm, Riparian Resources, was hired to establish monitoring locations and collect vegetation data in three areas along Rock Creek (1996 and 2005) and two areas along Siparyann Creek (1996 only) (Miles 1996, 2005). Area 1 was on BLM land with normal livestock grazing densities, area 2 was on the refuge within a livestock exclosure built in 1991, and area 3 was on the refuge with spring-only livestock grazing. Siparyann (area 4) was located on BLM land inside and outside a limited fall-grazing pasture.

The monitoring between 1996 and 2005 documented an uneven, unexplainable distribution in cottonwoods and willows that was not tied to river geomorphology. Over the 9 years, the areas all experienced a 55-percent decrease in number of young cottonwoods (98 percent, 59 percent, and 35 percent decrease in areas 1, 2, and 3 respectively). This indicated that the older plants are not being adequately replaced by young cottonwoods, due to browsing by wildlife and livestock. Timing of use is critical with winter use probably removing the most plant biomass and causing the most damage to the young cottonwoods. Average age of recruitment is 3 years suggesting that cottonwood replacement did not equal loss.

Browsing use by wildlife and livestock is high throughout the entire project area. Sixty to ninety-two percent of the second-year stems had been browsed on the young cottonwoods and willows. In area 1, this was likely to due livestock; in area 2, likely due to elk and possibly deer; and in area 3, both elk and livestock. These results were not expected. Studies have shown elk avoid areas with large concentrations of cattle and without security cover (Knowles and Campbell 1982, Stewart et al. 2002, USACE et al. 2001). Siparyann Creek (area 4) was monitored in 1996 for willows since only eight cottonwood seedlings were found along 8,000 feet of stream. The number of willows found inside the fence

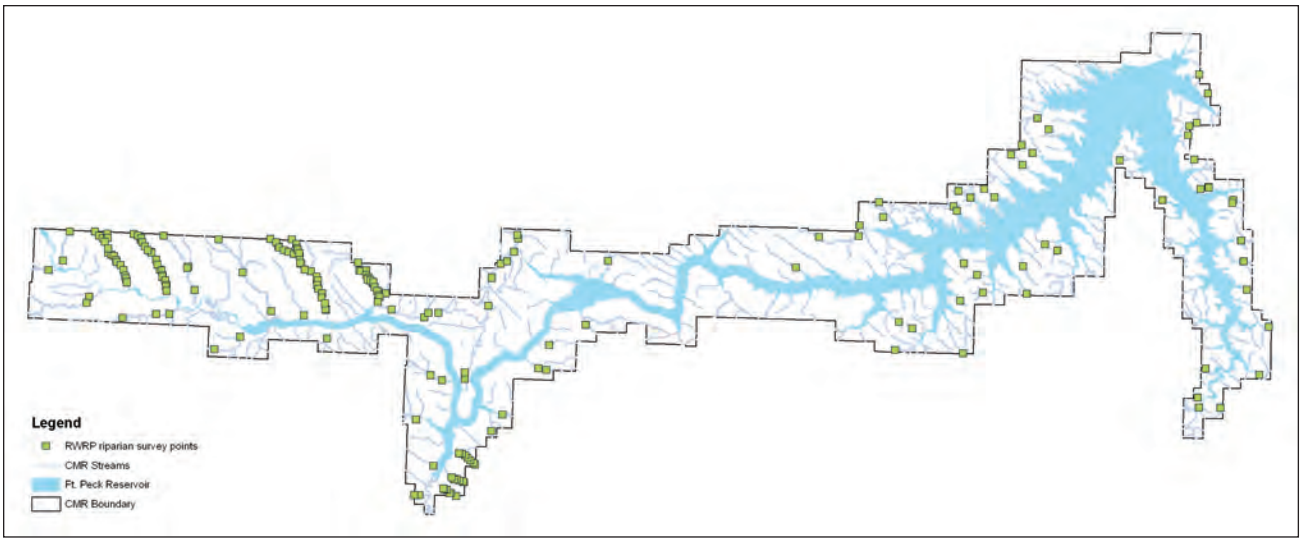


Figure 21. Map of Riparian and Wetland Research Program survey locations at the Charles M. Russell and UL Bend refuges.

Table 10. Comparison of riparian health of 82 streams across the Charles M. Russell National Wildlife Refuge (1995–2009).

Year	*Number of Polygons*	*Miles of Stream*	*Riparian Acres*	*Vegetation Score* (%)*	*Soils/Hydrology Score (%)*	*Overall Score (%)*	*Health Category*
All polygons on Charles M. Russell refuge: assessed in 1995–7 and resampled in 2009							
1995–7	188	88.0	1,284.0	63	55	59	Nonfunctional
2009	155	81.8	1,303.5	70	86	78	Functional at risk
All one-to-one exact match polygons on Charles M. Russell refuge: assessed in 1996 and resampled in 2009							
1995–7	114	53.6	681.2	62	52	56	Nonfunctional
2009	114	53.6	773.4	65	83	74	Functional at risk
Slippery Ann (Siparyann) Habitat Unit 2: assessed in 1996 and resampled in 2009							
1996	34	27.0	282.7	63	54	58	Nonfunctional
2009	33	27.1	329.0	72	89	81	Functional
Germaine Coulee Habitat Unit 55: assessed in 1996 and resampled in 2009							
1996	19	8.8	74.7	55	51	53	Nonfunctional
2009	19	8.8	111.6	60	83	73	Functional at risk
UL Bend refuge: assessed in 1995 and resampled in 2009							
1995	7	1.1	24.3	65	46	55	Nonfunctional
2009	7	1.1	27.5	84	91	87	Functional
Rock Creek (northwest end of refuge): assessed in 1995 and resampled in 2009							
1995	4	0.5	13.0	67	61	64	Functional at risk
2009	17	13.8	228.1	84	97	91	Functional
Nichols Coulee Habitat Unit 4: assessed in 1995 and resampled in 2009							
1995–7	6	3.4	33.5	63	36	49	Nonfunctional
2009	6	3.4	34.3	70	72	71	Functional at risk
CK Creek: assessed in 1997 and partially resampled in 2009							
1997	18	20.7	379.5	63	55	59	Nonfunctional
2009	2	3.1	49.0	63	66	65	Functional at risk
Armells Creek: comparison of two small polygons assessed in 1995 with two larger polygons assessed in 2009 that contain them							
1995	2	0.3	4.1	50	31	40	Nonfunctional
2009	2	2.2	35.9	80	91	86	Functional
Armells Creek, all 15 polygons: assessed in 2009							
2009	15	9.9	187.4	74	89	82	Functional
Pines Recreation Area (South Fork of Duck Creek to Sutherland Creek): assessed in 1995 and resampled in 2009							
1995	7	0.9	18.9	68	63	65	Functional at risk
2009	7	0.9	20.3	60	63	61	Functional at risk
Woody Draws (Rock Creek area and north to Fort Peck Dam): assessed in 1995 and resampled in 2009							
1995	3	0.5	6.9	92	91	91	Functional
2009	9	3.5	74.2	59	78	69	Functional at risk

**Average scores, weighted on polygon size. Scoring values: 80%–100%=Functional (healthy); 60%–79%=Functional at risk (healthy, but with problems); <60%=Nonfunctional (nonhealthy).*

was 110, and 30 willows were found outside. Essentially, by excluding cattle in area 2, a highly attractive area was created, concentrating high numbers of elk. It is believed that high-quality riparian habitat would not be as heavily impacted if additional riparian areas were improved or created by excluding cattle and maintaining elk numbers at lesser numbers.

The strategies for the alternatives (Chapter 3–Alternatives) stress the importance of working closely with lessees to manage livestock. A few weeks of unauthorized use or overgrazing can set back years of progress in improvements of riparian-wetland systems (Duff 1983). A few head of unauthorized livestock throughout most of the hot season can negate any positive riparian-wetland habitat response (Myers 1981). According to the guide, Best Management Practices for Grazing in Montana (1999), it is the amount of time livestock spend in the riparian area that determines the amount of grazing impact. Success in maintaining or enhancing riparian health is dependent more on the commitment and involvement of the manager (both refuge staff and livestock operator) than on what grazing system is employed (Ehrhart and Hansen 1997).

SHORELINE

The nearly 1,520 miles of shoreline is a highly dynamic area found along the lakeshore areas of the refuge. The habitat is defined as the vegetation found between current lake levels and high pool elevation (about 2,250 feet). The USACE has primary jurisdiction for management of the lakeshore areas, and the Service cooperates with USACE to meet habitat needs of several threatened and endangered species (piping plover, least tern, and pallid sturgeon).

An interesting observation recently is the influence of lake levels and livestock use. When lake levels are low, livestock spend most of their time in the zone between low water mark and the high water mark, thus reducing grazing pressure on refuge uplands. When lake levels return to high pool, refuge uplands will again take the brunt of the grazing pressure.

Fire occurrence along the Fort Peck Lake shoreline is almost nonexistent. In 1992, 35 acres of shoreline at the Fort Peck Dam were prescribed burned to provide suitable nesting habitat for piping plover. An occasional wildfire may burn into the sparsely vegetated shoreline but quickly goes out for lack of burnable fuel.

INVASIVE SPECIES

Invasive species continue to be one of the greatest challenges for managers in the Refuge System including the refuge (FWS 2007c). Service-wide, according to the Service's 2007 Refuge Annual Performance Planning database, 2.4 million acres of refuge lands are infested with invasive plants. In addition, there are 4,423 invasive animal populations on refuge lands. To combat this growing problem on refuges, Invasive Species Strike Teams were set up in several Service regions including region 6. They are mobile response units designed to rapidly respond to the detection of new infestation and eradicate them. The strike team for region 6 is based out of Benton Lake near Great Falls, Montana, and the team assists the refuge in combating invasive plants.

Although there are several types of invasive species of existing or potential concern including weed species, aquatic invasive species such as zebra mussels, and other pests that could be an issue in the future (pine beetle), weeds are the primary issue of concern for the refuge. MFWP monitors for the detection of aquatic nuisance species in Montana.

Weed Species

Figure 22 shows the areas treated from 1997 to 2008. In 2008, the strike team treated five primary weed species: Russian knapweed, saltcedar, spotted knapweed, and whitetop (hoary cress) (refer to table 11).

Table 11. Acreage of treated weeds at the Charles M. Russell and UL Bend refuges (2008).

Weed Species	*Treated Acres*
Leafy spurge	2.47
Russian knapweed	72.90
Saltcedar	30.00
Spotted knapweed	0.71
Whitetop/hoary cress	6.00
Total	112.07

Additionally, the strike team conducted a number of other activities centered on prevention and education efforts, inventory and monitoring, and coordination and cooperation with other agencies. For example, the team participated in the Zortman weed rodeo and conducted a hunter vehicle weed wash. More than 70 miles of road were surveyed. Because of the need to cover as much ground as possible, other invasive species like Canada thistle were not mapped. Other invasive plant threats found on the refuge include Russian olive, smooth brome, crested wheatgrass, and quack grass (refer to river bottoms). In the uplands, the two common invasive species are Japanese brome and yellow sweetclover. Both species have increased as native plant species diversity has decreased in response to the press herbivory and fire suppression practices of the refuge. The healthier landscapes on the refuge (places where native plant species populations are diverse and viable) have less Japanese brome and yellow sweetclover.

USFWS

In collaboration with others, the Service operates a weed wash station during hunting season.

Invasive plant seeds are easily picked up and transported by vehicles. Because the refuge experiences much of its vehicle traffic during the hunting seasons, in 2007 the Rancher's Stewardship Alliance in Phillips County organized a hunter-vehicle weed wash. This has proven to be an excellent education program, and a number of hunters reported washing their vehicles prior to coming out to the refuge in 2008.

USACE also manages for invasive species on the refuge. Generally, they concentrate their efforts on treating saltcedar below the high water mark on Fort Peck Reservoir while the Service focuses primarily in the river bottoms and upland areas. The Service maintains close cooperation and coordination with USACE. For example, in 2008 the strike team combined contractor spray efforts in areas important to both agencies. The strike team also cooperated with BLM and Valley County to conduct an extensive invasive plant survey, recording weed infestations along 2,900 miles of road across several jurisdictions.

A number of methods are currently used or could be used to combat weeds on the refuge. Mechanical methods like hand pulling, power tools, and mowing and tilling are more effective for controlling annual or biennial pest plants. For perennial plants, the root system has to be destroyed or will continue to resprout and grow. Biological control agents involve the deliberate introduction and management of natural enemies to reduce pest populations. There are advantages and disadvantages to biological controls. Some biological control efforts have been initiated on the refuge. Herbicides (for example, Milestone™) are also used to treat weed-infested areas. For long-term prevention and proper maintenance of refuge habitats, restoration including revegetation with native/desirable plants is essential (refer to river bottoms [above] for more information).

Saltcedar or tamarisk is the most prolific invasive species along the river. Canada thistle and knapweed are also common. Saltcedar plants are spreading shrubs or small trees, 5–20 feet tall, with numerous slender branches. They are an aggressive colonizer, able to survive in a variety of habitats. Often they form monotypic stands, replacing willows, cottonwoods, and other native riparian vegetation. The stems and leaves of mature plants secrete salt that inhibit other plants and changes soil chemistry. Saltcedar is an enormous water consumer, and a single large plant can absorb 200 gallons of water per day. Infestations can have detrimental effects on wildlife. Large infestations of saltcedar occur along the 1,520-mile-long shoreline of the reservoir. Most infestations occur along the south shore in bays and inlets where drainages enter the reservoir (Lesica and Miles 2004). Many people believe that the most effective way to treat saltcedar would be inundat-

INSERT 11x17
Figure 22

blank back of Figure 22

ing them by raising water levels to drown them for a substantial length of time (Lesica and Miles 2004). As stated in Chapter 1–Introduction, raising water levels is controlled by USACE and is an issue outside the scope of the planning process.

BIG GAME

The primary big game species found on the refuge include Rocky Mountain elk, mule deer, white-tailed deer, pronghorn, Rocky Mountain bighorn sheep, and mountain lion.

When the Fort Peck Game Range was established in 1936, elk, bighorn sheep and mountain lions were absent, mule deer populations were depressed and pronghorn were quite scarce. Conservation of wildlife was in its infancy at the time and setting aside a large block of land, specifically for game, was a bold and novel move. Through the years, reduced big game harvest, reintroductions and management with a wildlife emphasis has resulted in the relatively abundant big game resources present today. The emphasis to manage primarily for wildlife was reaffirmed when the Game Range became a National Wildlife Refuge in 1976 and was strengthened even further with the 1997 passage of the National Wildlife Refuge System Improvement Act (see chapter 1 for more details on refuge establishment and the purposes of the refuge).

Rocky Mountain Elk

Considered abundant in 1805 when Lewis and Clark traveled through what is now the refuge, elk were extirpated from the Missouri River Breaks 100 years later. Some 50 years after that, elk were reintroduced on the refuge during winter of 1951–2 with the transplant of 161 animals from Yellowstone National Park. A refuge report (unpublished report on file at refuge headquarters) from December 1964 described the game counts on the south side of the Missouri River on the refuge:

> "The primary purpose of this portion of the survey was to census and locate elk in the area prior to a State-opened permit hunt. The area from Highway 191 east to Crooked Creek [the refuge portion of hunting district 410] was transected at 2-mile intervals north and south. A total of 39 elk were sighted in an area approximately 300 square miles, a total of 117 elk could be projected providing that the elk were distributed throughout the entire area. [equates to 0.39 elk per square mile] On the basis of these surveys, it is estimated that elk number not less than 64 or more than 76 in the area between Highway 191 and the Musselshell River."

In comparison some 40 years later, 712 elk were counted during aerial surveys of 79 square miles in five sample blocks of the refuge in this same area during December 2005 (observed 9.0 elk per square mile). Total harvest of elk in the Missouri River Breaks was estimated to be 291 during 1987 and peaked in 2006 with 2,235 elk harvested. The current population of elk in the Missouri River Breaks is thought to be substantially above objective levels that MFWP established in its 2004 Elk Management Plan (MFWP 2004). Hence, elk permit quotas and seasons have been relatively liberal in the Missouri River Breaks during the last several years. Over 9,000 elk were harvested in Missouri River Breaks hunting districts from 2004 through 2008, averaging 1,850 annually (MFWP 2009b). Table 12 lists MFWP's elk objectives by hunting district, their most recent population estimate, and the degree of population reduction needed to achieve the upper end of their population objective range.

Mule Deer

Mule deer populations across the refuge fluctuate for a variety of reasons and densities are highly variable (figure 23). One of the oldest and continuously monitored mule deer study areas in Montana is located on and adjacent to the refuge and is known as the Sand Creek study area on the southwestern portion of the refuge. Mule deer investigations and monitoring began there in 1960 and continues today. In addition, refuge staff has conducted a variety of aerial

Table 12. MFWP's elk population objectives, estimates, and needed herd-size reductions for hunting districts covering the Charles M. Russell and UL Bend refuges.

Hunting -District	*County*	*MFWP Maximum Objective in 2004 Elk Plan*	*Most Recent MFWP Population Estimate*	*% Reduction Needed to meet MFWP Objective*
410	Fergus, Petroleum	2,300	2,300	0
417	Fergus	400	600	33
620, 621, 622	Phillips	1,650	2,868	42
630, 631, 632	Valley	350	650	46
700	Garfield	1,100	1,676	34
	Total	5,800	8,094	28

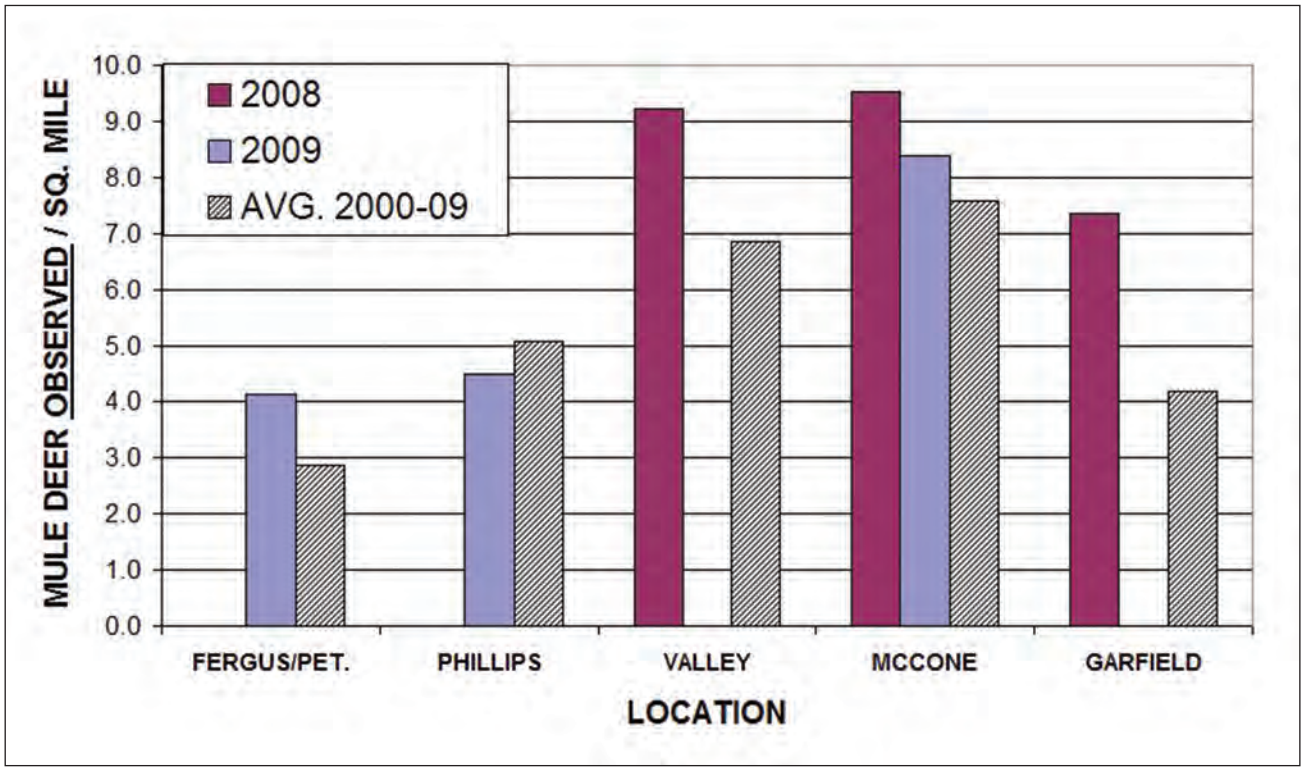


Figure 23. Chart of mule deer densities within six counties covering the Charles M. Russell and UL Bend refuges.

mule deer surveys over the years. A standardized sampling design (figure 24) for aerial surveys covering 430 square miles was implemented in 2000 and has been conducted annually after the hunting season since then. Observations from survey blocks of like colors are combined to produce mule deer density and ratio estimates for county areas.

The total number of mule deer estimated on the refuge has varied from around 7,000 to more than 14,000 over the last 10 years. Mule deer are a highly sought game animal in northeastern Montana. The refuge has managed the population so that older aged bucks are well represented in the posthunting season population (figure 25). The Service feels it is appropriate to have the older aged bucks as an indicator for achieving naturally functioning ecological systems and for providing quality recreation experiences for the public on a national wildlife refuge (refer to public use for more information about quality wildlife-dependent uses).

Overall the public has supported the Service's approach for mule deer because of the variety of hunting opportunities. For example, in one hunting district on the refuge (652), mule deer hunting is by permit only and in 2008, nearly 900 people applied for the 100 permits. In other areas, the refuge has established regulations that shorten the hunting season to the first 3 weeks of the standard 5-week season in most of the rest of Montana. The logic for the shortened season is to allow more mature bucks to survive the hunting season by limiting hunting pressure during the rut, when bucks are more vulnerable to harvest, generally during the last 2 weeks of the hunting season. In another hunting district (700), refuge regulations permit mule deer hunting for the full 5-week season authorized by MFWP.

There are no mule deer harvest estimates specifically for the refuge, but MFWP does produce estimates for each hunting district in the State. Over 6,000 mule deer were harvested in those hunting districts that encompass the refuge in 1995 and mule deer population levels were near all-time highs. That level dropped to less than 3,000 during the following several years and populations were near all-time lows. Slowly, populations have rebounded, but they still fluctuate, and harvest from 2006 through 2008 was around 5,000 mule deer annually (figure 26).

White-tailed Deer

White-tailed deer are much less abundant than mule deer and are found primarily along the Missouri and Musselshell Rivers and major tributaries. They are also seen often on portions of UL Bend National Wildlife Refuge and occasionally in other upland sites. No monitoring specifically geared toward white-tailed deer has been done and hunting seasons on the refuge have been the same either-sex, 5-week season as adjacent areas. In addition to a deer A-tag valid

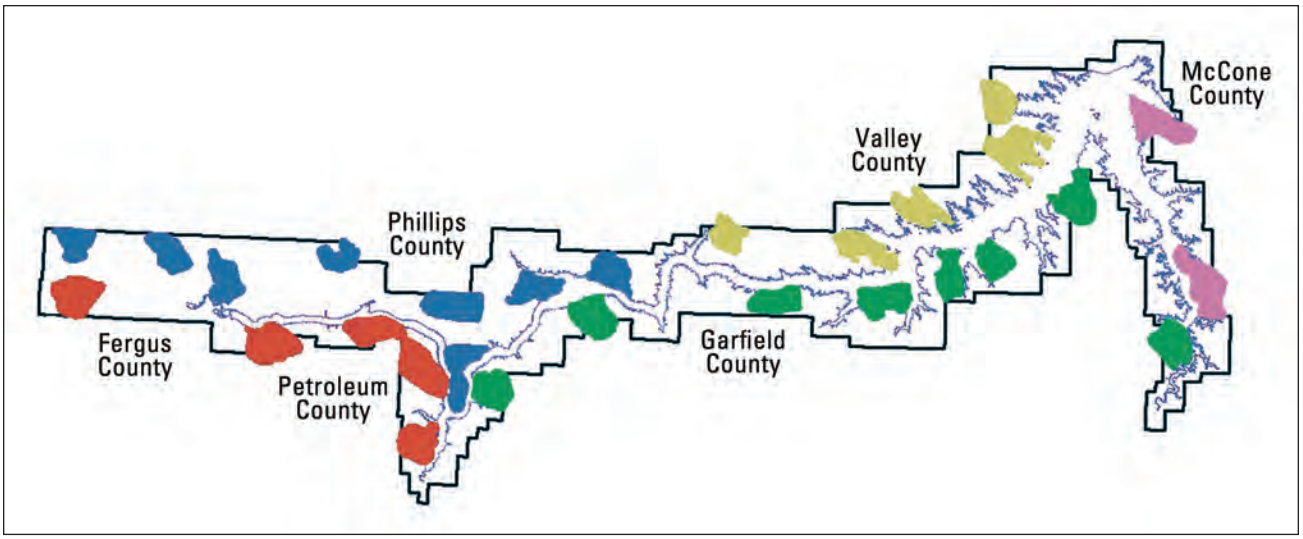


Figure 24. Map of the aerial survey blocks for mule deer and elk at the Charles M. Russell and UL Bend refuges.

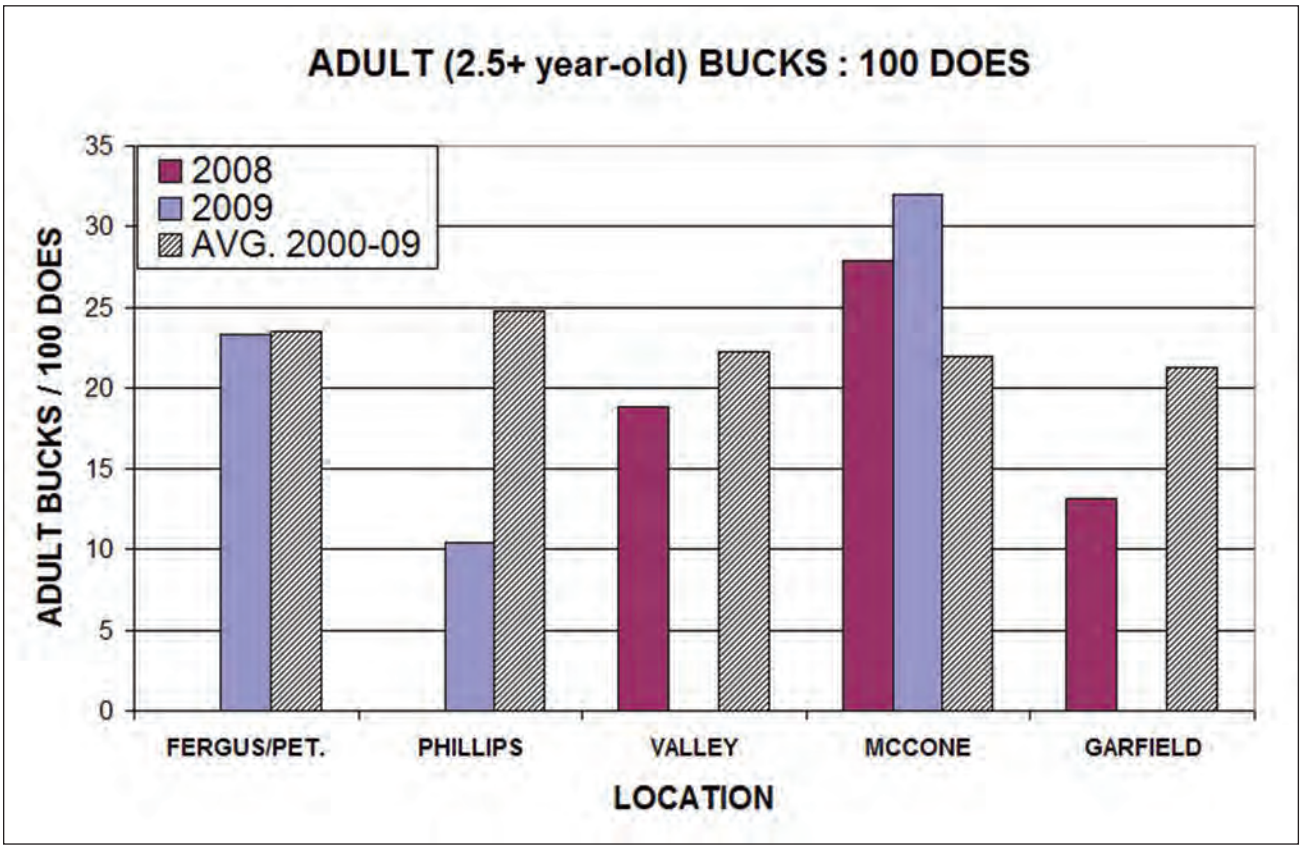


Figure 25. Chart of the ratios of adult bucks to does within the six counties covering the Charles M. Russell and UL Bend refuges.

on the refuge for either deer species and either sex in most areas, MFWP also offers a B-tag for an antlerless white-tailed deer that can be used throughout eastern Montana and those tags are valid on the refuge. There are a few hunters who concentrate on hunting for big white-tail bucks in the river bottoms of the refuge, but the hunting pressure for white-tails is far less than for elk and mule deer.

There are no white-tailed deer harvest estimates specifically for the refuge, but MFWP does produce estimates for each hunting district in the State. About 1,000 white-tailed deer were harvested in those hunting districts that encompass the refuge in 2000 and then dropped to an average of 500 for all eight hunting districts for the next 4 years. The esti-

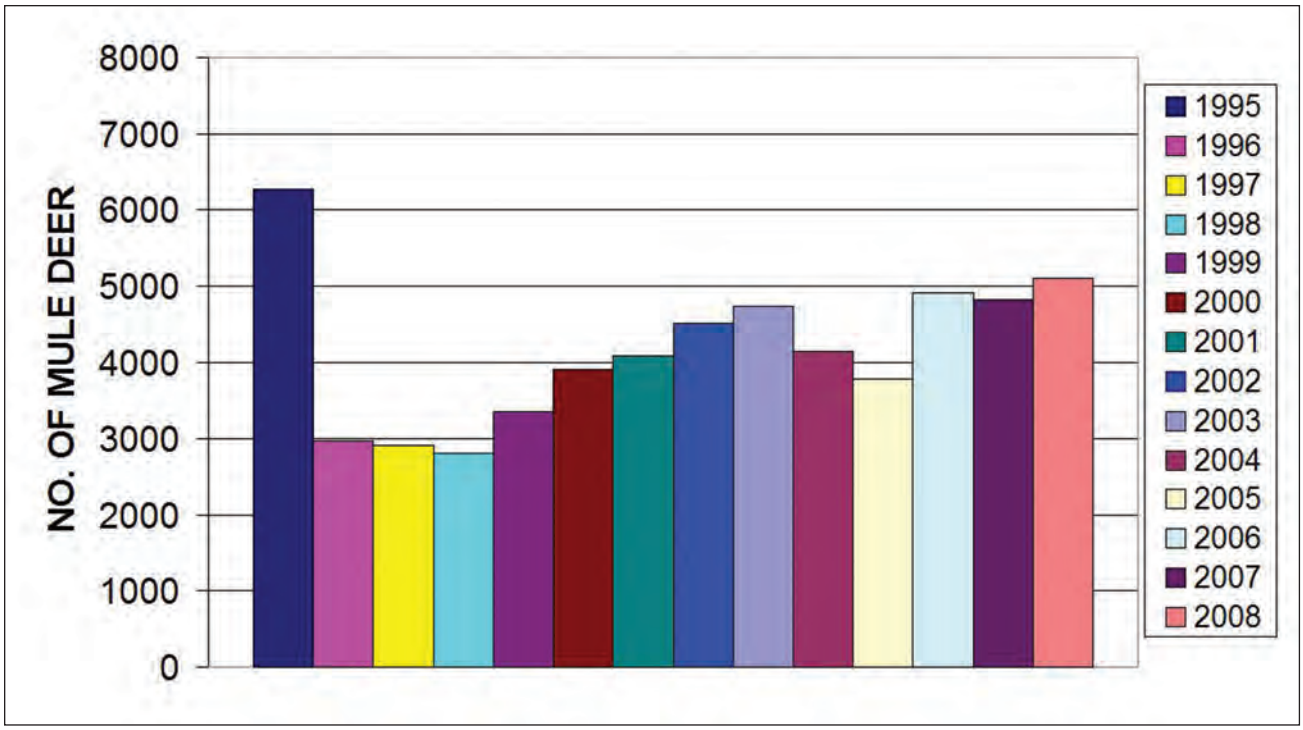


Figure 26. Chart of the number of mule deer harvested in hunting districts on and adjacent to the Charles M. Russell and UL Bend refuges.

mate for 2008 was a harvest of about 1,100 white-tailed deer.

Pronghorn

The 1936 Executive Order 7509 establishing the Fort Peck Game Range specifically identified the need to protect and manage for pronghorn (refer to Chapter 2–Refuge History and Vision). Pronghorn are a highly mobile species and recent research using GPS collars has documented migrations of more than 300 miles from animals collared near the Montana–Canada border north into Alberta and Saskatchewan. The collar from a pronghorn doe marked north of Malta during January 2008 was retrieved 1 year later some 70 miles south, within 1 mile of the refuge boundary. With deep snow and bitterly cold, subzero temperatures during December 2008 and January 2009, many hundreds of pronghorn were observed migrating south from Canada and northern Montana and likely crossed the refuge and the Missouri River and wintered farther south. During the spring, pronghorn have been observed crossing the Missouri River headed north, or attempting to head north, but stranded on the south side of Fort Peck Reservoir. They have been observed pacing the south shoreline of Fort Peck Reservoir during spring and sometimes attempting to swim across to the north, having migrated south across the ice during the previous winter.

Despite the mandatory focus on pronghorn in the executive order, very little survey work has been done on pronghorn and no research studies have ever been conducted. Much of the refuge is not considered pronghorn habitat as the topography is too rough and/or covered with trees and juniper. However, pronghorn are regularly observed using many areas on the refuge, but the role the refuge lands play in a larger landscape and pronghorn ecology are unknown. Studies designed to better understand pronghorn ecology using GPS collars have been proposed, but have not yet materialized.

Rocky Mountain Bighorn Sheep

Quoting from the refuge's 1980 annual narrative report:

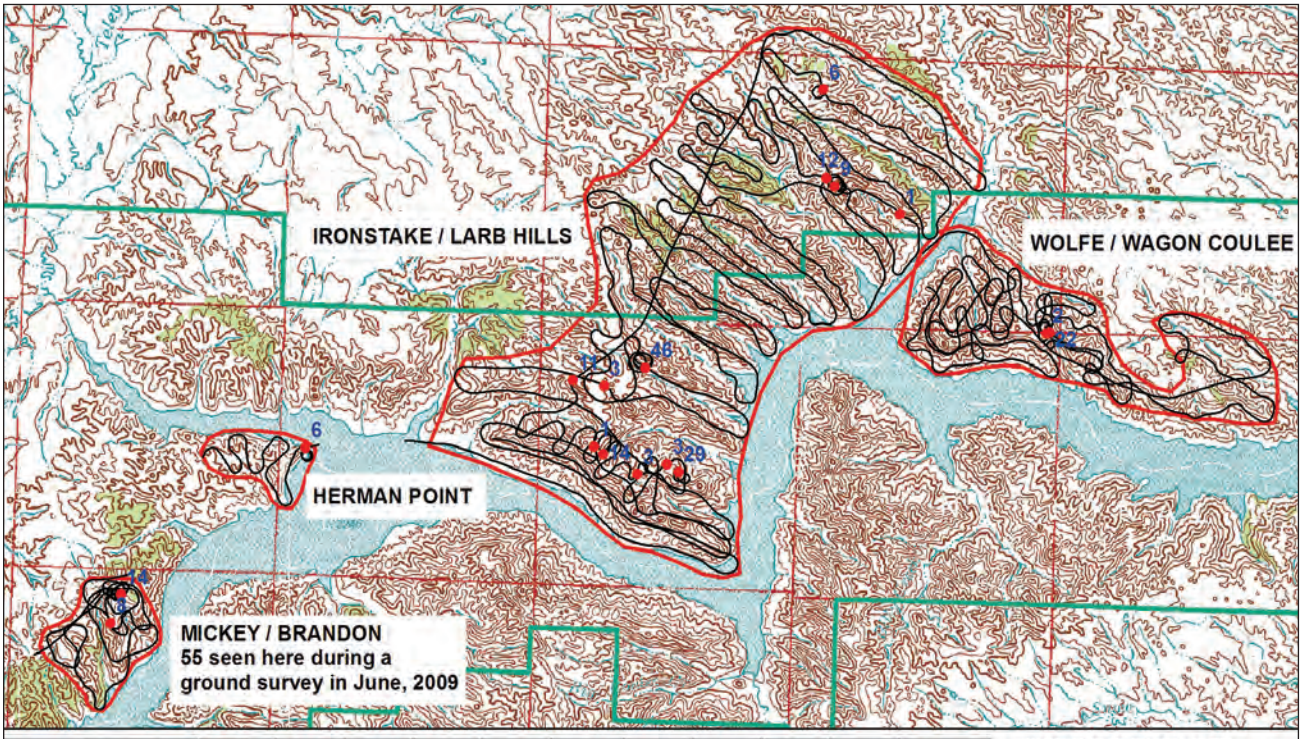
> "The future of the remnant Two Calf transplant herd was sealed this fall when the last remaining ram was poached. FWS special agents have not been able to develop enough evidence to make an arrest.
>
> The ram was poached at the beginning of the rut and it is doubtful any breeding occurred. The number of surviving lambs is unknown but probably less than five. There are no yearling rams and poor survival in the past has resulted in some very old ewes. A BLM transplant occurred some 25 miles upriver and possible dispersal might replace some animals.
>
> On March 8, 1980, 27 bighorn sheep from the Sun River herd were released near Mickey-

Brandon Buttes. The majority of the ewes and two small rams stayed on the buttes. The older rams wandered to the north throughout the summer and at least 4 returned to the buttes area for the rut. Another small group of ewes was reported by hunters to be on Iron Stake Ridge, 15 miles northeast of the main herd group. A December aerial count showed 4 rams, 11 ewes and 3 lambs."

Bighorn sheep are occasionally observed in the Two Calf Creek and Heller Bottom area on the very southwestern portion of the refuge. It is thought these animals are part of a larger sheep population that extends upstream from the refuge. In the Mickey/Brandon Buttes and Ironstake Ridge/Larb Hills area, an average of 94 bighorn sheep (range 74–128) were counted annually from a combination of ground and aerial surveys from 1986 through 1997. Counts during December ground surveys from 1998 through 2004 increased steadily from a low of 96 to a high of 174 in 2004. MFWP personnel counted bighorns in hunting district 622, west of Timber Creek, while conducting helicopter elk surveys in 2006 and 2007 and observed close to 200 sheep each year. The refuge staff conducted an aerial bighorn sheep survey in July 2009 (see figure 27). This was the first time such a comprehensive summer survey of all potentially occupied sheep habitat was attempted. Results were reported as:

"An aerial bighorn sheep survey was completed on July 16–17, 2009 in HD 622. Of special note was seeing 24 sheep, including at least 6 lambs, east of Timber Creek. This is the first time we've tried a summer aerial survey and although we counted 190 sheep, I'm sure we missed seeing rams."

For many years the refuge proposed moving bighorn sheep into suitable habitat east of Timber Creek. During the last several years there have been anecdotal reports of sheep in this area. It appears they have begun colonizing this area on their own. MFWP released its Draft Bighorn Sheep Conservation Strategy in August 2009 (MFWP 2009a) for public comment. Their population objective for Hunting District 622 bighorn sheep is 175–200 observed sheep, but does not include the approximately 20 square miles of habitat now occupied by sheep east of Timber Creek. With the recent expansion of hunt-



LOCATION	DATE	AREA (SQ.MI.)	SURVEY TIME	TOTAL	EWES	LAMBS	RAMS	<1/2	1/2 - 3/4	> 3/4	UNCLASS.
IRONSTAKE / LARB HILLS	7/16/2009	72.9	2:56	138	68	29	11	3	7	1	30
WOLFE / WAGON COULEE	7/17/2009	17.4	1:04	24	12	6	1	1			5
HERMAN POINT	7/17/2009	2.8	0:10	6			6	2	3	1	
MICKEY / BRANDON	7/17/2009	4.9	0:37	22	8	2	8	2	5	1	4
TOTAL		98.0	4:47	190	88	37	26	8	15	3	39

Figure 27. Map of the aerial bighorn sheep survey at the Charles M. Russell National Wildlife Refuge.

ing district boundary 622, this could be revised in the future. Two either-sex bighorn sheep tags were issued in 1987 for Hunting District 622. From two to seven either-sex permits have been issued annually since then along with a few permits for ewes. Ninety-eight rams and 10 ewes have been harvested from 1987 through 2008 and the long-term average ram age was 6.7 years old (range 4.9–7.8). Almost two-thirds of the total harvest has come from the Mickey/Brandon Buttes area.

There is about 200 square miles of bighorn sheep habitat in northern Garfield County, of which more than 90 percent is on public land (figure 28). Refuge staff are in the early phases of working with landowners, MFWP, and other partners to see if bighorn restoration into this area is possible. For comparison, there is about 110 square miles of habitat where about 200 bighorn sheep currently live in the Mickey/Brandon Buttes and Ironstake Ridge areas.

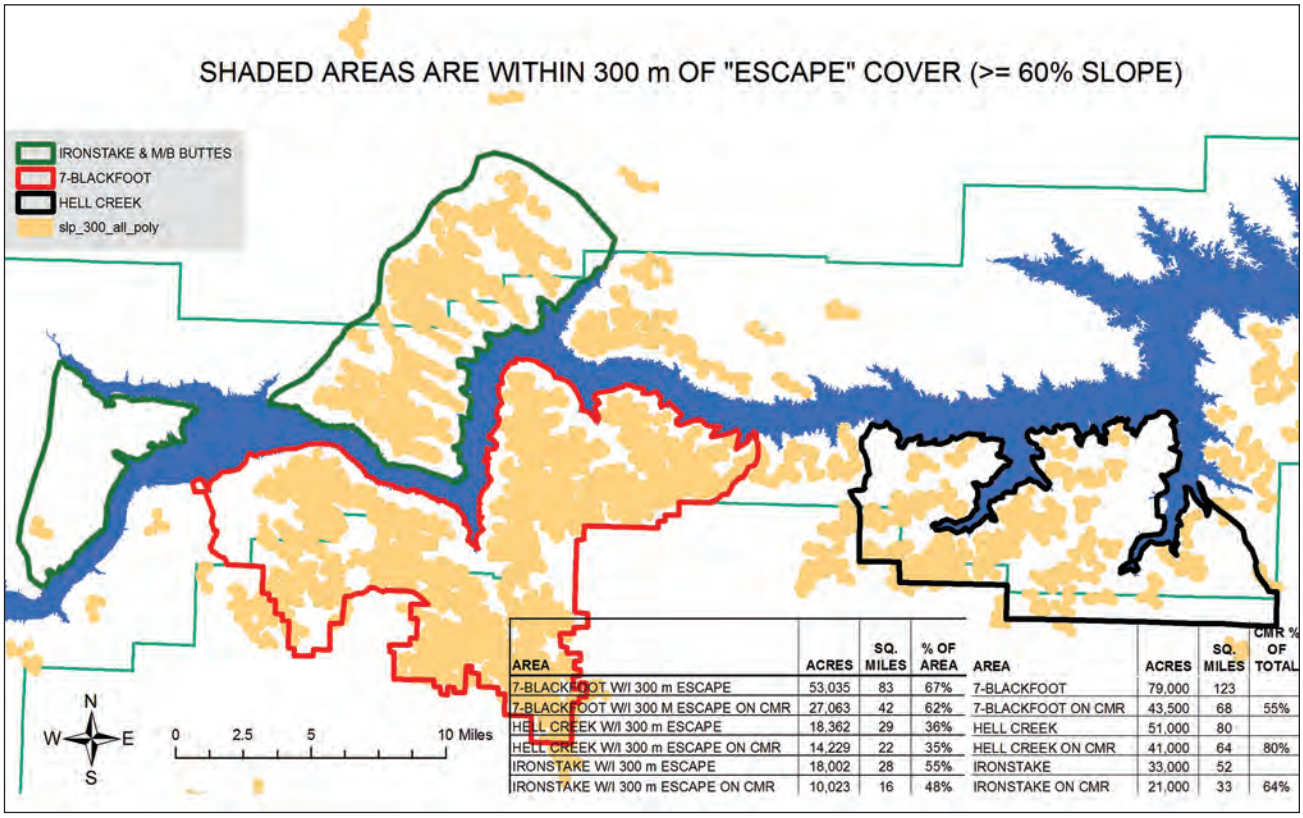
Mountain Lion

Hunting for mountain lion is not currently allowed on the refuge. Mountain lion sightings, encounters with hunters and poaching on the refuge have been numerous enough in recent years to suggest a well-established population. The abundance of elk and deer, especially on the western half of the refuge, would provide an adequate prey base to support mountain lions. No studies on mountain lion abundance or ecology have been conducted in the Missouri River Breaks, so little information is known.

There have been several lions fitted with GPS collars during the last 2 years in the nearby Bears Paw and Little Rocky Mountains. Preliminary data from 11 marked animals and other observations suggests high mortality, primarily from human harvest in these mountain ranges. The connectivity and interchange of lions between these mountain ranges and the Missouri River Breaks is unknown, but there is a proposal to begin fitting lions in the Breaks with GPS collars to begin gaining a better understanding of lion ecology and abundance in north-central Montana.

FURBEARERS and SMALL PREDATORS

Little is known about the populations of furbearing species on the refuge. Few studies/inventories on the abundance or ecology of furbearer species regulated by MFWP (muskrat, beaver, mink, and swift fox [discussed under Species of Concern], bobcat, and river otter) or unregulated by MFWP (least weasel, long-tailed weasel, short-tailed weasel, striped skunk, badger, raccoon, red fox, and coyote) have been conducted on the refuge, so little factual information is known. Beaver and bobcats are the only two furbearers that have been studied or inven-



AREA	ACRES	SQ. MILES	% OF AREA	AREA	ACRES	SQ. MILES	CMR % OF TOTAL
7-BLACKFOOT W/I 300 m ESCAPE	53,035	83	67%	7-BLACKFOOT	79,000	123	
7-BLACKFOOT W/I 300 M ESCAPE ON CMR	27,063	42	62%	7-BLACKFOOT ON CMR	43,500	68	55%
HELL CREEK W/I 300 m ESCAPE	18,362	29	36%	HELL CREEK	51,000	80	
HELL CREEK W/I 300 m ESCAPE ON CMR	14,229	22	35%	HELL CREEK ON CMR	41,000	64	80%
IRONSTAKE W/I 300 m ESCAPE	18,002	28	55%	IRONSTAKE	33,000	52	
IRONSTAKE W/I 300 m ESCAPE ON CMR	10,023	16	48%	IRONSTAKE ON CMR	21,000	33	64%

Figure 28. Map of areas within 328 yards (300 meters) of escape cover for bighorn sheep at and around the Charles M. Russell National and UL Bend refuges.

toried on the refuge. Beaver and muskrat sightings on the refuge are numerous enough to suggest well-established populations on the Missouri River and Fort Peck Lake. However, occurrence of these species on associated tributaries within the refuge is relatively unknown except for anecdotal observations. Expanding suitable riparian habitats would provide the basis for increased populations of muskrat, beaver, river otter, and mink. Current population numbers of the remaining furbearer species is unknown, most have undocumented observations by staff and other visitors; however, continued restrictions would be beneficial to maintaining viable populations.

A research project on bobcats conducted in 1979–80 indicated illegal hunting to be the largest mortality factor among radio-collared bobcats on the refuge (Knowles 1981). Current population numbers on the refuge remain relatively unknown; however, continued restrictions would be beneficial to maintaining a viable bobcat population in the Missouri River Breaks as areas around the refuge continues to be trapped.

The market for beaver fur in the 19th century played a major role in the exploration of western North America (Wilson and Ruff 1999). Throughout North America and Europe, beaver populations were trapped to near extinction by 1900; however, the response by game management agencies in the last century prevented total elimination (Foresman 2001). Beaver populations have since recovered and even considered a nuisance in some areas due to their gnawing of trees and dam construction. Beginning in 1949, but more consecutively 1960–87, refuge staff inventoried beaver caches along the Missouri River within the refuge boundary. Total beaver caches varied from 18 to 115 with an average of 55 per year. The last inventory was completed in 1992, with 64 caches from the west boundary of the refuge to the Musselshell River bottom. Although observations of beaver are quite common along the Missouri and Musselshell Rivers, current population numbers on the refuge remain relatively unknown.

AMERICAN BISON

Bison as wildlife have been eliminated from the Missouri River Breaks for more than 100 years. One permittee in the Grass Coulee Habitat Unit has grazed bison as a form of livestock in recent years. The American Prairie Foundation now has about 200 bison that came from Wind Cave National Park and are currently classified as domestic livestock. Those animals graze primarily on private and BLM land adjacent to the refuge, although some grazing does occur on the refuge in an exchange of use for AUMs that the American Prairie Foundation holds on State leases within the refuge.

Currently, there is no proposal to reintroduce bison on the refuge, but there has been considerable discussion about the possibility of the refuge participating in a restoration effort. Should such a proposal be developed, there will be multiple agencies, partners and cooperators involved and a public process for consideration and evaluation of any bison restoration proposal. The Service is willing to participate with others if such an effort develops and emphasizes the need for cooperation, coordination, and public input (refer to chapter 3, Objectives for American Bison).

BIRDS

More than 250 species of birds have been documented on the refuge. The unique combination of native prairies, sagebrush shrub lands, forested coulees, pine-juniper woodlands, riparian areas and river bottoms, and badlands makes the refuge a haven for migrant and breeding birds. The refuge is also extremely important for year-round residents such as sharp-tailed and sage-grouse. This section discusses sharp-tailed grouse (which is specifically mentioned in Executive Order 7509) in addition to other important bird species not mentioned previously.

Grassland Birds

Some grassland birds found on the refuge are among the fastest and most consistently declining birds in North America due to the loss of native grasslands and the management of remaining grasslands (Cunningham and Johnson 2006, North American Bird Conservation 2009). Each grassland bird species has a unique set of habitat requirements, which may include plant species present as well as plant structure and development. Some birds prefer extremely short grass heights (upland sandpiper) whereas others prefer tall (Baird's sparrow). Some avoid areas of woody vegetation (short-eared owl) and others do not (McCown's longspur). Needed food plants may be present but may not produce needed seed or fruits due to herbivory or timing of fire. Needed insect foods may be dependent on specific plant species that may or may not be present. Raptor prey items (rodents and small birds) may depend on individual plant species and plant structure or insects on an individual plant species. Nesting requirements may be different than brooding requirements and both might need to be within close proximity of each other. Bird species may also be dependent on unbroken blocks of grasslands of certain sizes (NRCS 1999).

According to the North American Breeding Bird Survey data from 1966 to 1993, 70 percent of 29 prairie species have experienced population declines (Fuhlendorf and Engle 2001). Resident and documented breeding refuge birds that are in trouble and/or showing sharp declines include western meadow-

larks, short-eared owls, mountain plover, Sprague's pipit, lark bunting, Baird's sparrow, chestnut-collard and McCown's longspurs, and greater sage and sharp-tailed grouse (North American Bird Conservation 2009). Compounding these declines are the current and future effects of global climate change on grassland birds. Global climate change has and will continue to affect ranges of grassland birds by causing changes in summer range such as: exclusions (Sprague's pipit), contractions (Brewer's sparrow), expansions (Say's phoebe) or additions (scissor-tailed flycatcher). It could also alter migration behavior and habitat and could ultimately affect their survival ability (Price and Glick 2002).

Sharp-tailed Grouse. Sharp-tailed grouse are distributed throughout the refuge, but similar to other species, habitat suitability varies spatially and seasonally. Sharp-tailed grouse are considered an indicator for large grassland landscapes and other grassland birds. Although Executive Order 7509 specified that the refuge should be managed for a maximum of 400,000 sharp-tailed grouse, those numbers have not been observed on the refuge.

Since the mid-1970s, 177 sharp-tailed grouse leks have been mapped (figure 29) and some 2,100 counts of sharp-tailed grouse attending leks have been counted. Leks are specific areas where grouse gather in the spring for courtship displays and mating. There have been 15,000 sharp-tailed grouse counted on the refuge (including repeat counts of the same leks within years). Accurate lek counts are difficult to obtain because sharp-tailed grouse have lower site fidelity than other species (such as sage-grouse), and multiple counts within a season are challenging due to the size of the refuge. Because of these logistical challenges, an annual listening survey was initiated in 1989 as an index to track regional sharp-tailed grouse population levels. Some 330 stations were established in potential sharp-tailed grouse habitat, each spaced about 1 mile apart on roads. An observer listens for sharp-tailed grouse breeding sounds early in the morning and records presence or absence at each station. When populations are high, more birds make more sounds and new satellite leks become established, all contributing to hearing birds at a higher proportion of listening stations. The opposite is true when populations are low. Figure 30 summarizes listening data collected since 1990.

Other Birds

Other bird groups found on the refuge include colonial-nesting birds, waterfowl, raptors, and owls. Early refuge narratives document the declines of colonial-nesting birds and waterfowl as water levels rose after the Fort Peck Dam was completed. Pelicans, great blue herons, and cormorants were common nesters in the large cottonwoods along the river but these birds gradually disappeared as the cottonwoods were drowned out and covered by water.

Ducks and geese were also documented as common upland nesters along the Missouri River prior to the lake rising. Most goose nests were located in the dense underbrush found along the river whereas duck nests were located in the grassy uplands. Nesting waterfowl numbers seem to have fluctuated early on with the rise and fall of the lake. Refuge personnel noted that the lake provided little food to waterfowl, and over time the refuge became more of a migratory loafing area than a nesting area. Winter flocks of waterfowl used the refuge during times when area farmers stockpiled cereal crops such as barley and oats for winter livestock feed. Supplemental feeding of wintering waterfowl on the refuge was also quite common during the 1940s and '50s. Currently, waterfowl remain in the river below the Fort Peck Dam during fall and winter months.

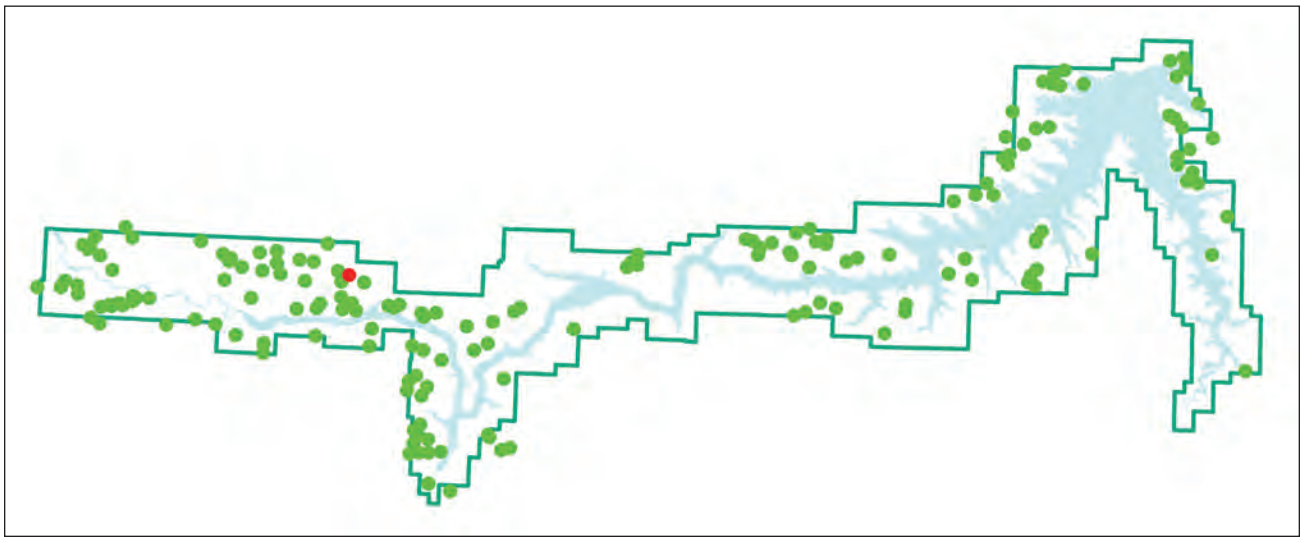


Figure 29. Map of lek locations for sharp-tailed grouse on the Charles M. Russell and UL Bend refuges.

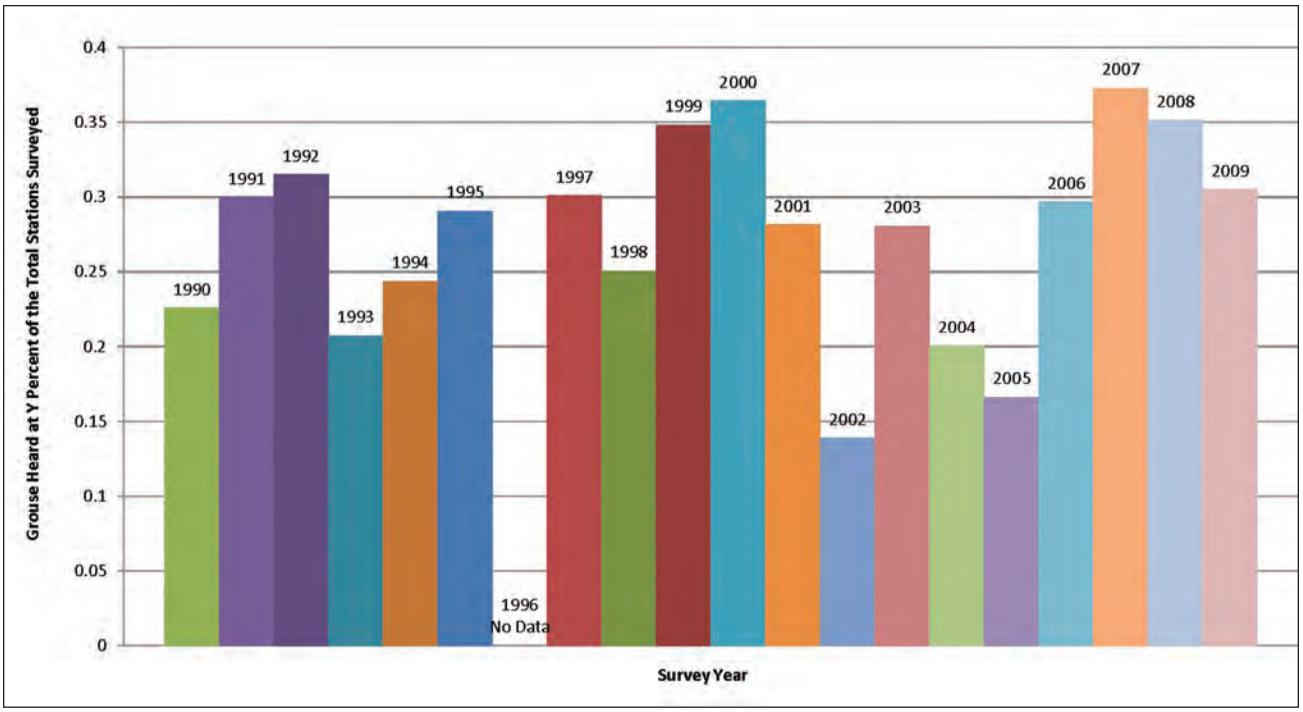


Figure 30. Chart of survey results for the listening route for sharp-tailed grouse on the Charles M. Russell and UL Bend refuges (1990–2008).

In the mid-1950s, refuge personnel began documenting raptors and owls mainly because they counted the numbers of both that had been killed by refuge employees. It was also noted that local residents and hunters also shot these birds on sight. Both golden and bald eagles were commonly shot as well as great horned owls (crows and magpies were also shot on sight). Other raptor species documented included northern goshawk, prairie falcon, rough-legged hawk, and northern harrier ("marsh hawk"). Ospreys were first recorded along the lake in 1958. Their numbers have increased due to nesting platforms being built by refuge employees. Eagle numbers have also increased due to the elimination of strychnine poisoning and shooting.

Neotropical migratory birds use the refuge both as nesting habitat but also as a stopover area during spring and fall migrations while heading both north and south of the refuge. The millions of Neotropical birds using the refuge primarily as a stopover area are also impacted by grazing for many of the same reasons as nesting birds. Foraging habitat (multiple layers of plant species) needs to be protected along with the food producing plants (seed and berry producing plants) and food sheltering plants (plants insects feed on) (Pool and Austin–Migratory Bird Management for the Northern Great Plains Joint Venture 2006).

Although riparian zones make up less than 1 percent of western landscapes, they harbor the most species-rich avifauna of all the major habitats in the western United States (Young et al. 2001). In the western United States, more species of breeding birds are found in these limited riparian zones than the far more abundant adjacent uplands. Over 60 percent of Neotropical migratory birds use riparian areas as stopover areas while migrating north and south or as breeding habitat (Krueper 1993). They are also the most modified suffering a loss at greater than 95 percent. Shorebird species found on refuge wetlands, shoreline habitats and grasslands are also in decline (Brown et al. 2001).

The National Audubon Society has recognized the refuge as an Important Bird Area. The program recognizes that coupled with global warming, habitat loss and fragmentation are the most serious threats facing populations of birds across American and around the world (National Audubon Society 2009). The refuge has been recognized as a Global Important Bird Area based on three criteria: (1) the site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern; (2) Montana State–holds species of State Conservation Concern; and (3) Montana State–has greater than 1 percent of the State's population. Of the 276 species of birds actually recorded near or on the refuge, there are a number of species of global or continental conservation concern (table 13). The refuge lies directly south of the Glaciated Prairie Sage-steppe Important Bird Area for Greater Sage-Grouse and northeast of the Musselshell Important Bird Area for Greater Sage-Grouse (Montana Important Bird Areas for Greater Sage-grouse 2008).

Potential Sentinel Bird Species

The Service has identified a number of species as sentinel birds, those that serve as indicator species on the refuge. These are species that regularly nest on the refuge, species of conservation priority or concern, Service's target species, stewardship species under the North American Landbird Conservation Plan, species of concern under the North American Landbird Conservation Plan. These include:

- **Grassland and shrub-steppe:** grasshopper sparrow, Baird's sparrow, long billed curlew, upland sandpiper, mountain plover, lazuli bunting, chestnut collared longspur, burrowing owl, greater sage-grouse, sharp-tailed grouse
- **Conifer-grassland mosaic:** sharp-tailed grouse, red-headed woodpecker, western tanager
- **River bottom:** northern flicker, yellow warbler, Bullock's oriole
- **Riparian area:** sora, American kestrel, yellow-breasted chat, least flycatcher, Brewer's sparrow
- **Shoreline:** piping plover, spotted sandpiper, bald eagle

Table 13. Bird species of concern on the Charles M. Russell and UL Bend refuges.

Global Concern	*Continental Concern*	*Montana Species of Conservation Concern*
greater sage-grouse	northern harrier	greater sage-grouse*
mountain plover	Swainson's hawk	mountain plover
ferruginous hawk	prairie falcon	Brewer's sparrow
long-billed curlew	upland sandpiper	
chestnut-collared longspur	burrowing owl	
Sprague's pipit	short-eared owl	
red-headed woodpecker	loggerhead shrike	
piping plover	marbled godwit	
Sprague's pipit	common tern	
	willow flycatcher	
	Baird's sparrow	
	McCown's longspur	

**The refuge has more than 1 percent of this species' population in the State of Montana.*

Grazing and Fire Effects

Management tools such as livestock grazing and fire can cause profound changes in the composition and abundance of plants, which in turn affects bird species composition and numbers (Bock 1993, Murphy 2008, Fuhlendorf et al. 2006). Refuge narratives as early as 1942 noted the negative effects grazing was having on grouse species: "Locally, the upland game depends largely on habitat and weather, the habitat in turn depending on grazing pressure." When ungrazed and grazed streamside riparian areas were compared on the refuge, almost twice as many individual birds were found on the ungrazed areas than grazed (Knowles and Knowles 1994, FaunaWest Wildlife Consultants 1996). Bird species composition showed a higher number of grassland species (sparrows) on the grazed areas, whereas the ungrazed areas had species more commonly found in forested riparian areas such as flycatchers, warblers, and cavity nesters including kestrels.

Bock (1993) states, "the principal means by which livestock grazing affects bird populations is by altering habitat structure and food availability." Relationships between birds and grazing—whether by bison, wild ungulates, prairie dogs, or domestic livestock—are complex since there are such wide ranges in intensity, season, duration, and style of grazing. Individual bird species such as horned lark and mountain plover may respond positively to grazing, although they still require shade plants to survive summer heat (Shackford 1996). Other birds such as Baird's sparrow may respond negatively, and some birds such as grasshopper sparrow have a mixed response. These same species may respond differently in the taller grasses of the Midwest versus the response in the shorter grasses of the Great Plains. Adding seasonal changes in precipitation and possible long-term changes in climate only complicate things further.

Grassland birds can be affected by fire in several ways. Fire can eliminate trees and shrubs, which negatively affects some bird species that are adapted to nesting in prairie grasses. Although birds and nests decline immediately after a fire, within a few years they can exceed pre-burn levels. Short-term loss of breeding habitat is often outweighed by long-term benefits to the changes in vegetation (Murphy 2008). Using a management tool such as patch-burn grazing results in a mosaic of habitats that consistently shifts. One benefit is that it provides needed habitat for the full range of year-round resident, migratory,

breeding, and nonbreeding birds (Churchwell et al. 2007). The severity of fires can also influence bird abundance and species, which suggests a need for all kinds of fires and not just the low-severity fires used most in prescribed fire plans (Smucker et al. 2005).

The short- to mid-grass prairies of the Great Plains evolved with frequent disturbances including intense grazing by prairie dogs and bison. Grassland birds also changed with these grazing effects on the vegetation. Birds selected a variety of different grass heights created by the intense grazing by prairie dogs and bison. Native grazers created a natural patch ecosystem, and each patch had different site characteristics that favored the entire prairie bird fauna. When contrasted with current grazing patterns, now there is less of a patchwork of habitat because more of the grassland is the same. This change has contributed to a decline in native birds (Vickery et al. 2008). Increasing the disturbances in grasslands through patch burning and grazing can, in time, reverse this decline by increasing diversity in both food and structure (Fuhlendorf et al. 2006).

Road and Public Use Effects

Roads have the potential to fragment wildlife habitat, which can exacerbate the problem of habitat loss for grasslands birds. One of the concerns for bird species is the edge effect whereby birds that live on the edge of an area are able to invade and attack interior species. Understanding the effects of habitat fragmentation is complex and not easy to assess (Johnson 2001).

OTHER WILDLIFE

This section discusses the smaller animals found on the refuge including amphibians, reptiles, fish, and small mammals.

Amphibians and Reptiles

Nineteen amphibian and reptile species are present on the refuge. Incidental observations from 1974 to present, as well as systematic surveys conducted in 1998–9 (Hendricks), have documented one amphibian species (Northern leopard frog) currently proposed for listing on the Federal endangered species list (refer to threatened and endangered species above) and nine species of herpetofauna listed as a Montana species of concern with either a ranking of S2 (milksnake, western hognose snake, and Great Plains toad) or a S3 (greater short-horned lizard, plains spadefoot toad, common sagebrush lizard, painted turtle, spiny softshell, and snapping turtle). The tiger salamander, boreal chorus frog, Woodhouse's toad, gopher snake, eastern yellow-bellied racer, common, terrestrial and plains garter snakes and western rattlesnake also occur on the refuge.

Amphibians and reptiles require a mosaic of habitats suitable for breeding or nesting, foraging, protection, and overwintering. Habitat linkages are required to meet all the life stages, allowing animals to migrate seasonally between different areas to feed, overwinter, and reproduce. The permeable nature of amphibian skin makes these animals extremely vulnerable to contaminants in the environment (Pilliod and Wind 2008).

Tiger salamanders often live in rodent burrows during much of the year and migrate to shallow ponds to breed in the spring. Some may retain larval characteristics including external gills, and larval body form, reach sexual maturity in a process called paedomorphosis or neoteny. These are strictly aquatic and may exist with individuals that metamorphose. Most amphibians use upland forests, shrub lands, and grasslands for foraging, overwintering, or dispersal. Many reptiles are adapted to be less dependent on water bodies (Werner et al. 2004). Boreal chorus frogs breed in glacial potholes and reservoirs and feed in moist areas around ponds, or move into terrestrial settings to feed on ants and spiders. Adults forage 0.5 mile or more from breeding sites. They overwinter in underground rodent burrows or crevices.

Great Plains toads are found up drainages and on the prairie where they are seen around glacial potholes, stock reservoirs, irrigation ditches, and smaller coulees. They require clean water so heavily used stock ponds may not be conducive to breeding. They spend time underground sometimes in prairie dog burrows. They will forage 1 mile from breeding sites. Woodhouse's toads are common along rivers, large lakes and reservoirs. They overwinter below the frost line in rodent burrows, crevices or among tree roots. Breeding occurs in river backwaters, stock reservoirs, larger ponds, or lakes.

Plains spadefoot toads are found in more arid environments close to water. They spend much of their time underground, but will, depending on temperature and moisture, throughout the day, emerge from and retreat to burrows dug with the spur on the back of their feet. They burrow below the frost line during winter and occasionally use rodent burrows.

Greater short-horned lizard occupy sagebrush and short-grass prairie, especially south-facing slopes, rocky rims of coulees, and shale outcrops. Common sagebrush lizard is associated with sagebrush habitat, but also live in ponderosa pine and juniper along the Missouri River and in short-grass prairies. The lizards seek refuge under rocks, in crevices at the base of trees, or in rodent burrows.

Painted turtles live in ponds and wetlands and spiny-softshell and snapping turtles live in the Missouri and Musselshell Rivers. They lay their eggs on land, often spending winter months buried and inactive in soft mud. Spiny softshells dehydrate much faster than hardshell turtles, and they are rarely found

© Michael Mauro

Western Painted Turtle

far from water. Nesting occurs in sand or gravel, usually 100 yards or less from water. Snapping turtles are omnivores that live in large rivers, lakes, ponds, and marshes. They dehydrate more rapidly than most freshwater turtles, so are vulnerable to high temperatures and low humidity. They overwinter under cutbanks, submerged logjams, or in the bottom mud of larger rivers or marshes (Werner et al. 2004).

Western hognose snake and prairie rattlesnake use burrows, dens, and tunnels dug by prairie dogs and pocket gophers for cover and as places to search for food. Rock outcrops in grassland areas provide important cover and basking sites. Western hognosed snakes like well-drained, sandy soils, so are often seen along exposed riverbanks, sandstone outcroppings, and old riverbeds. Eastern yellow-bellied racers use open habitats such as prairie, sagebrush, and badlands. They overwinter in mammal burrows, rock crevices, and sandbanks, alongside garter snakes, rattlesnakes, or gopher snakes. Milksnakes inhabit grasslands and spend most of the day in burrows around sandstone outcroppings, riparian zones, cedar-juniper hillsides, and margins of agricultural lands (Werner et al. 2004).

Fish

Numerous fish species are found in both the large and small streams on the refuge. Bramblett et al. (1999) performed a literature review for fish on the refuge. He found MFWP unpublished reports (Needham 1978, 1979; Needham and Gilge 1980, 1981) summarized fish sampling on the refuge. In 1977, MFWP sampled larval fish and benthic macroinvertebrates in Timber, Nelson, Big Dry, Sand, and McGuire Creeks. Larval cyprinids and catostomids and benthic macroinvertebrates (*Diptera* spp., *Coleoptera* spp., *Neuroptera* spp., *Ephemeroptera* spp., *Trichoptera* spp., *Odonata* spp., *Hemiptera* spp., *Annelida* spp., and *Amphipoda* spp.).

In Big Dry, Little Dry, Timber, Nelson, and McGuire Creeks, in 1979 and 1981 MFWP sampled 17 taxa in Big Dry Creek including goldeye, common carp, fathead minnow, flathead chub, *Hybognathus* spp., lake chub, longnose dace, sand shiner, river carpsucker, shorthead redhorse, white sucker, black bullhead, channel catfish, walleye, yellow perch, and freshwater drum (Neeham and Gilge 1980, 1981). The Montana Rivers Information System lists 17 species in Big Dry Creek. These include some of the list above with the following additions bigmouth buffalo, plains minnow, smallmouth buffalo, and western silvery minnow but not other *Hybognathus* spp., freshwater drum, or shorthead redhorse.

The 15 taxa in Little Dry Creek included common carp, fathead minnow, flathead chub, *Hybognathus* spp., lake chub, longnose dace, pearl dace, sand shiner, river carpsucker, shorthead redhorse, white sucker, black bullhead, channel catfish, walleye, and yellow perch. Nine taxa in Timber Creek included common carp, fathead minnow, *Hybognathus* spp., lake chub, longnose dace, pearl dace, sand shiner, buffalo, and white sucker. The 12 taxa in Nelson Creek include common carp, fathead minnow, flathead chub, *Hybognathus* spp., lake chub, longnose dace, sand shiner, buffalo, white sucker, plains killifish, brook stickleback, and yellow perch. Two museum specimens from Nelson Creek were a lake chub and a fathead minnow. Five species in McGuire Creek were common carp, fathead minnow, lake chub, sand shiner, and white sucker.

The Montana Rivers Information System database lists the following: (1) fathead minnow as the only species in Flat Creek; (2) four species in Squaw Creek—fathead minnow, lake chub, longnose dace, western silvery/plains minnow; (3) four species in Timber Creek (north side)—fathead minnow, longnose dace, northern redbelly dace, and white sucker; (4) six species in Timber Creek (Big Dry Arm)—fathead minnow, lake chub, northern pike, northern redbelly dace, western silvery/plains minnow, white sucker; and (5) four species in Woody Creek—fathead minnow, lake chub, longnose dace, western silvery/plains minnow.

Wagner (1996) sampled Rock Creek and found three species in the upper section (white sucker, longnose dace, and northern redbelly dace), six species

in the middle section (white sucker, longnose sucker, carp, longnose dace, fathead minnow, and flathead chub), and no fish in the lower section because it was completely dry.

MFWP, who is responsible for monitoring and managing fish species in the Missouri and Musselshell Rivers, sampled fish in the Lower Musselshell River in August 2000. Sauger is probably not still common in the Lower Musselshell. McMahon and Gardner 2001 comments on Musselshell River habitat, "No data are currently available on the status of sauger … Chronic dewatering limits its suitability as sauger habitat." They estimate that sauger populations may have declined by 50 percent in the Lower Musselshell. The Montana Rivers Information System lists the following 24 species in the Musselshell River: black bullhead, blue sucker, channel catfish, common carp, emerald shiner, flathead chub, firewater drum, goldeye, lake chub, longnose dace, northern pike, northern redbelly dace, plains minnow, river carpsucker, sand shiner, sauger, shorthead redhorse, smallmouth bass, smallmouth buffalo, stonecat, walleye, western silvery minnow, white sucker, and yellow perch.

MFWP (Gardner 2003) evaluated the fisheries conditions in the middle Missouri River, which includes portions of the refuge. Methods used included electrofishing, trammel net drifting (deeper areas), seining (shallow areas), trawling, and creel surveys. Shorthead redhorse, goldeye, longnose sucker, emerald shiner, and sauger were most abundant species found during electrofishing. Flathead chub, *Hybognathus* spp., shorthead redhorse, and emerald shiner were most abundant in the seine sampling. Channel catfish, sicklefin chub, and sturgeon chub made up 75 percent of the fish sampled by trawling and goldeye and channel catfish were the most common fish caught according to creel census surveys. Sauger catch rates were 13.8 fish per hour in the Fred Robinson Bridge section (Robinson section) giving a density 126 sauger per mile.

In 2005–6, electrofishing samples found shorthead redhorse, goldeye, emerald shiner, *Hybognathus* spp., and flathead chub to be the most abundant species. Emerald shiner and *Hybognathus* spp. were the most abundant species captured by seining. The exceptionally abundant representation of emerald shiner was one of the most noticeable changes compared to past years with catch rates nearly three times greater than the trend. The most abundant species captured by trawling were the shorthead redhorse, longnose dace, channel catfish, sturgeon chub, and sicklefin chub. Sauger catch rates in the Robinson section were 12.3 fish per hour.

In addition to the above-listed common species, the following species were also found in the Missouri River (Gardner 2003): bigmouth buffalo, burbot, carp, rainbow trout, flathead chub, freshwater drum, longnose dace, river carpsucker, shovelnose sturgeon, smallmouth buffalo, smallmouth bass, stonecat, walleye, and white sucker. All six State species of special concern were sampled: pallid sturgeon, blue sucker, paddlefish, sauger, sicklefin chub, and sturgeon chub.

Small Mammals

Minimal information has been collected on the distribution and occurrence of small mammal species on the refuge. Although there have been cooperative efforts with the Montana Natural Heritage Program, Montana Tech University, the University of Montana, and the University of Denver that have targeted specific questions regarding small mammals, few have identified the current composition of small mammal communities that exist on the refuge. Half of the studies identified the presence of specific diseases (plague and Hantavirus) in terrestrial small mammals (Douglass 2003, Holmes et al. 2006) while others have attempted to identify the composition of small mammal communities in and surrounding the refuge (Hendricks et al. 2007, Stewart 2007).

The Montana Natural Heritage Program has an ongoing study aimed at filling in the distribution gaps for small mammals in Montana and included several sites within or surrounding (within 10 miles) the refuge boundary. Terrestrial small mammal species were captured using a combination of Sherman live traps, snap-traps, and pitfall arrays. Although research in 2006 extended ranges of several terrestrial small mammals, no new species were captured outside known occupied counties (Hendricks et al. 2007). Time and personnel limited the trapping effort and many terrestrial species of low abundance or relatively rare were not captured. Further research would be needed to quantify the occurrence and abundance of these rarer species.

Research targeting bat species identified range expansions and filled distribution gaps for several species found in central Montana. Bat species were documented using recorded vocalizations during survey periods in 2003–4 by University of Denver and again in 2006 by the Montana Natural Heritage Program. Results from these studies indicated new locations within counties for several species (Hendricks et al. 2007, Stewart 2007), signifying the lack of information available for many species' distributions.

THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN

There are currently four species found on the refuge that are listed on the threatened and endangered species list: black-footed ferret, least tern, piping plover, and pallid sturgeon. The grizzly bear

and gray wolf occur in Montana but are not currently found on the refuge. Additionally, information about a number of species of concern is discussed.

Threatened and Endangered Species

The Service is following recovery plans for the following listed species found on the refuge: black-footed ferret, least tern, and pallid sturgeon, which are all listed as endangered, and piping plover, which is listed as threatened.

Black-footed Ferret—Endangered. Black-footed ferrets, listed as endangered, were first reintroduced in Montana in 1994 on black-tailed prairie dog colonies located at UL Bend National Wildlife Refuge. The thinking at the time was that reintroduction techniques could be figured out on the refuge portion (10 percent) of the experimental reintroduction area and once refined, expand reintroductions north on to what had been about 26,000 acres of prairie dogs as mapped in 1988. There were also hopes to expand even further and try to populate with ferrets another 25,000 acres of prairie dog colonies on the Fort Belknap Indian Reservation.

Black-footed ferrets require extensive prairie dog colonies to provide both habitat and prey, because they are obligate predators of prairie dogs and they live in the tunnel systems created and maintained by prairie dogs. Many public land managers and landowners have a general intolerance for very many acres of prairie dogs and throughout the black-footed ferret's historical range, generally small and fragmented prairie dog occupied landscapes are limiting ferret recovery. In addition to limited human tolerance of prairie dogs, epizootics of sylvatic plague can eliminate thousands of acres of prairie dogs in a few weeks, thus eliminating expansive areas of black-footed ferret habitat. In addition, ferrets exposed to plague die within 3 days. Plague was first ever detected in Phillips County, Montana in 1992 when many prairie dog colonies suddenly disappeared. By 1996, nearly 80 percent of 26,000 acres of prairie dog colonies had died out. Epizootic plague was never observed at the UL Bend refuge until 2007.

Despite these obstacles, a huge amount of effort has gone into trying to establish black-footed ferrets in north-central Montana. There have been 229 captive-reared ferret kits released in three areas of the UL Bend refuge, 95 north of the refuge on BLM lands and 167 in two areas of the Fort Belknap Indian Reservation. In addition, at least 236 wild-born kits have been observed at the UL Bend refuge. The last confirmed sighting of a ferret on Fort Belknap was in 2003, 2006 on BLM lands and six ferrets (two males and four females) were observed at UL Bend during April 2009. The following graph (figure 31) illustrates the population history of black-footed ferrets at UL Bend National Wildlife Refuge.

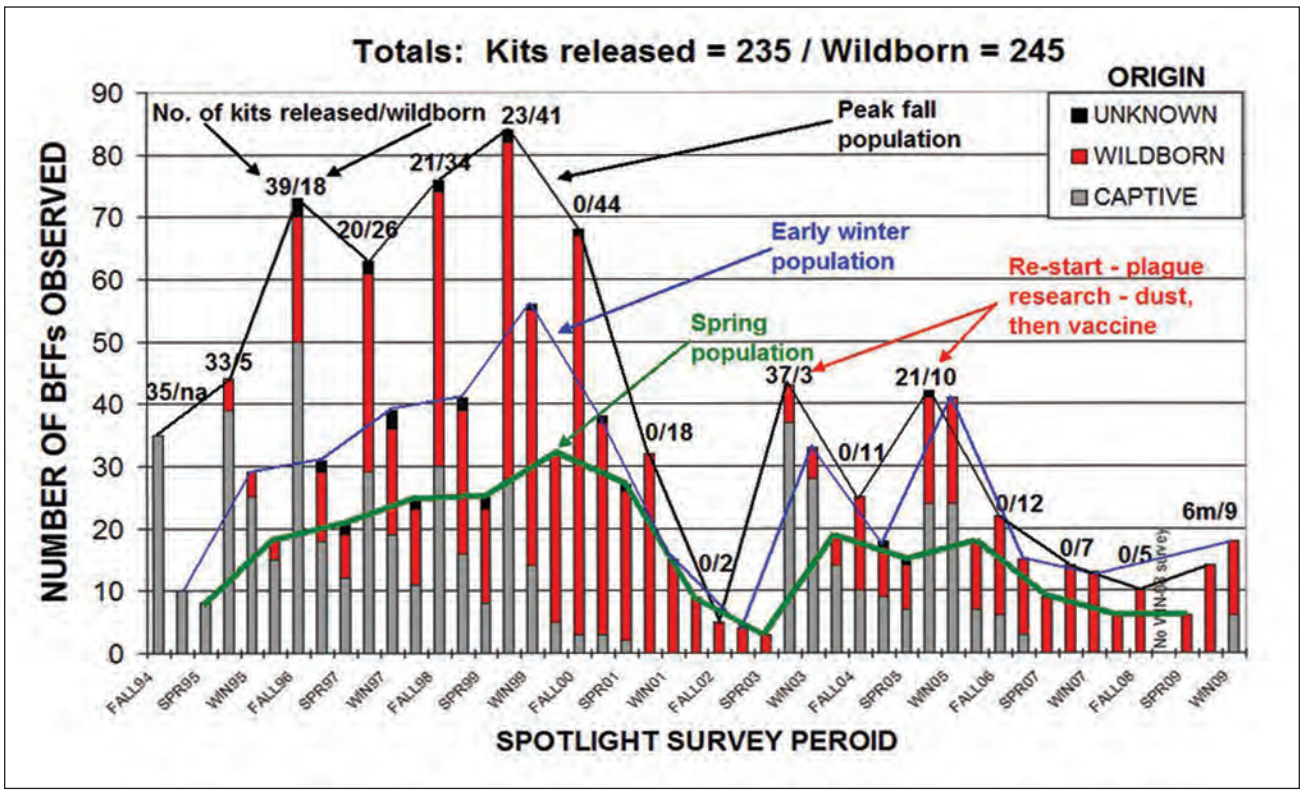


Figure 31. Graph of data for the black-footed ferret population at the UL Bend National Wildlife Refuge.

During 2007 and continuing in 2008, epizootic plague eliminated about 60 percent of the prairie dog acreage where ferrets had resided at the UL Bend refuge. Plague was also reported to be widespread north of the refuge and was eliminating a substantial portion of remaining prairie dogs throughout Phillips County. To protect the remaining prairie dogs and resident ferrets (six ferrets present in April 2008—four male and two female), all remaining active portions of prairie dogs in the Locke and Hawley area were treated with 0.05 percent deltamethrin during early summer 2008 to kill fleas (a vector for plague and shown to improve ferret and prairie dog survival in plague-prone areas (Matchett et al. 2009 and Biggins et al. 2010). Over 34,000 burrows were treated, and both prairie dog and ferret populations have persisted through fall 2009.

Despite the failure to establish a self-sustaining black-footed ferret population in Montana, much has been learned along the way that has greatly benefited national ferret recovery efforts. For example, Matchett et al. (2009) has shown that in addition to epizootic plague affecting ferrets, enzootic plague (that is, the presence of disease-causing *Yersinia pestis* when there is no noticeable decrease in prairie dog abundance) also reduces ferret survival and that both flea control and an experimental plague vaccine for ferrets were effective.

Given the greatly reduced prairie dog abundance in Phillips County and continued local intolerance for prairie dogs, no future ferret reintroductions are planned. Refuge staff will continue monitoring the remaining ferrets at the UL Bend refuge. Several wild-born kits were observed during fall 2009, but with a total spring breeding population of only six animals during the last 2 years, the Service expects the population to die out completely in the near future.

As summarized below, MFWP has spent considerable time constructing plans for prairie dog and associated species conservation. Refuge staff and many cooperators have worked diligently for some 20 years trying to maintain and enhance complexes of prairie dogs capable of supporting a viable population of black-footed ferrets in Montana. With the multiple planning efforts and committees established by MFWP, the Service views them as the lead agency for these efforts.

In response to black-tailed prairie dogs becoming a candidate species (warranted, but precluded) for listing under the Endangered Species Act in 2000, MFWP developed a statewide prairie dog conservation plan that was finalized in 2002. They then worked hard to complete a local region 6 (northeast Montana) prairie dog plan in 2006. After completion of that local plan, MFWP established a facilitated "Implementation Committee" to attempt locating and managing for complexes of prairie dogs suitable for black-footed population establishment as called for in the previous two plans (Category I Complexes). That Implementation Committee made its recommendations to MFWP in 2008, but fell short of drawing any lines on maps.

Least Tern—Endangered. The interior population of the least tern was listed as endangered by the Service in 1985. The least tern was first documented in Montana at Fort Peck Lake in 1987. Annual surveys have been conducted since 1988 on both Fort Peck Lake and the Missouri River below the dam. The most successful breeding year for least terns on the reservoir was in 1994 and nesting has been sporadic since then (USACE 2008), as shown in table 14.

Table 14. Least tern nest success at Fort Peck Lake.

Year	*Number of Nests*	*Successful Nests**
1994	8	3
2004	0	0
2005	0	0
2006	2	1
2007	2	1

**Number of nests producing fledglings. (USACE 2008).*

Fort Peck Reservoir is at the northwestern limit of the interior least tern's breeding range resulting in the low numbers of birds in this area. In addition, the amount of available habitat changes with the lake level and affects the number of birds attracted to the reservoir in any given year. The Missouri River below the dam and the Yellowstone River attract more birds than the reservoir. Survey results show that Montana has met and/or exceeded the recovery goal of 50 adult birds as set forth in the 1990 Interior Least Tern Recovery Plan (Atkinson and Dood 2006).

Pallid Sturgeon—Endangered. The upper Missouri River above Fort Peck Reservoir is one of the six recovery-priority management areas, identified as RPMA 1 in the Pallid Sturgeon Recovery Plan (Dryer and Sandvol 1993). Historically, pallid sturgeon were found along this 230-mile reach; however, losses of habitat and the migration barrier caused by the completion of Fort Peck Dam in the 1930s, and construction of Canyon Ferry and Tiber dams in the 1950s, has caused their near extinction. Additionally, the population was found to be senescent and that there had been no significant recruitment in the last 10 years (Gardner 1996). Very few wild pallids now remain in RPMA 1 (probably 10–20). The core area where most of the pallids are now primarily found is

a 61-mile reach between Cow Island (river mile 1944) and Beauchamp Creek (river mile 1883).

MFWP, in cooperation with the Service initiated pallid sturgeon recovery in RPMA 1 with the release of 733 hatchery-reared, yearling pallid sturgeon during 1998. Table 15 shows the stocking history of the Missouri River in Montana.

Table 15. History of stocking pallid sturgeon in the Middle Missouri River, Montana (1998–2008).

Year (Class)	*Year Stocked*	*Stage*	*Number Stocked*
1997	1998	yearling	733
2001	2002	yearling	2,058
	2004	age 3	189
2003	2004	yearling	3,113
2004	2005	yearling	706
2005	2005	larval	33,300
	2005	fingerling	2,480
	2006	yearling	4,737
2006	2007	yearling	4,534
2007	2007	fingerling	38,608
	2008	yearling	5,699
2008	2008	larval	62,055
	2008	fingerling	24,980
		Total	176,393

The goal for stocking is to restore the population to 1,000 adults, age 15 years or older (including about 20,000 pallids less than 15 years) by 2027. The population of 15-year and older adults will be maintained by stocking for one generation. The population of 1,000 adults was selected based on maintaining genetic diversity and reasonable population demographics.

The present habitat condition will be maintained in at least the present form (minimum instream flows, water quality, and riparian). Main stem and tributary dams in the area have had profound effects on natural flow conditions and therefore dam operation effects on pallid sturgeon habitat will be evaluated. There seems to be considerable pallid use of the transitional river/reservoir reach (river mile 1867–98) near the river delta in Fort Peck Reservoir. There may be potential for enhancing the riverine habitat here for pallid sturgeon by developing a more favorable water level management plan (Gardner 2009). Gerrity et al. (2008) found pallid sturgeon avoids reaches of river with islands and secondary channels, selecting reaches without islands and main channel habitats. Water level management can influence the amount of habitat available for pallid sturgeon. Fish are the primary prey of juvenile pallid sturgeon, as sturgeon chub and sicklefin chub comprised 79 percent of the diet of sampled pallid sturgeons (Gerrity et al. 2006). These two cyprinids are on the species of concern list.

Piping Plover—Threatened. There are three breeding populations of piping plovers in North America, which were listed under the Endangered Species Act in 1985. Plovers nesting on Fort Peck Reservoir are considered part of the northern Great Plains population and are listed as threatened.

Plovers are attracted to gravel beaches on the lakeshore and islands that are exposed during periods of low lake levels. In 2002, the Service designated 77,371 acres on Fort Peck Reservoir as critical habitat (see figure 32). According to the 2006 Montana Piping Plover Management Plan, critical habitat "refers to specific geographic locations that contain features essential for conserving a species and may require special management considerations" (Atkinson and Dood 2006).

Although plovers were observed in Montana during the 1970s and were known to breed on Fort Peck Reservoir, formal surveys did not begin until after they were listed under the Endangered Species Act. The USACE conducts annual surveys of the reservoir and monitors nest success (refer to table 16). The amount of available habitat changes with the lake level and affects the number of birds attracted to the reservoir in any given year. However, long-term monitoring shows that most inland sites have failed to reach specified recovery levels and the northern Great Plains population as a whole is declining (Atkinson and Dood 2006).

Table 16. Piping plover nest success at Fort Peck Lake.

Year	*Number of Plovers*	*Number of Nests*	*Nesting Success**
2004	9	4	4
2005	26	11	7
2006	20	7	6
2007	16	8	6

**Number of nests producing fledglings. Table taken from Fort Peck Dam/Fort Peck Lake Master Plan (2008).*

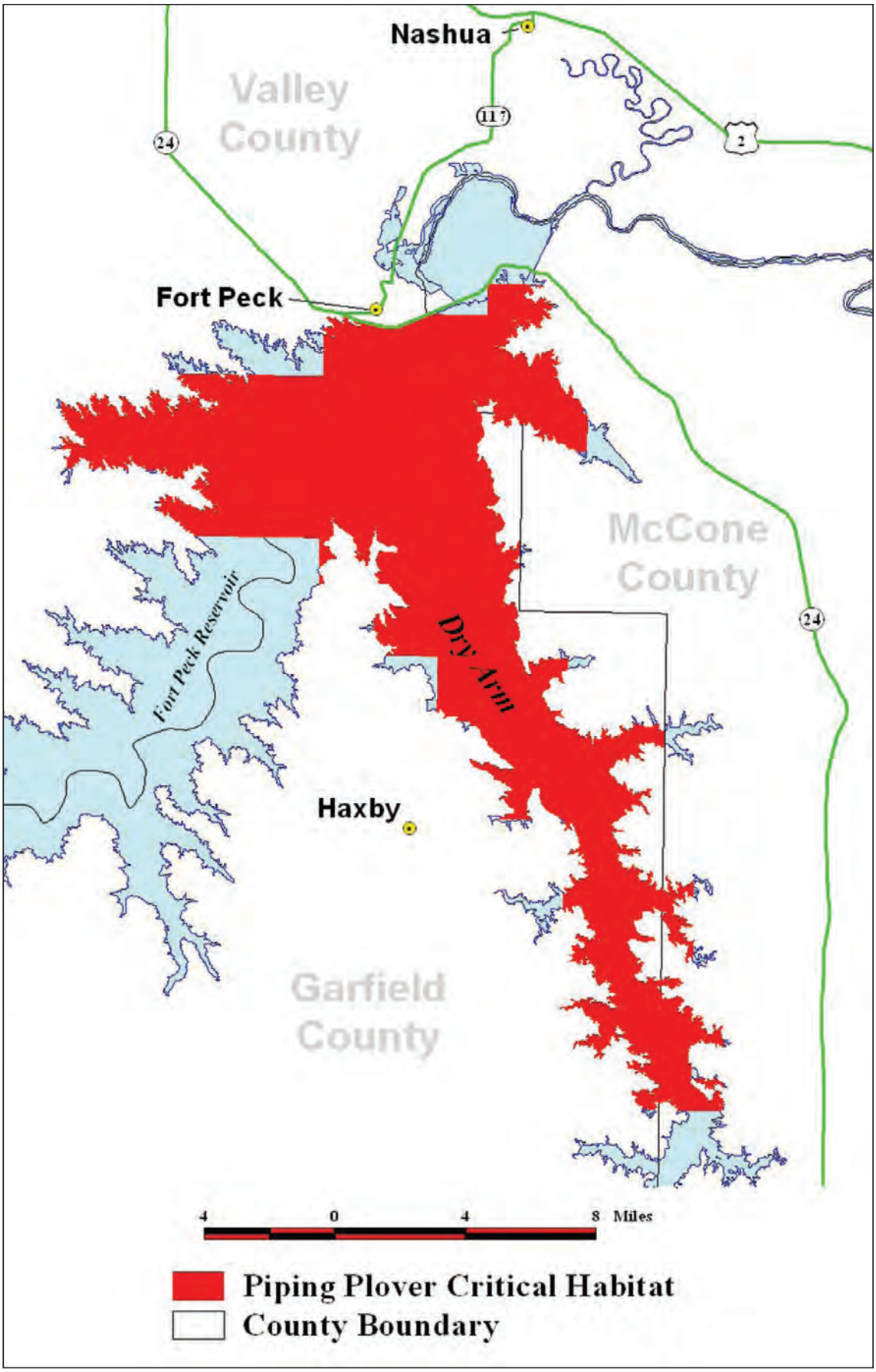


Figure 32. Map of critical habitat for piping plover at Fort Peck Reservoir.

Grizzly Bear—Threatened. Grizzly bears are generally larger and more heavily built than other bears, and can be distinguished from black bears by longer, curved claws, humped shoulders, and a face that appears to be concave. When Lewis and Clark explored the West in the early 1800s, an estimated 50,000 grizzly bears roamed between the Pacific Ocean and the Great Plains, across vast stretches of open and unpopulated land . But when pioneers moved in, bears were persecuted and their numbers and range drastically declined. As European settlement expanded over the next hundred years, habitat for these large omnivores, along with their numbers drastically declined. Today, only a few small corners of grizzly country remain, supporting about 1,200–1,400 wild grizzly bears. Of 37 grizzly populations present in 1922, 31 were extirpated by 1975. In 1975, the Service listed the grizzly bear as a threatened species in the lower 48 States under the Endangered Species Act, placing the species under Federal protection.

On March 22, 2007, the Service announced that the Yellowstone Distinct Population Segment of grizzly bears is a recovered population no longer meeting the Endangered Species Act's definition of threatened or endangered. On April 18, 2007, the Service announced the initiation of a 5-year review of grizzly bear (as listed in the lower 48 States excluding the Greater Yellowstone Area population) and eight other species (72 FR 19549). The Service conducts these reviews to ensure that a classification of each species as threatened or endangered on the List of Endangered and Threatened Wildlife and Plants is accurate. A 5-year review is an assessment of the best scientific and commercial data available at the time of the review.

The Service, in cooperation with numerous partners, has purchased several conservation easements along the Rocky Mountain Front to benefit grizzly bears (and other wildlife species) by conserving corridors for grizzly bears to move to other large blocks of secure habitat. Over the past 2 years juvenile grizzly bears from the Rocky Mountain Front have ventured towards the Missouri River Corridor. As grizzly bear populations grow and more habitat is conserved, the probability of grizzlies traveling from the Front to the Missouri River and subsequently onto the refuge increases. As a result, the CCP addresses the Service's response if grizzly bears naturally migrate down the river onto the refuge.

Gray Wolf—Endangered. There have not been any confirmed sightings of wolves on the refuge since they were extirpated in the late 1800s or early 1900s, although refuge staff have received a few unconfirmed sightings in recent years. There was a hybrid wolf killed in northern Garfield County after several livestock depredations in 2007. Scattered reports of wolves on the refuge have been received for the past couple of years, but neither the Service nor MFWP staff has documented any packs on the refuge.

Wolf reintroductions into Montana and Wyoming occurred in 1995 in Yellowstone National Park. Populations increased rapidly and spread to surrounding lands in both States and Idaho. In recent years, populations have declined slightly as packs and prey densities become more established. There have been wolves observed in eastern Montana during the last 20 years, but they have all been transients and no packs have been established. Idaho and Montana implemented wolf hunts in 2009.

Recently, several groups sued to have wolves placed back on endangered species list. In August 2010, a ruling by the U.S. District Court resulted in the gray wolf being listed as an endangered species. There are no plans to reintroduce wolves on the refuge but, given their dispersal capacity and the established population in western Montana, eventually wolves could immigrate to the refuge (refer to chapter 3, objectives for gray wolf).

Species of Concern

There are a number of species of concern found on the refuge. They generally rank no greater than G3 or S3 from Montana Natural Heritage Program (2008), or are currently being considered for listing under the Endangered Species Act.

Black-tailed Prairie Dog. Black-tailed prairie dog colonies on the refuge are most abundant in the Phillips County portion of the refuge and near the southern end of the Big Dry Arm of Fort Peck Reservoir, along with a single colony of about 1,000 acres in Valley County. The perimeters of prairie dog colonies have been mapped through the years and figure 33 shows the maximum extent of where prairie dogs have been recorded from 1979 through 2007 and totals 15,700 acres. The last time all colonies on the refuge were mapped was in 2003 and totaled 7,300 acres. Epizootic plague was widespread in Phillips County during 2007 and reduced prairie dog acreage there by 50 percent from 5,200 acres mapped in 2004 to 2,600 mapped in 2007.

The vast majority of the refuge is not suitable habitat for prairie dogs and much of the refuge is on the fringe of suitable habitat. Many existing colonies have limited expansion potential because of topography, hydrology and shrub or tree cover limitations. Sylvatic plague was first documented in Phillips County in 1992 after thousands of acres of prairie dogs suddenly disappeared throughout the county. The Manning Corral prairie dog colony on the refuge in southern Phillips County was nearly 1,400 acres in size prior to being impacted by plague in 1992 when it was reduced to 16 acres in about a month. Plague

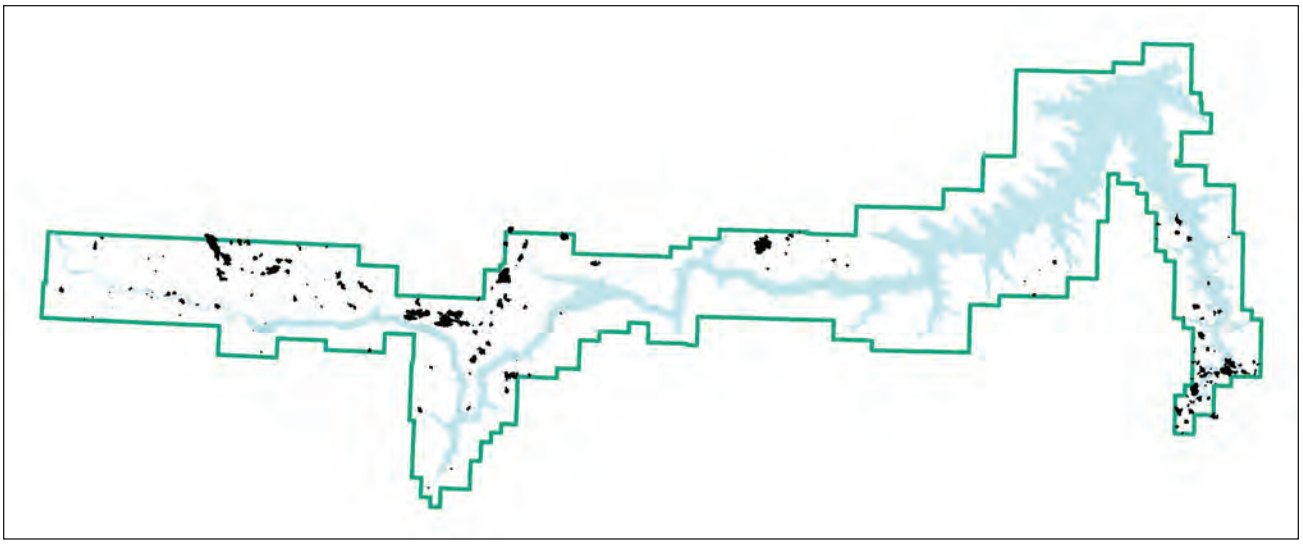


Figure 33. Map of the maximum extent of black-tailed prairie dogs at the Charles M. Russell and UL Bend refuges (1979–2007).

epizootics continued in varying degrees through 1996 and prairie dog populations have slowly recovered since, until 2007 when plague once again eliminated many colonies over a wide area. Additional discussion about prairie dogs and plague is located under the black-footed ferret section.

Prairie dog range in the early 1900s reached from southern Saskatchewan southward across the Great Plains to northern Mexico. Although prairie dog colonies covered up to 98 million acres (Knowles and Knowles 1994), current estimates place the area occupied at 1–2 percent of historical levels (Miller et al. 1990; Marsh 1994). Prairie dogs have lived on the Great Plains for thousands of years, providing food or habitat for numerous species. The endangered black-footed ferret, for example, depends solely on prairie dogs for food, and on prairie dog burrows for shelter (Clark 1978; Henderson et al. 1969; Hillman and Clark 1980; Hillman and Linder 1973).

Prairie dogs are a keystone species for the Great Plans (Kotliar 1999). Prairie dogs are prey for other species, dig burrows used as nest sites and shelter for invertebrates and vertebrates, and alter nutrient cycling, plant species composition, and plant structure. Sensitive species closely associated with prairie dogs include the mountain plover and burrowing owl (Campbell and Clark 1982). Predator species include black-footed ferrets, raptors, badgers, bobcats, mountain lions, coyotes, and western rattlesnakes. Nine of the 208 species listed in the literature as observed on or near prairie dogs colonies have quantitative evidence of dependence on prairie dogs (Kotliar 1999).

In 1998 the prairie dog was petitioned for listing under the Endangered Species Act. In 2000, the Service found that listing was "warranted but precluded" meaning that listing was warranted but other species had higher priority. In 2004, the Service issued a "not warranted" finding on a resubmitted petition removing it as a candidate species. In 2007, the prairie dog was petitioned again for listing and on December 2, 2008, the Service issued a positive 90-day finding for the prairie dog. Most recently, the Service completed a status review and determined that it does not warrant protection under the Endangered Species Act at this time.

Section 87–5–103(1), Montana Code Annotated states that nongame wildlife species should be "perpetuated as members of ecosystems." The prairie dog itself is listed on the Natural Heritage Program and MFWP "Species of Concern" list (Montana Natural Heritage Program and MFWP 2009), as well as BLM's "Special Status Species" list in Montana. A number of species associated with prairie dogs also are listed by the State and BLM as species of management concern. BLM has a heightened responsibility for species that it designates as "sensitive," in that it should afford them special protection to ensure that their populations and habitat are conserved.

The refuge has been an active member of the Montana Prairie Dog Working Group that produced the MFWP Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana (2002). Refuge staff continue to work with MFWP and other partners to establish and maintain a complex of prairie dog colonies capable of supporting a viable black-footed ferret population as called for in the plan, but little progress has been made. Prairie dogs remain a controversial species, considered a pest in need of control by agricultural interests, the focus of recreational shooters (not on the refuge), and plague continues to be problematic. All these factors make it difficult to grow and maintain adequate prairie dog acreage to support ferrets. Experience with black-footed ferret reintroduc-

© Diane Hargreaves

Watchful prairie dogs atop their mound.

tions over the last 19 years across the Nation clearly shows that larger complexes of prairie dog colonies close together have better success establishing ferret populations than areas with small and scattered colonies.

Swift Fox. Swift fox were common throughout central and eastern Montana prairies prior to poisoning efforts directed at coyotes and wolves in the early 1900s (Foresman 2001). After the large poisoning efforts on the prairies and 50 years without documented observations, Hoffmann et al. (1969) suggested the swift fox was extinct in Montana. Since 1969, sporadic observations have been documented throughout eastern Montana. Reintroduction efforts on the Blackfoot Indian Reservation in northwestern Montana in 1998 and southern Saskatchewan and Alberta from 1983 to 1991 are thought to be the source population of many of these sightings (Foresman 2001). These populations continue to expand to the south and east in Montana, and recent surveys have documented swift fox in many of the counties bordering Canada in north-central Montana (Moehrenschlager and Moehrenschlager 2001). Trapping is not currently allowed in Montana.

Swift fox are not known to regularly occur on the refuge, but there were two reported sightings in the UL Bend area during the late 1990s and one along Bone Trail in southern Valley County during July 2006 along with a couple older sightings along Highway 191 north of the refuge.

Not unlike prairie dog habitat, much of the refuge is topographically too rough for swift fox that generally prefer wide-open areas with gentle topography and generally sparse vegetation. The World Wildlife Fund is planning a camera trapping survey of 16 townships in Phillips County beginning in September 2009 and will include two townships on the refuge. Results of that survey should provide better picture of swift fox abundance in southern Phillips County.

There are no current plans for any swift fox reintroductions into suitable habitat on the refuge, but they have been considered in the past, and could be again.

Greater Sage-grouse. The refuge contains some quality sage-grouse habitat, but similar to other prairie species, much of the refuge is on the fringe of more expansive areas of prime sage-grouse habitat. Sage-grouse populations are monitored primarily with counts of birds on breeding leks in the spring (figure 34). Overall population levels fluctuate annually for a variety of reasons. Long-term population levels and trends appear to be stable on the refuge. Perhaps the greatest potential threat to sage-grouse is the effect of West Nile virus, an exotic disease first introduced to sage-grouse in Montana during 2003.

The refuge staff monitored more than 100 radio-marked adult female sage-grouse during late summer and fall 2003 and measured a 16-percent mortality rate in about a month (Moynahan et al. 2006a). During the two summers prior to this West Nile virus

outbreak, mortality among radio-marked hens averaged 1 percent. It is very difficult to confirm West Nile virus as the cause of death as carcasses degrade rapidly in the summer heat, but West Nile virus was confirmed as the cause of death in four birds. Subsequent monitoring of radio-marked sage-grouse through 2006 also detected West Nile virus-caused deaths, but mortality rates were lower.

In February 2010, the Service determined the greater sage-grouse was "warranted, but precluded" for listing under the Endangered Species Act. Greater sage-grouse are now considered a candidate species and will be managed on the refuge as if they were listed as threatened. The refuge has been an integral part of several sage-grouse graduate research studies in recent years (Battazzo 2007; Moynahan 2004, Moynahan et al. 2006a, 2006b; Sauls 2006). In addition, refuge staff has collaborated with many others throughout the West on sage-grouse conservation and the effects of West Nile virus (Naugle et al. 2004, 2005).

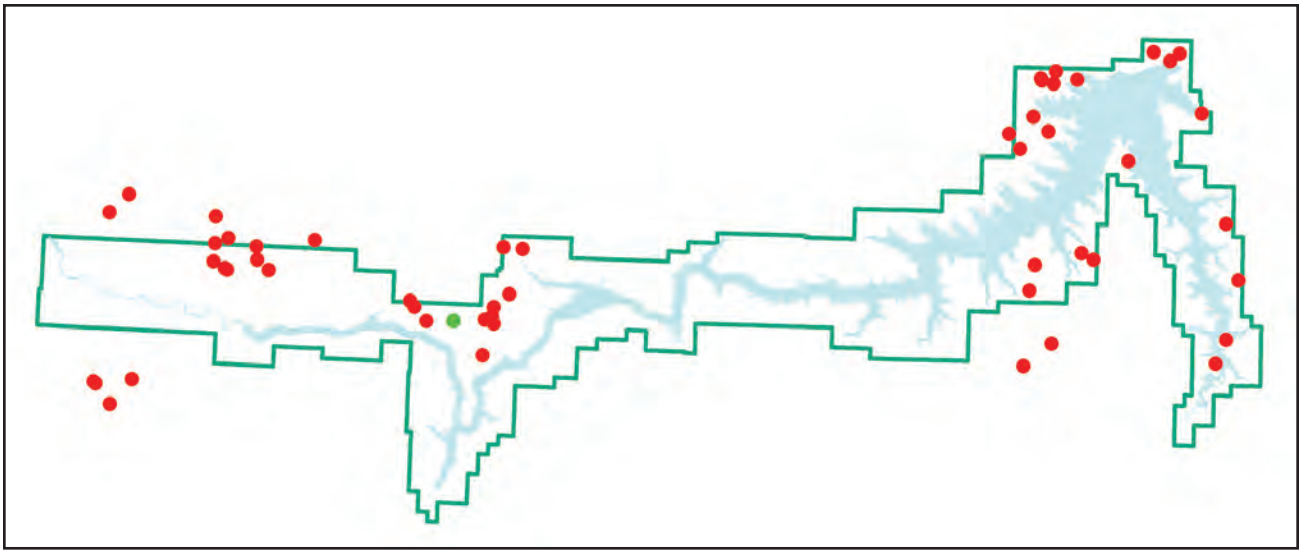


Figure 34. Map of lek locations for greater sage-grouse on and near the Charles M. Russell and UL Bend refuges.

Mountain Plover. Mountain plover occurrence on the refuge is primarily associated with nesting habitats located on prairie dog colonies. Many prairie dog colonies on the refuge are not selected by mountain plovers for nesting (for example, most of the prairie dog colonies on the UL Bend refuge), but others, primarily located on upland ridges and often with glacial till/desert pavement substrates, are prime nesting areas. Researchers have conducted long-term mountain plover monitoring efforts, primarily in Phillips County. Mountain plover populations and nesting success closely parallel black-tailed prairie dog abundance and like prairie dogs, are greatly influenced by the effects of sylvatic plague. Once plague effectively eliminates a prairie dog colony, within a year, that colony is no longer suitable for mountain plover nesting habitat as vegetation heights become too high without prairie dog activity.

Sicklefin Chub, Sturgeon Chub, and Blue Sucker. Sicklefin chub was proposed for listing as federally endangered in 1994, is currently a Category 1 species (Grisak 1998), and is ranked S1 on the Montana species of concern list. MFWP conducted a population survey on the Missouri River starting in 1996. Distribution around the refuge includes the middle Missouri River from Cow Island downstream to the headwaters of Fort Peck Reservoir. The sicklefin chub lives to 4 years of age and becomes sexually mature at 2 years old. Spawning occurs in main channel areas of large turbid rivers during the summer. Early life history is unknown. They prefer deeper water and sandy substrate. The major threat is habitat alteration by dams and irrigation development. Further reductions in stream flows associated with irrigations could degrade existing habitat.

Sturgeon chub is common in eastern Montana but is listed as a Montana species of concern (S2S3) and was proposed for listing federally in 1994. Recently surveys have found it to be more widely distributed than previously thought. It is indigenous to the Missouri-Mississippi river basins. The sturgeon chub spawns from June to July, reached sexual maturity at 2 years, and few live to 4 years old (Gould 1998). They are adapted to turbid water, associated with moderate currents and depths and prefer sand or rock substrates. They require riffles and runs in turbid shallow waters or deeper running waters. The major threat is habitat alteration by dams and irrigation development. Further reductions in stream

flows associated with irrigations could degrade existing habitat (Gould 1998).

Blue sucker (S2S3) populations are healthy in Montana, but it is listed as a species of concern. It is adapted for life in swift currents of large rivers, migrating in spring upriver and congregating in fast rocky areas to spawn. They can live 17 years but seem to have very low reproductive success. The species is considered an indicator species for ecosystem health because of its habitat-specific requirements. Habitat protection includes establishment of more natural seasonal flows on rivers (Williams et al. 1989).

Northern Leopard Frog. Northern leopard frogs were proposed for listing as threatened under the Endangered Species Act in 2009. A positive 90-day finding was published in the Federal Register on July 1, 2009, and a 12-month status review of the species is underway. They breed in a variety of habitats including slow-moving or still water along streams and rivers, wetlands, permanent or temporary pools, beaver ponds, and stock tanks (Rorabuagh 2005). These areas do not contain predaceous fish or other predators and contain emergent vegetation for breeding and tadpole habitat (Smith 2003). Subadults migrate to feeding sites along the borders of larger, more permanent bodies of water (Merrell 1970). Adults require stream, pond, lake, and river habitats for overwintering and upland habitats adjacent to these areas for summer feeding. In summer, adults and juveniles commonly feed in open or semi-open wet meadows and fields with shorter vegetation, usually near the margins of water bodies, and seek escape cover underwater. During winter, leopard frogs are found inactive underwater on the bottom of deeper streams or waters that do not freeze to the bottom and are well-oxygenated (Stewart et al. 2004) Males call in shallow water during breeding season. Eggs are laid in breeding habitat and are attached to the vegetation, just below the water surface. Larvae develop in shallow, still water exposed to sunlight. Tadpoles are generalist herbivores, eating attached and free-floating algae (Hoff et al. 1999). Adult and sub-adult frogs are generalist insectivores (Merrell 1977, Smith 2003). During spring and fall migrations and juvenile dispersals, leopard frogs have been tracked 5 miles from original locations (Werner et al. 2004).

Incidental observations of northern leopard frogs on the refuge have been recorded in early narratives. Sightings of between one and three individuals are common but on two occasions, two areas on the refuge have had over 50 individuals recorded. In 2009 at the UL Bend, refuge 50 individuals were found south of Dry Lake; in Valley County, more than 100 leopard frogs were found in ponds by Duck Creek (see figure 35).

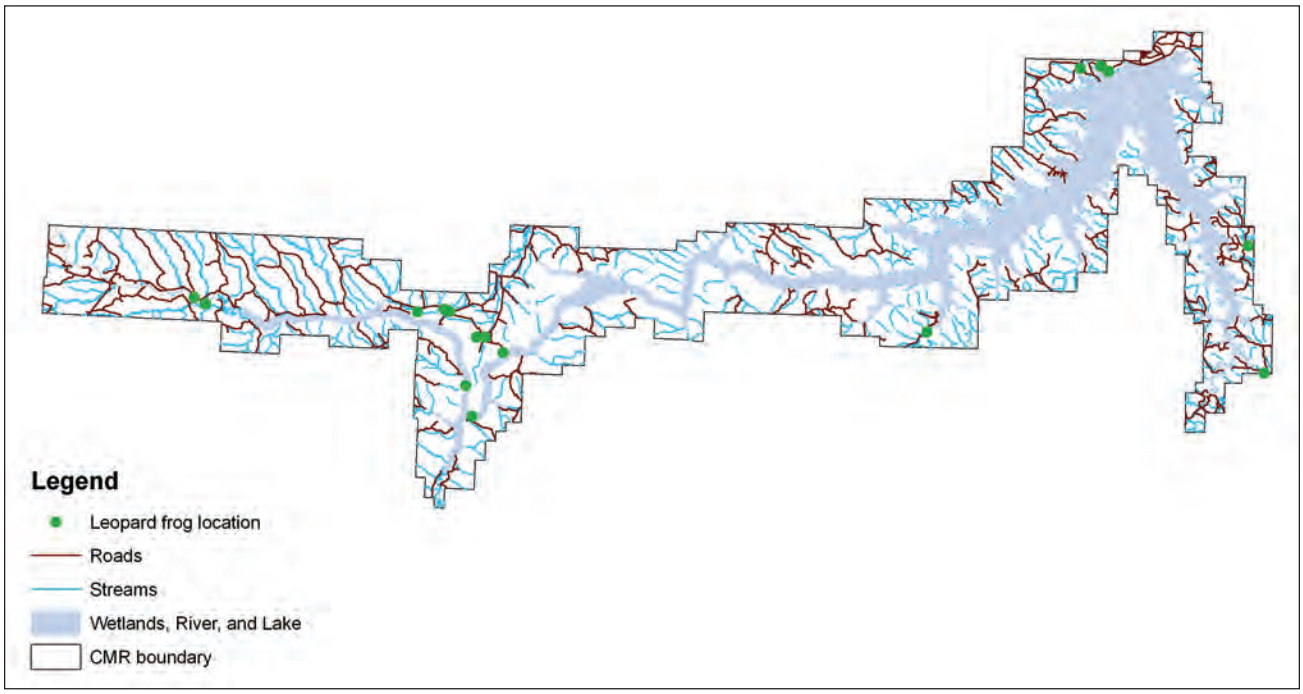


Figure 35. Map of leopard frog locations on the Charles M. Russell and UL Bend refuges (1996–2009).

4.4 Special Management Areas

The Charles M. Russell and UL Bend refuges have additional special land designations being reviewed as part of the CCP and EIS. The Service has several types of jurisdiction across the refuge.

- **Service primary**–Lands that were withdrawn or acquired for the sole purpose of managing as part of the refuge.
- **Service secondary**–Lands that are withdrawn or acquired that have a secondary purpose subject to the primary purpose.
- **Withdrawn lands**–Lands that were withdrawn from public domain and reserved for a specific purpose such as a national wildlife refuge or USACE project. Public domain lands would include lands that were never homesteaded or Bankhead-Jones lands that came back to the public domain when the original homesteader defaulted.
- **Acquired lands**–Lands that were purchased in fee title by the USACE for the Fort Peck Project or purchased by the Service for the management of the refuge.

The Service works closely with USACE, BLM, and the National Park Service in managing lands within the refuge that have other Federal-jurisdiction land designations.

WILDERNESS

In 1976, Congress designated about 20,890 acres as the UL Bend Wilderness. This acreage was later modified to its current size of about 20,819 acres. Within UL Bend Wilderness, visitors can expect to experience undeveloped land retaining primeval character providing an opportunity for solitude and unconfined recreation. For further information on the specific boundaries each tract reviewed for its wilderness characteristics, refer to appendix E.

As guided by the Service's Wilderness Stewardship Policy, which provides an overview and foundation for implementing the Wilderness Act, and as part of the development of the draft CCP and EIS, a wilderness review has been conducted updating the existing lands within the refuge and their current wilderness potential. Proposed wilderness units are those areas that have previously been reviewed by the Service and approved by the Secretary of the Interior as a parcel of land that meets the wilderness characteristics found within the Wilderness Act of 1964. The refuge currently maintains 15 areas of about 155,288 acres known as proposed wilderness units. All 15 units are spread across the 1.1 million-acre refuge. Since Congress has not officially designated these 15 areas as designated wilderness, they are managed as proposed wilderness units in which Service policy (FWS 2008d) requires them to retain their wilderness characteristics in the event they are designated as wilderness. Appendix E provides further information on the specific boundaries each tract reviewed for its wilderness characteristics.

LEWIS and CLARK NATIONAL HISTORIC TRAIL

In 1978, Congress amended the National Trails System Act to include national historic trails and designated the Lewis and Clark Trail as one of four national historic trails. It commemorates the events that form the trail's central theme through historic interpretation, preservation, and public use. The trail is approximately 3,700 miles and follows the Missouri and Columbia Rivers, including the section that flows through the entire refuge. The official headquarters for the trail system is located in Omaha, Nebraska and is administered by the National Park Service. The Lewis and Clark expedition camped at 19 sites on the refuge, which are shown in figure 15.

HELL CREEK and BUG CREEK NATIONAL NATURAL LANDMARKS

The primary goals of the National Natural Landmarks Program, which was established by the Secretary of the Interior in 1962, are to recognize landmark resources and support their conservation. On the refuge, there are two of these areas, one at Hell Creek and one at Bug Creek. Both areas were designated because of their paleontological resources. The program is administered by the National Park Service and involves an annual inspection. A plaque has been installed at each site designating the area. Future refuge management involving prescribed fire, grazing, and scientific research should consider this designation when making management decisions (see figure 15). There are several sites on adjacent BLM land including Ash Creek Divide, Hell Creek, Bug, Creek, and Sand Arroyo.

RESEARCH NATURAL AREAS

"Research natural areas" are part of a national network of reserved areas under various ownerships where natural processes are allowed to predominate and that are preserved for the primary purpose of research and education. Currently there are 210 research natural areas on national wildlife refuges. They exist to fulfill three objectives, delineated by the Service's Refuge Manual as follows: (1) to participate in the national effort to preserve adequate examples of all major ecosystem types or other outstanding physical or biological phenomena; (2) to provide

research and educational opportunities for scientists and others in the observation, study, and monitoring of the environment; and (3) to contribute to the national effort to preserve a full range of genetic and behavioral diversity for native plants and animals, including endangered or threatened species. Research natural areas are areas where natural processes are allowed to predominate without human intervention. The Service's Refuge Manual states that a research natural area "must be reasonably protected from any influence that could alter or disrupt the characteristic phenomena for which the area was established." Future management decisions must be evaluated to ensure the characteristics for which these areas are recognized and protected for their ecological values. There are eleven research natural areas listed for the refuge on the Service's website: Dillon Island, Fourth Ridge, Grand Island, Limber Pine, Manning Corral Prairie Dog Town, Missouri River Bottomlands, Prairie Dog Island, Spring Creek Bay Coulee, Two Calf Douglas-fir Community, Two Calf Island, and York Island. Several of these areas are actually part of the same natural area, resulting in seven research natural areas that the refuge recognizes (see figure 15).

UPPER MISSOURI BREAKS WILD and SCENIC RIVER

In 1968, Congress passed the Wild and Scenic River Act, and in 1976 the Upper Missouri Breaks Wild and Scenic River was established, which includes the western most 10 miles of the Missouri River on the refuge. This designation recognizes the wildness and scenic values that exist along that portion of the river. Management decisions should ensure that those values are protected for the American public. Such activities as livestock grazing on the river and vehicle traffic on refuge roads 209, 307, 308, 874, 845, and 853 should be evaluated to ensure these activities do not detract from the wild and scenic values.

MISSOURI RIVER BREAKS BACK COUNTRY BYWAY

The National Scenic Byways Program is part of the U.S. Department of Transportation, Federal Highway Administration. The program is a grass-roots collaborative effort established to help recognize, preserve, and enhance selected roads throughout the United States. In addition to the national designation, many agencies promote their own sets of scenic roads and byways. BLM has identified a number of "back country byways" including the Missouri River Breaks Back Country Byway, designated on July 21, 1989, which passes through BLM lands and through several refuge roads along the western boundary including the Knox Ridge Road to U.S. Highway 191. This byway is not officially recognized under any Service designation.

LANDS WHERE USACE has PRIMARY JURISDICTION

These are lands within the refuge that have been withdrawn or acquired and are subject to the purposes and operation of the Fort Peck Project. Most lands where USACE has primary jurisdiction have either been outgranted to the Service, or by agreement, allow the Service to manage those lands as part of the refuge for the purposes of wildlife and wildlife habitat. Some USACE primary lands within the refuge have been retained by the USACE. These include the developed recreation sites and administrative sites such as the dam and power plant.

The USACE has 16 designated recreation sites on the refuge. The sites are managed by a multitude of agencies and governments including counties, BLM, MFWP, and the Service. The level of recreation development is defined in the Fort Peck master plan (USACE 2008). Agencies responsible for management of individual recreation sites changes depending on funding levels. The Service participated in the development of the master plan.

UPPER MISSOURI RIVER BREAKS NATIONAL MONUMENT

On January 17, 2001, President Clinton created by proclamation The Upper Missouri River Breaks National Monument. The monument abuts the refuge to the west, and the stretch of the wild and scenic river on the refuge is managed as if were part of the monument. Specifically, this pertains to river travel only. At the terminus of the wild and scenic river is Kipp Recreation Area near the Fred Robinson Bridge (figure 15), which is a designated USACE recreation site. The USACE permits the BLM to operate the Kipp site. The recreation site is located where USACE has primary jurisdiction and the Service has secondary jurisdiction. At times, this has created management challenges, particularly when development of the recreation facilities involves habitat loss or degradation on the refuge. In the past, the Service and BLM have coordinated development activities to minimize habitat loss or manipulation. Ideally, this should be continued and formalized with the three agencies involved to ensure conflicts over future use of the area does not affect each agencies' purposes.

4.5 Visitor Services

The nearly 250,000 visitors to the refuge enjoy a variety of recreational activities related to the six wildlife-dependent recreational uses that are identified in Improvement Act as the priority uses (hunting, fishing, wildlife observation, photography, interpretation, and environmental education). Due to the refuge's immense size and remote location, there are a number of other activities such as camping and boating that are allowed on the refuge, and these enable the Service to facilitate providing for the priority public uses on the refuge. Service policy provides guidance on the management of wildlife-dependent recreational uses (FWS 2006c).

This section discusses the priority public uses, access, and other activities that the Service is involved with in managing the refuge. Recreational areas that the USACE manages are mentioned briefly, but because the Service does not manage these areas, these are not analyzed further.

HUNTING

Hunting has been an important traditional public use of the refuge throughout its history. For many visitors, the refuge is synonymous with big game hunting. Long known for its ability to offer outstanding opportunities to hunt for Rocky Mountain elk, mule deer and white-tailed deer, as well as Rocky Mountain bighorn sheep, the refuge offers multiple opportunities for outdoor recreation. Hunters currently are able to take part in a variety of hunting opportunities from areas with significant road access to areas with relatively no roads as provided for through wilderness and proposed wilderness units. About 103,900 hunters participate in hunting annually on the refuge. Of these, there are about 90,000 big game visits, 2,900 waterfowl and migratory bird visits, and 10,000 upland game visits reported annually (refer to socioeconomic analysis for chapter 4).

The Theodore Roosevelt Conservation Partnership conducted a poll of hunters and sportsmen and sportswomen's groups (figure 36). The results showed that the Missouri River Breaks, including the refuge, ranks among the most highly valued recreation areas in Montana (Dickson 2008).

Hunting for upland birds and waterfowl is also currently permitted and participated in by some visitors, although not at the level of big game hunting. In recent years, the refuge has instituted several special hunting opportunities including hunts open only to young people with a refuge-sponsored orientation day at the refuge and an accessible hunting

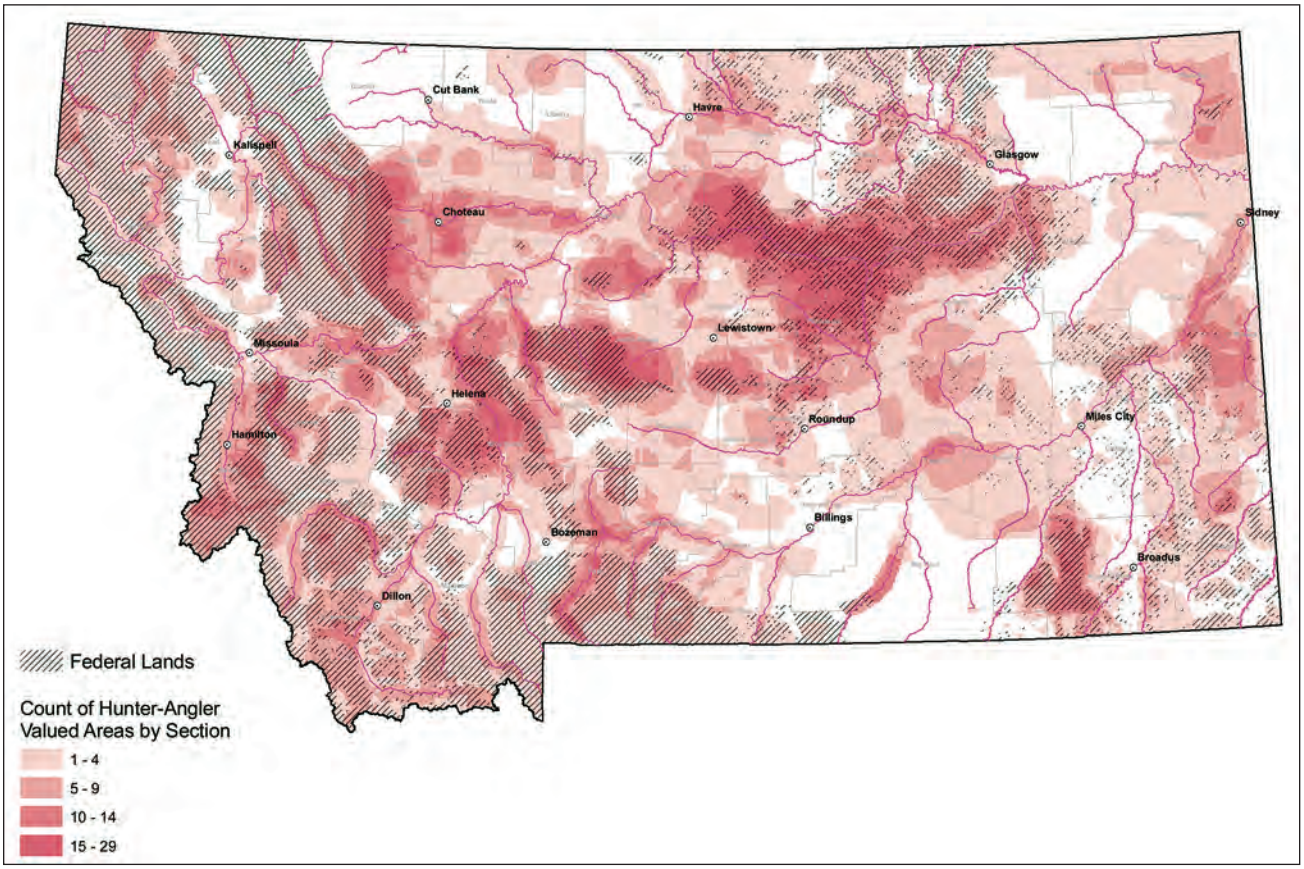


Figure 36. Map of areas in Montana that are valued by hunters and anglers. Source: Dickson 2008.

blind to provide wheelchair-bound hunters a quality opportunity to hunt elk and deer.

The refuge takes in portions of eight hunting districts within three administrative regions managed by the MFWP. Season setting and permit allocations are primarily done through a process administered through MFWP. The refuge is an active partner in this process and refuge wildlife objectives are considered in the refuge's management recommendations in these efforts. At times, the refuge has promulgated more restrictive regulations to address wildlife objectives within the refuge. For example, there is a current 3-week mule deer rifle season in place for portions of the refuge where mature buck ratios are below the set objective, which differs from the State-regulated, 5-week, mule deer, rifle season.

Commercial outfitting for hunting is also allowed on the refuge. Currently, there about 11 permits issued annually (refer to commercial recreation below).

FISHING

About 60,000 fishing visits are attributed to the refuge throughout the year as anglers participate in a number of fishing opportunities including bank fishing, fishing from boats, and also ice fishing on the surface of Fort Peck Reservoir and the Missouri River. This does not include the number of fishing visits attributed to USACE recreation areas or the lake, which is about 160,000 fishing visits (USACE 2009c).

The State of Montana (MFWP) has primary responsibility for all fisheries management within the refuge, which is consistent with the Service's policy on fishing (FWS 2006e). This includes regulating harvest, egg collecting efforts, and stocking activities.

One of the more popular fishing opportunities is the spring paddlefish run, which brings some of the greatest angler concentrations to the banks of the Missouri River seen throughout the year. Anglers also pursue walleye, sauger, northern pike, channel catfish, and shovel nose sturgeon. Additionally, lake trout and salmon are found in Fort Peck Reservoir and provide for great open-water–fishing opportunities.

Anglers are able to access the river and reservoir on the refuge through the numbered road system, which provides for a number of roads leading to the waters edge, some with primitive or improved boat ramps. Recreation sites administered by USACE are located throughout the Fort Peck Reservoir and provide anglers with camping and boat launching facilities.

Sport fishing on Fort Peck Reservoir and upstream sections of the Missouri River has always been a popular activity with locals and nonresident anglers alike. The main game species present include walleye, northern pike, chinook salmon, lake trout, smallmouth bass, and paddlefish. With the exception of paddlefish, lake trout, and smallmouth bass, all of these are stocked to varying degrees in the reservoir, because natural reproduction is not sufficient to meet the needs of anglers. The State of Montana operates a warm-water fish hatchery in Fort Peck and this hatchery supplies most of the fish that are stocked in any given year. Supplemental fish releases also occur from fish reared at the hatchery in Miles City, Montana.

Walleye tournaments are popular on the reservoir, with a varying number of them occurring each year. The most popular and well known of these is the Governor's Cup Tournament, which is held in July and can have as many as 200 teams participating. In addition, the Jordan chapter of Walleyes Unlimited annually sponsors a Kid's Fishing Day at Hell Creek Recreation Area, and the refuge always collaborates on this event. These tournaments are regulated by the USACE, with enforcement activities being provided primarily by MFWP. In recent years, the number of participants in these local tournaments has declined.

Another popular time of year for fishing use on the refuge is in May and June when large numbers of paddlefish move upriver from the reservoir to spawn upstream of the refuge in the upper Missouri River Breaks National Monument. Fishing pressure is most prevalent from Rock Creek Boat Ramp to the Fred Robinson Bridge and can attract large crowds when fish numbers and weather conditions are favorable. The State of Montana regulates the harvest and typically sets a quota number that only allows for catch and release fishing after that number of permitted fish has been reached.

Paddlefish are among the largest freshwater fish. Remarkably adapted to its environment, the paddlefish is a classic example of millions of years of ecological fine-tuning and could be the oldest big game animal surviving in North America (MFWP 2009b). In Montana, the Slippery Ann area is one of a few important paddlefishing areas along the Missouri River. Historically, paddlefishing was open to all, and hundreds of anglers would pack into accessible areas from Kipp Recreation Area to the Rock Creek boat ramp along the Missouri River to try their luck in the spring. Law enforcement officers remained busy keeping order and preventing resource damage from camping and bank fishing. In recent times, MFWP has placed limits on days open for paddlefishing, the number of permits issued and number of paddlefish harvested.

Throughout the refuge depending on the lake elevation, there are about 16 boat ramps available to the public for launching boats, although most of these are managed and maintained by USACE. In general, overall fishing use of the reservoir and river is highly variable and depends on reservoir levels

and boat access along with how good fishing success is in any given year.

WILDLIFE OBSERVATION and PHOTOGRAPHY

The refuge provides outstanding wildlife-viewing opportunities due to the abundance of elk, mule deer, bighorn sheep, eagles, burrowing owls, sage and sharp-tailed grouse and other grassland birds. Consistent with the opportunities to view wildlife, many visitors also take the opportunity to photograph these critters and their associated habitats. These photographers take advantage of early mornings and late evenings to make breath-taking photographs. The refuge receives approximately 20,300 photography visits a year. The auto tour route and elk-viewing area receives approximately 4,000 visitors during the elk rut. Other visitors take advantage of photographing prairie dogs and burrowing owls, sage-grouse and sharp-tailed grouse on leks, and bald eagles around Fort Peck Dam in the winter. Numerous professional photographers have photographed the scenery and diversity of wildlife for numerous book projects and magazine articles. Videographers with National Geographic and other television programs come to the refuge to capture provocative images of the Missouri River Breaks. Over the years, numerous volunteers and neighbors have obtained some extraordinary photographs of refuge wildlife and scenery. These people have graciously shared their photographs with the refuge and they have become invaluable in the development of brochures and publications.

Commercial photography occurs sporadically with a few requests annually from still photographers and videographers. Most of these requests are from professionals that are writing books on the area or preparing an informational video associated with other work in the area such as American Prairie Foundation and the World Wildlife Foundation. Temporary blinds are allowed but they must be removed at the end of the filming periods. All permit holders are required to provide the Service copies of their work for use by the Service for public use programs, brochures, and other needs. A nominal fee is charged. Additionally, the Service collaborates with other local photographers to obtain refuge media for brochures or other needs.

INTERPRETATION

Interpretation is closely tied to the other priority public uses. The guiding principles are to promote visitor understanding and appreciation for America's natural and cultural and conservation history. The communication process should forge emotional and intellectual connections between the audience and the resource (FWS 2006g). Interpretation provides opportunities for visitors to make their own connections to the resource. Examples of interpretive resources found on the refuge include interpretive programs, exhibits, signage, facilities, and special events.

Each of the refuge's four field stations—Lewistown (headquarters), Sand Creek, Jordan, and Fort Peck—provide a visitor contact area; however, the attractiveness and accessibility vary between the stations. In 2007, region 6 conducted a visitor service review, and the reviewers recommended sprucing up these areas with wildlife mounts and displays. There are also kiosks with interpretive panels at each office and at several other places on the refuge. Several kiosks need to be moved to more suitable locations and almost all of the panels need to be updated. Most of the refuge brochures and other printed materials comply with Service's graphic standards.

The Fort Peck Dam and Interpretive Center is a cooperative effort between the USACE, the Service, and Fort Peck Paleontology Incorporated. One-third of the facility is dedicated to interpreting the fish, wildlife, and habitat of the refuge. There is a memorandum of understanding in place that requires a Service staff presence at the center but this position has been vacant since 2007. Two seasonal employees are hired during the summer to assist the USACE with running the facility.

There is a 20-mile auto tour route near the Sand Creek Field Station with a graveled road and updated interpretive panels. Based on traffic counters set up at different access points, an estimated 10,000 vehicles use the tour route each year. Several hiking trails are located at Sand Creek Field Station, which provide access to wilderness and there are paved accessible walking trails near the Fort Peck Interpretive Center on the east side of the refuge.

The Slippery Ann Elk Viewing Area on the west side of the refuge is very popular with the public, particularly during the fall. From September to early October, visitors can watch as many as 300 elk in the bottomlands near the Missouri River. During peak times, on weekend evenings as many as 175 vehicles have been counted entering the viewing area. In 2009 on one peak day (September 26), 161 vehicles entered the viewing area with 585 visitors counted. From September 5–October 18, there were an average of 35 vehicles a day and about 107 visitors a day. Out of 56 counties in Montana, visitors from 40 counties (75 percent) visited the viewing area. Additionally, there were visitors from 32 States (65 percent), two Canadian provinces and several international visitors. Some of the main issues have been how to handle the increasing interest in the viewing area. Public safety and impacts to refuge resources are of concern. Dust from vehicles, inade-

quate and appropriate parking along the route, and visitors not adhering to refuge regulations all need to be addressed.

The refuge offers bus tours several times during the fall and has produced a brochure with information on the viewing area and elk biology.

A 30-minute video about the refuge and refuge management is being produced by the Service's National Conservation Training Center. In the future, the video will be shown at the Fort Peck Interpretive Center, on bus tours to the elk-viewing area and will be on a continuous loop at the Lewistown headquarters.

ENVIRONMENTAL EDUCATION

Environmental education is a process designed to teach visitors and citizens the history and importance of conservation and biological and scientific knowledge of our Nation's natural resources. Within the Refuge System, it incorporates on-site, off-site, and distance learning, activities, programs, and products that address the audience's course of study (FWS 2006d).

Often environmental education is associated with teaching children (kindergarten through high school) through the local schools using the State standards for the curriculum that is taught. Most of the schools in the six counties surrounding the refuge are located far from the refuge, which makes field trips difficult due to time constraints and school transportation budgets. There has been no formal environmental education program since 2007 when the outdoor recreation planner stationed at Fort Peck Field Station left the Service but refuge staff give classroom presentations when requested. There is no refuge-specific curriculum. Staffs at Fort Peck and Jordan field stations participate in annual environmental camps in cooperation with other agencies. Seasonal employees at the Fort Peck Interpretive Center give presentations throughout the summer and there are educational trunks available for loan through the Fort Peck Interpretive Center.

USFWS

The refuge offers limited programs in environmental education.

OUTREACH

Currently, key outreach tools for the refuge are public presentations, news releases, weed tours, county commissioner meetings, the Ranchers Stewardship Alliance, and Missouri River Conservation Districts. The refuge website is currently being expanded and updated to increase its usefulness and appeal. As of August 2009, the website attracted an average of almost 3,000 visitors a month.

ACCESS

The refuge staff and the public access the refuge by a variety of modes or means including vehicle, boat, aircraft, foot (including snowshoes or cross country skis), bicycle, or horseback. All-terrain vehicles (ATVs) are allowed on the refuge only on numbered routes that are open to all other vehicles. All ATVs using the refuge are required to be street legal and display a metal license plate. Snowmobiles are not allowed any portion of the refuge other than the ice of Fort Peck Lake. Snowmobiles may be off-loaded at any point that a numbered route reaches that lake ice, but are restricted from any other travel within the refuge.

Access is an important consideration particularly for outdoor recreationists, the primary user of the refuge. Other requirements for access include staff access in the performance of duty, permittee access, and access for fire suppression.

Roads

There are approximately 670 miles of refuge roads (see figure 7, alternative A map, in chapter 3). These include several paved highways that traverse the refuge, gravelled roads, and dirt or two-track roads. All refuge routes have a three-digit number 101-899. Typically, the lower the number the more frequently traveled and maintained the road will be.

U.S. Highway 191 traverses the refuge on the west end near the Sand Creek Wildlife Station. It is an asphalt two-lane road, crosses the refuge for about 9 miles, and crosses the Missouri at the Fred

Robinson Bridge. State Highway 24 passes through or immediately adjacent to about 11 miles of the refuge near the Big Dry Arm and the Fort Peck Field Station. Both highways are maintained by Montana Department of Transportation.

There is at least one graveled, all-weather access road leading to the refuge from each of the six adjacent counties with 60 miles of all-weather access within the refuge boundary. Most of the refuge's roads are small two-track dirt trails that require a high-clearance four-wheel-drive vehicle. All open routes on the refuge are uniquely numbered. The nature of the soil types found within the refuge make road conditions impassible in wet conditions unless significant improvements have been made such as gravelling or pavement. An all-weather road does not equate to all-season access.

The refuge grades approximately 137 miles on an annual basis. Most of the work is done on the west half of the refuge. Some years, depending on weather conditions, certain portions of roads will be maintained up to three times during the frost-free season. In addition, roughly 2 miles of road is worked on each year, with other refuge equipment, to repair washouts and culverts. In Garfield County, about 56 miles of road are maintained, under a special use permit, by the county. In McCone County, about 25 miles of road are maintained under a special use permit. Valley County also maintains about 8 miles of refuge road leading to the Pines and Bone Trail recreation areas.

Funding for road improvements primarily comes from the Service's refuge roads program, which was created under the 1998 Transportation Equity Act for the 21st Century (TEA-21) and subsequently revised by passage of the Safe, Accountable, Flexible, Efficient Transportation Equity Act. It is administered under the Federal Land Highways program. Any funding that is obtained can only be used for refuge roads, and funds must be used for maintenance and improvement.

On the refuge, roads have been created by county commission resolution or by petition. In addition, attempts have been made to establish roads by grant (easement), but at times this has met with local landowner opposition.

County Commission Resolution. The Crooked Creek Road (refuge road #103) was designated a public road by a Petroleum County Commission resolution in the 1990s. After the refuge graveled about 5 miles of the road with TEA-21 funding, the county established it as a public road and in affect agreed to maintain the road. The road leads to the Crooked Creek Recreation Area where Petroleum County has a USACE permit to manage the site.

Petitioned Roads. There are an unknown number of petitioned roads on the refuge within the six counties. Some counties' road books and files will have complete sets of petitioned road records for individual roads. Some will have portions of the legal requirements for a legally petitioned road. Usually the only time the necessary research is done to determine if a road is truly a petitioned road is when a private landowner or land management agency proposes to close a road. On the refuge, road 343/606 that leads to the Musselshell Bottom in Garfield County was closed at the refuge boundary by a new landowner. Because this was a major access point to a large portion of the refuge, the Service and the county challenged the closure. Information presented at a public commission meeting showed that the refuge had periodically maintained the road and historically the road led to an old post office. The county commissioner's decision was based on historical information provided by the Service and neighboring landowners. The road remains open today, and it would be considered a public road. In the early 1990s, a fire destroyed the Garfield County courthouse that housed all the county road records. In Garfield County, it will be difficult to establish public roads without having the historical records. In several areas, access to the refuge has been blocked because roads cross private land that has been closed. Through land acquisition and the purchase of rights-of-way, vehicle access to the refuge for the public will need to be improved. In addition, Garfield County may be willing to establish roads by easement if landowners and agencies can identify a public and private benefit.

Each of the six counties has a variety of complete or incomplete road records. Some records parallel and overlap nicely the current refuge road system. In some instances county records show petitioned roads that may never have been built and/or have never been shown on refuge maps. As stated in chapter 1, determining the legal validity of petitioned roads is outside the scope of this CCP and EIS. This document would not eliminate the counties' or a private landowner's legal ability to contest the existence or nonexistence of a road on the refuge that may or may not be open to the public.

Where possible the counties and the Service may agree on which roads on the refuge are open to vehicle travel. In some situations, it would be beneficial to identify roads as being refuge roads to allow the expenditure of Service's refuge roads program funding to improve all weather access. In some situations, it may be best to recognize a road as a legal county road to facilitate maintenance. Over the past 18 years, approximately 45.5 miles of refuge roads have been graveled on the refuge with the use of refuge road dollars. If a road is designated a county road, such as the Crooked Creek Road, funding under the refuge roads program cannot be used to improve or maintain the road in the future. This must be consid-

ered before declaring a "county road" versus leaving a road a "refuge public road."

Other Public Access Issues

The majority of the open refuge roads are publicly accessible. Roads that lead to the refuge are designated for public use and allow legal access to the existing and open refuge roads. However, some refuge roads currently remain open, yet are not open to the public. This situation primarily occurs in the Garfield County area where a number of roads that access open refuge roads cross private land bordering the refuge. These roads that cross private lands are not open to the public and subject to the private landowner's permission. In Garfield County, this situation occurs on 21 individually numbered routes and has created an exclusive use situation.

Boats. Numerous types and sizes of boats are used to access the Fort Peck Lake and the Missouri River. Montana boating laws and regulations apply to refuge waters. The Service has little data on the total number of boaters using the Fort Peck Reservoir or Missouri River but informal observations by staff suggest that more boats could be accessing the refuge from the river or lake during hunting season than in the past.

Restrictions are in place from June 15 to September 15 for the Wild and Scenic River portion of the refuge along the western boundary (refer to soundscapes in section 4.1 above). In reporting on visitor and boat use through the Upper Missouri Wild and Scenic River, about 22 percent of boaters use the stretch from Judith Landing to the James Kipp Recreation Area located on western edge of the refuge (BLM 2008). The latest information for 2008 on boat use for the Upper Missouri River indicates there were about 4,495 registered users (BLM 2009), so it is estimated that nearly 990 boats take out at Kipp during the summer season. Since 1976, the highest number of registered users occurred in 2002 with 6,034 registered users with 1,272 using a commercial operator.

Water levels on the Missouri River fluctuate considerably and dictate what types of boats may be suitable for use. Boat access to the water varies from improved USACE concrete boat ramps located at developed recreation areas that allow larger craft to launch to areas where vehicle access leads to the water edge but only small watercraft (such as canoes) can be used. Access to those boat launch areas vary as well from paved highway and graveled and improved all weather roads to unimproved two-track roads that are impassible when wet.

Access by Foot, Horse, or Bicycle. There no restrictions for access by hiking or walking on the refuge other than the elk-viewing area and Sand Creek Administrative Area on the west end of the refuge. Additionally there are no designated or improved hiking trails on the refuge (an established hiking trail is located at Hell Creek State Park within the refuge). Similarly, there are no restrictions to horseback riding on the refuge other than the previously mentioned areas closed to foot traffic. As with foot travel, there are no designated trails or paths for horse travel, and some portions of the refuge are unsuitable/unsafe for horse use. Certified weed-free hay is required when keeping horses on the refuge. Bicycles are allowed on numbered roads only including seasonally closed roads.

Universal Access. There are several hundred miles of open refuge roads that are available for hunters of all abilities to hunt from with the appropriate Montana State license. Additionally, an accessible blind is available to hunters needing wheelchair access along the Missouri River.

Use of Game Carts. Game carts were originally designed for retrieving big game in areas where road access was limited. They often consist of a small cart with two wheels that a hunter pushes or pulls. On much of the refuge, it is not feasible to use one because of the rugged, steep terrain, and hunters have to carry an animal out to where they can use a game cart. Game carts are not allowed in UL Bend Wilderness. However, the use of a game cart is approved for the proposed wilderness units. A minimum tool analysis is being completed as part of the wilderness review (refer to appendix E).

RECREATION SITES

USACE recreation areas include Crooked Creek, Forchette Bay, Devils Creek, Hell Creek, McGuire Creek, Nelson Creek, Rock Creek, Fort Peck, and The Pines. Since the Service does not have primary jurisdiction over these areas, they are not analyzed further.

The Service managed several primitive camping areas that have vault toilets including Slippery Ann, Rock Creek, Turkey Joe, Withrow Bottoms, Jones Island, and Rocky Point (figure 15). A few additional areas that were outgranted to the Service in the Enhancement Act of 2000 have no facilities (Bear Creek and Bobcat).

Except where designated as closed, camping (other than backpacking) must take place within 100 yards of the Missouri River and Fort Peck Reservoir or within 100 yards of numbered and open roads. Camping is limited to 2 weeks within any 30-day period. The use of dead and down wood is allowed for making a campfire. Camping is not permitted on the islands.

COMMERCIAL RECREATION

There are a number of commercial recreation activities that occur on the refuge including hunting and outfitting, fishing, and photography. Any commercial activity requires a special use permit. Currently the Service has provided little to no oversight for the commercial harvest of fish or mussels in the past since most of it falls within the primary jurisdiction of USACE. This topic is discussed in detail under fishing in chapter 3. Commercial outfitting also occurs on the refuge but is limited to 11 special use permits annually.

REFUGE HEADQUARTERS AND FIELD STATIONS

The headquarters for the refuge is located along Airport Road in Lewistown, Montana. It consists primarily of a headquarters building, a maintenance shop, and a few other buildings. A small wind turbine is used to offset energy costs. Additionally, there are three field stations located at Sand Creek, Jordan, and Fort Peck and a small research facility at the UL Bend refuge. Each field station consists of a few buildings that provide office space, a fire cache, some maintenance capability and storage, and residences or bunkhouses.

4.6 Human History and Cultural Resources

From prehistoric times to present day, the refuge has a rich human history that has shaped the landscape.

PREHISTORIC HISTORY

As a river corridor, the refuge was an important land feature for aboriginal people due to the variable resources provided by a major waterway in relatively dry country and unique hunting opportunities provided by the Missouri River breaks. Most of the prehistoric people of the plains depended on animal products for subsistence. Areas along the Missouri River Breaks probably tended to concentrate large ungulates along the breaks, funneling animals into narrow passages to cross the river during winter migrations. These natural game funnels would have made likely ambush points for prehistoric hunters. An area of the refuge near UL Bend is known as an important migrational area for large ungulates and it is obvious that aboriginal cultures exploited this knowledge based on the presence of prehistoric sites documented in the area. Documentation of the use of the refuge by native people is known mostly through surface remains. Some archaeologists believe that the actively eroding nature of the soils along the refuge have erased the remains of many of the earlier sites, but recent archaeological work has shown that some earlier prehistoric sites could be deeply buried (Loflin 2008). Formal archaeological investigations have been sporadic and were associated primarily with Federal projects. Planning documents and some large-scale fieldwork has been produced by the BLM on their lands surrounding the refuge (Davy 1992, Ruebelmann 1982). Known prehistoric site types suggests that the early inhabitants of the river were highly mobile and did not create permanent villages as is seen further east in the Missouri River floodplain. This is consistent with the use of the area by groups of people exploiting the area for hunting bison. To date, little archaeological excavation has taken place on the refuge, but archaeological testing was conducted on a few sites in 2008 and additional testing is scheduled for 2009 (Boughton and Peteson 2007).

Paleo-Indian Period (9500 B.C.–6500 B.C.)

Although no Paleo-Indian sites are known on the refuge, in the 1960s, one Folsom point was reported at the UL Bend refuge by a nonprofessional (Reubelmann 1982). More recently, Davy reports that a Folsom and a Hell Gap point have been recovered on the surface and in a buried context by professionals (1992). Investigation into the buried artifact demonstrated that there was no site associated with it.

Middle Prehistoric Period (6500 B.C.–200 A.D.)

Depending on location, it appears that these people were largely focused on exploiting bison, but the tool kit expanded from Paleo-Indian times suggesting dependence on a broader spectrum of plant and animal resources in more varied habitats. Climatologically, it was becoming dryer and Plains Archaic populations tended to inhabit areas with protected water sources. Sites typically occur in basin/foothill regions, river valleys and in open prairie. During the Altithermal, some of the Great Plains became dry enough to cause the formation of dune fields, which pushed the bison and native people to other areas. There is a wide variation of projectile point (spear/atlatl) types associated with the Middle Prehistoric, no doubt due to the varied species, environments and hunting techniques used to procure game in this fluctuating climatic regime. The spear thrower was introduced allowing greater range than spear throwing and necessitating smaller projectile points. Communal hunting continued, but researchers have suggested that smaller hunting groups were used at various times of the year. There is also more evidence of processing of vegetal resources suggesting reliance on a broader spectrum of resources. There are very few excavations of Middle Prehistoric sites near the refuge although surface finds demonstrate that these people were present.

Late Prehistoric Period (A.D. 200–1750)

During this phase, prehistoric people moved out onto the prairies and new technologies were introduced including the bow, arrow, and pottery. Complexes included in this tradition include Besant, Avalonea, Benson's, Butte/Beehive, and Old Women's. The Besant complex represents the earliest adoption of pottery and bow and arrow use in this area of the northern Great Plains. In the Dakotas, it has been documented that sites of this phase have burial mounds along the Missouri River although none have been reported in Montana. In areas of the lower Missouri, village-dwelling, semi-agricultural, aboriginal people lived in earthen lodges, making forays at certain times of year to other areas to secure resources. Although none of these village sites is known from the refuge, a nonprofessional reported that an earthen lodge existed on the river before it was flooded to create Fort Peck Reservoir (Reubelmann 1982).

Although the horse was in use in the southern plains earlier, in the northern plains they were not in widespread use until A.D. 1725–50. Bison continued to be the primary resource exploited by Protohistoric groups, but the addition of the horse to hunting techniques drastically affected social organization, settlement patterns, and effectiveness of bison hunting. Protohistoric people were able to react more quickly to the movements of the bison herds, were able to hunt further away from base camps and began to leave women and children in camps while hunting.

Although many of the prehistoric sites on the refuge do not have datable artifacts, it has been suggested that a majority of the known prehistoric sites are attributed to this period. This may be because most of the sites are known from surface finds and is logical that the latest materials would be on the surface. It is also likely that aboriginal populations were much higher during this period as more groups were pushed into the plains with the advancement of Anglos and the effect trade goods were having on tribal politics.

HISTORICAL PERIOD

During this period, trade goods and interaction between Anglos and tribal people began to directly affect aboriginal life ways. This process started well before Anglos reached the area around the refuge. Trade goods and the desire for them changed Native American life ways by shifting hunting activities for household consumption to a means to obtain trade goods. As more of the aboriginal people were being pushed into the area, conflict between tribes in search of bison became more frequent. Taking control of territories for hunting grounds and high mobility became increasingly important. Furthermore, during the 19th century, the area around the refuge was the stage for many conflicts between Anglos and tribal people due the increasing use of this section of the river to move goods to and from western Montana to support the fur trade, bison robes trade, and gold mining.

One well-documented, aboriginal historic site from this period is located south of UL Bend on the opposite side of the river (Park 1998). The site consisted of a bison kill located in a series of coulees. Artifacts observed in the surface included a projectile point (arrowhead), stone butchering tools, a piece of iron, and a potsherd. The site consists of three activity areas where butchering was conducted each having evidence of buried deposits, including evidence of hearths. This site is planned for archaeological testing to demonstrate its eligibility for the National Register.

Native American Tribes

Archaeologists and linguists debate the origin of aboriginal groups in eastern Montana before 1500. In eastern Montana, by the 1600s, it is generally accepted that the River Crow were situated on the Missouri River and the Mountain Crow along the Yellowstone River. The Blackfoot were situated northwest of the River Crow into Canada and the Assiniboine to the northeast of the River Crow into Canada. Before the introduction of trade goods, the Sioux lived in Minnesota. At that time, they were at war with the Chippewa, who had been armed through trade with Anglos, and began moving westward and south. Firearms gave the Chippewa an advantage in warfare, which destabilized the traditional relationships between the groups.

The Sioux left their aboriginal homelands in Minnesota and began to disperse west and south following major river drainages. This process was relatively rapid beginning in Michigan, Iowa, and South Dakota. No doubt, the mobile lifestyle required by bison hunting made the process faster. Early Anglo explorers wrote that they had seen some horses among the Sioux in Minnesota during the first Anglo contact in the 1600s. Many of the eastern Sioux have certain culture traits that are more woodland oriented while the western tribes have aspects of their culture that are similar to other plains groups. In the east, early accounts of the Sioux document at least some level of agriculture or intensive plant exploitation along with hunting as the basis of the economy. As the Sioux moved west onto the plains, their economy was directly linked to bison as their major resource. With this orientation toward hunting bison, shifts in their material culture and mobility patterns were required to stay in close association with the bison herds. For instance, the use of tipis for shelter was necessary for mobility and the use of horses, increased the effectiveness of hunting bison. Access

to guns and other trade items also made bison hunting more effective. To acquire trade goods, the Sioux became involved in the bison robe trade.

The Assiniboine split from the Sioux and began to move north and westward onto the Canadian plains to hunt bison. By the late 17th and early 18th centuries, they were trading with the Hudson's Bay Company in Saskatchewan, Canada allowing them access to guns and trade goods. In the fur trade, the Assiniboine acted as intermediaries between the company and other plains tribes. Eventually the Assiniboine would expand their control from Lake Superior to northeast Montana.

In the late 18th century, increased movement of Anglos in the northern plains caused the first outbreaks of smallpox among the native people (Fandrich and Peterson 2005). By 1781, reports in Saskatchewan Canada relate that 30–60 percent of the native population was lost. Diseases introduced by Anglos would greatly affect tribal politics and warfare because the loss of population numbers forced certain tribes to create partnerships that would allow them to defend themselves against native enemies. Anglo contacts grew more frequent with ongoing movement of riverboats associated with the fur trade and discovery of gold in western Montana. This increased opportunities for diseases to spread through the native populations. With the introduction of the steam-powered riverboats using the Missouri River to ship supplies, diseases were able to move faster across the region. The Gros Ventre, Sioux, and Plains Cree did not experience radical population losses from the outbreak. The companies with which they had been trading vaccinated the Sioux and Cree to prevent population losses. The Mandan and Hidatsa, who lived in dense village populations, were devastated by the outbreak and never played a major role in the region's native political arena. Interruptions in hunting caused by the Sioux, who had moved further up the Missouri to take advantage of the territory that opened up with the movement of the Mandan, Hidatsa, and Arikara, kept these groups from sustaining themselves by hunting bison. This forced the Mandan, Hidatsa, and Arikara to become dependant on the Federal Government for support. The Assiniboine also lost two-thirds of their population and became vulnerable to attacks from the Crow, Blackfoot, Gros Ventre, Hidatsa, and Sioux. They were never again able to regain their previous political power.

In the late 1860s, the Sioux were becoming a major political force in the area. In 1868, 1,000 Sioux of the Cuthead Band of the Yanktonai and two Bands of the Sissetons arrived at Fort Buford. They agreed to make peace with the Federal Government and made an alliance with the Lower Assiniboine. These Sioux were able to sustain themselves in the first year with annuities shared by the Assiniboine. Yellowstone Kelly noted that Medicine Bear of the Sioux moved up the Missouri River displacing the other groups, which opened the eastern mountains up to hunting for the Sioux. Sioux conflicts with the Assiniboine resulted in the recommendation from Indian Agent Sully that the Assiniboine go north to the Milk River Agency and join the Gros Ventre. Some Assiniboine agreed, while others did not, which split the group into the Upper Assiniboine allied with Long Hair and Whirl Wind and the Lower Assiniboine of the Canoe Paddler Band allied with the Yankton, Yanktonai, and Santee Sioux. They resided near the mouth of the Popular River. The San Arcs and Tetons controlled the area west of Big Muddy Creek to the Musselshell River.

During the 1880s, the climate and conditions for native people in northeast Montana was at its worst. The bison were now gone from the area and a series of harsh winters left most tribal populations without adequate food. Government supplies were not sufficient to feed the tribal populations and without bison hunting for supplemental nutrition, starvation ensued. At the Wolf Point subagency, 300 Assiniboine starved as well as tribal members at other locations.

Lewis and Clark Expedition

In 1802, Thomas Jefferson organized the Corps of Discovery after the Louisiana Purchase from the French ended any European claim to the land. At the time, this portion of the western United States was largely undocumented. Jefferson realized the need to survey the area in preparation for settlement and was also in search of a Northwest Passage to the Orient. At that time there was no navigable route that connected Eastern and Western North America, requiring ships to sail around South America and Africa. Ultimately, this goal of the Corps was not realized because the route was difficult to navigate and required several portages making movement of large watercraft unpractical. When the Corps of Discovery returned to Saint Louis they brought with them field maps documenting the locations of waterways and resources they had encountered. The Corps found large numbers of wild furs and wildlife that inhabited the region would later spur the fur trade. Although the Lewis and Clark Expeditions of the region are generally thought of the as the first Anglo visitors to the refuge, they were predated by trappers who traveled the area in the 18th century. Some of these trappers were of French Canadian origin working with the Hudson's Bay Company.

Fur Trade

With the rise of beaver pelt prices, in the 19th century, more whites came to the Upper Missouri to trap. Once the beaver were trapped out of the area

near the refuge, the fur trade shifted to the bison robe trade. Several small forts were established along refuge portion of the river for two reasons: (1) forts allowed the tribes easy access to traders for their furs; and (2) the river boats coming from Saint Louis often could not get further up river from the refuge because the river become shallower upstream. The shallower parts of the river were not navigable by riverboats when the water was low and the shallower sections froze up earlier in the year. Much of the river cargo was destined for Fort Benton near modern day Great Falls. Fort Benton served as a hub of transport for supplies and people because a road network leading to mining and other resource areas in the region connected the town.

By the 1820s, the American Fur Company began to sponsor forts along the river to secure a share of the trade in animal products from native and white trappers. In 1829, the American Fur Company established Fort Union near the mouth of the Yellowstone River creating the first substantial settlement of Anglos in the region (Brumley 2006). Fort Williams and Fort Jackson were established upstream of Fort Union to expand company control of trading. Several other forts were established to compete with the American Fur Company, but most failed due to the fierce competition with American Fur Company or frequent attacks by native people. One reason so many forts, trading posts and riverboat landings were constructed within the refuge was due to the difficulty with getting up river from this point. The stretch of river from Cow Island to Fort Benton was known as "Rocky River" marking the point where elevation increased approximately 2 feet per mile as one went upstream (Davy 1992). From the refuge, riverboats could be unloaded and freight put on wagons to be hauled to Helena, Great Falls, or the Judith Mountains. Typically, the forts did not stay in business very long because conditions of the river and animal populations themselves affected their success. Fort Carroll is an excellent example. In the early 1880s, it was located within 150 miles of the remaining bison herds. It did brisk business with the riverboats in 1874 and 1875 because the river was low, and freight was unloaded at the town to be hauled by wagon to Great Falls (FWS 1996). Afterwards, when the river was elevated, riverboats were able to get up river to Fort Benton without help and the town's prosperity dwindled. By 1881, about 2,130 bison robes were traded at Carroll, down from earlier years of 4,000 robes. Soon after, the bison robe trade ended.

Thirty-one trading posts were built on the Missouri River between the North Dakota boundary to Fort Benton between 1828 and 1885 (Davy 1992). Those located in the refuge boundary are Fort Peck (1867), Fort Pouchette (1870), Fort Musselshell (1869), Kerchival City (1866), Fort Sheridan (1870), Fort Andrews (1862), Carroll (1874), Fort Hawley (1866), Wilders Landing (1875), Rocky Point (1875), Little Belt Mountain City (1875). Forts with a military function were Fort Peck, Rocky Point, Fort Carroll, and Fort Reeve (1867). In addition to forts, there were riverboat landings along the Missouri River, because riverboats could not get up the river to Fort Benton during icy and low water conditions. Cargo had to be unloaded and moved by wagon to the forts up river. Fieldwork in the 1970s demonstrates that remains of these landings as well as sunken riverboats can still be found (Wood 1977).

Throughout the 19th century, the fur trade in eastern Montana was dependent on riverboats to move the goods to the region. Originally, the trade consisted of beaver pelts, but in the 1840s the animals had been over exploited and fur prices dropped, changing the focus of trade to bison robes. Growth of this industry was rapid as 2,600 buffalo robes were sent east annually in the early 1800s, whereas approximately 90,000 or more would be shipped annually from St. Louis by the 1850s. By 1850, the tribes were dependent on trade goods, which they obtained through the buffalo robe trade.

With the discovery of gold in western Montana in the 1860s and the development of the fur trade, steamboat travel was a vital supply line to towns such as Fort Benton and Helena that had few other options for travel because of the lack of well-established roads or railways to supply these towns. Food, supplies, and trade goods required for miners and trappers would be hauled up from St. Louis; goods including furs, bison robes, and gold would be sent downstream to the markets. Steamboat traffic was common on the river from 1859 until 1888 and averaged about 20 boats a year.

Railroads

During the 1880s, railroads were established, linking eastern Montana to large cities and markets for the natural resources that were available for exploitation at the time. With the establishment of the railways, movement of goods was faster, more predictable, and cheaper than riverboat travel along the Missouri. The grasslands left vacant by the removal of bison and the placement of native people on reservations made the area particularly suitable to livestock grazing. With the addition of the railroad to the State's transportation system, the reliable movement of cattle to large markets in the east was ensured. The industry flourished, and high stocking rates were common due to unmanaged grazing on free land. This early success was tainted in the winter of 1886–7 when severe snow and cold froze many cattle that walked with the wind into coulees and fences and became trapped. Some estimates of

losses of cattle in the region are as high as 50–90 percent. Of 220 cattle operations in business before that winter, 120 financially survived.

By 1900, a homestead boom began that would last until 1918. Initial settlement of the region was in river bottoms that were readily cultivated. It was spurred by the cheap transportation by railways, profitable shipment of grain to market and advertisement campaigns by the railroad companies for free land. The Federal Government had given the railways land along tracks to pay them for the construction costs. When an area was settled, the railroads would not only be able to sell the land, but would also create more traffic for freight as the settlers would need to move their products to market. The homestead boom was so intense that Montana had more homestead entries than any other State. The boom continued successfully as high moisture during the period of 1909–16 made dry farming of cereal grains successful. The combination of shipping grain by rail made moving the grain to large eastern markets financially profitable and reliable. Once conditions became dryer, the farming boom ended as farmers began to understand the lack of predictable moisture in the eastern part of the State limited dry land farming. This, in combination with the Great Depression, caused a mass exodus from Montana in which half of Montana farmers lost their farms between 1921 and 1925. This process has continued in to modern times as illustrated by Garfield County, which in 1919 had 30 settlements with post offices. By 1968, five remained (Davy 1992). Creating predictable water for farming in eastern Montana would not be resolved until large-scale Government irrigation brought predictable water to the agricultural fields.

Roosevelt Era

In response to the Great Depression and the drought of the 1930s, President Franklin D. Roosevelt created a series of Government programs to provide jobs and income for impoverished families. Most of these programs were construction projects including dams, roads, and public works. The largest of these projects in Montana was Fort Peck Dam, which is situated on the eastern end of the refuge. The project was authorized by Roosevelt in 1933 and constructed under management of the USACE. This work was completed from 1933 to 1940. The dam originally had two purposes: providing jobs to Montanans who were jobless and creating flood control for the Missouri River. In 1938, the dam was altered to generate electricity in preparation for the United States involvement in the Second World War. It is the largest earth-filled dam in the world. Inside the clay core of the structure are 17,000 tons of steel sheet pilings that span the river. The project was so large that several towns were established to house workers. Some of the names of the towns include New Deal, Square Deal, and Roosevelt Heights showing their direct relationship with the project. During the construction period in the mid-1930s, the city of Fort Peck unofficially had a population of 30,000. Fort Peck is distinguished as being the first planned community, other than military post and religious communities, in the United States (Davy 1992). It was designed by USACE in 1933. At its peak, the project employed 10,546 people.

Homesteads and Ranching

Ranching in Montana began as small operations providing beef to miners primarily in the western part of the State to support the mining operations. In

Brett Billings/USFWS

A number of old homesteads dot the landscape.

1866, the first cattle drive from Texas took place and started the first open-range ranching in the grasslands that were vacant after the destruction of the bison herds. (Malone et al. 1976).

By the late 1870s, the large cattle raising operations west of the continental divide were searching for additional range lands. By the mid-1870s, ranchers had brought medium-sized herds into central Montana. The rapid expansion of the cattle industry on the northern Great Plains ended suddenly in the late 1880s south of the Missouri River and in 1906–7 north of the river. Ranchers failed to take action to ensure the range was not overstocked and during the brutal winter of 1886–7 and again in 1906–7, approximately 50–75 percent of stock in central and eastern Montana was lost. The winter of 1886–7 ended open-range ranching south of the Missouri River and started the ranch cattle operation. Open-rangeland ranching continued north of the river until the winter of 1906–7 when again another severe winter killed thousands of stock.

The Homestead Act had little effect in central Montana until 1909 when the Enlarged Homestead Act was passed. This act allowed a person to receive 320 acres instead of the original 160 and one-eighth of the land had to be cultivated continuously. The countryside became dotted with homestead shacks, and trails became roads as more and more traveled their course. "The homestead rush began slowly, but in less than 20 years an immense grassland in Central and Eastern Montana, over 500 miles long and 300 miles wide, was over-run, divided up into 320-acre tracts, plowed up and was producing some of the lushest crops ever seen." These homesteaders were mostly farmers, whereas those that preceded them were cattle and sheep men (Willmore 1990).

The beginning of the end of the boom years was 1919. It was the driest year ever recorded in central Montana, and there were no crops. More dry years followed until the Great Depression of the 1930s. Wheat harvests averaged only 2.4 bushels on land that had previously averaged 50 bushels and prices tumbled. Hordes of grasshoppers and cutworms, intense heat, and winds all added to the homesteader's misery. Families were starving and the exodus from the area accelerated. Over half of the farmers lost their land through bankruptcy and abandonment or sold to the Government under the Bankhead-Jones Farm Tenancy Act of 1937. The ranches that survived these times had diversified their operations to include a combination of stock and crops. Many of the area's farmers and ranchers of today are the children, grandchildren, and even great grandchildren of the men and women who made it through the difficult, sometimes impossible, days (Willmore 1990).

Historic Artists

Artists beginning in the early 19th century have portrayed the refuge. In 1833, Prince Maxmillian from Germany visited the refuge documenting its natural wonders. Maxmillian brought with professionally trained Swiss artist Karl Bodmer who painted the first scenes from the area by a classically trained artist. As an scientist, Maxmillian's observation along with Bodmer's illustrations provide a valuable source of scientific information about the natural features and native people inhabiting the area at that time. Maxmillian's expedition was from Fort Union to Fort McKenzie, which is just downstream of Fort Benton.

Charles M. Russell, the namesake of the refuge, was an artist and cowboy who lived in the area starting in 1864 at the age of 16. His primary artistic subjects were the cowboys of eastern Montana. Russell worked as a cowboy for 11 years beginning in 1882. These experiences left him with scenes of cowboy life from the late 19th century from which to draw on as an artist. Russell disagreed with the practice of dry land farming in the eastern Montana prairie, because he realized that the crops would fail in dry periods causing soil destruction. Known for his early conservation ethic, Russell was given the honor of having the refuge named after him.

KNOWN CULTURAL RESOURCES

The refuge has 363 known archaeological sites. Approximately 275 of the known archaeological sites are either National Register-eligible or have not been evaluated and therefore have to be treated as eligible. Very few of the archaeological sites on the refuge have been visited by a professional archaeologist. Many of the aboriginal sites that have been reported by refuge staff are stone circles or what are commonly called tipi rings or are historic farmsteads. Most of the known archaeological sites have been reported to the Montana State Historic Preservation Office; however, the information recorded was not done by current professional standards, making management of the resource difficult. Overall, less than 1 percent of refuge lands have been formally surveyed for archaeological sites.

REFUGE RESOURCES IMPORTANT to TRIBES

In 2005, the USACE completed a study of the traditional cultural properties near the refuge. During this study, the Assiniboine, Blackfoot, Chippewa-Cree, Crow, and Sioux tribes were interviewed about traditional use of the area. Many of the 16 traditional cultural properties are found on refuge land and include burial locations, plant-gathering areas,

and ceremonial locations. Some areas were inundated by Fort Peck Lake.

Modern tribes still collect and use plants or other resources for ceremonial and traditional purposes. Consultation with the Fort Peck and Fort Belknap tribal council in 2009 revealed that collecting sweat rocks, willows, and other materials are very important cultural traditions. Tribes that are interested in collecting small quantities of plants or other natural resources need to contact the refuge manager and obtain a special use permit prior to collecting materials for ceremonial purposes. Although bison are not managed as a species on the refuge, many tribes still consider them as central to their culture. Other wildlife species currently found on the refuge that are important include elk, deer, and other species; however, the State of Montana regulates the harvest of huntable populations of wildlife through State licensing. Many tribes also use eagle feathers and parts today for ceremonial purposes. The Service provides eagles to tribal members through the National Eagle Repository located in Colorado. Tribes reported having a deep spiritual connection to the refuge, and many of the scenic areas are considered focal spiritual areas, although information about any specific site on the refuge is not known.

4.7 Paleontological Resources

The refuge offers various exposures of geologic and paleontological interest, and the refuge has 465 known paleontological sites. Several of these sites have been designated as "national natural landmarks" for paleontological resources (refer to section 4.4, Special Management Areas).

The western part of the refuge is short-grass prairie with sparse pine forest in the uplands and cottonwoods in the dissected drainages and floodplain areas. On the eastern side of the refuge, the vegetation is short-grass prairie with juniper in deeply eroded drainages. Areas of the eastern part of the refuge have scant vegetation and are commonly known as badlands. In general, the central part of the refuge contains earlier fossils of Pleistocene mammals, while the downcutting of the river on the eastern portion of the refuge has exposed the Hell Creek Formation (Cretaceous Era), which is tens of millions years earlier. The Hell Creek Formation is known for its dinosaur fossils. In certain areas, exposures of marine fossils are observable.

Of the paleontological deposits on the refuge, the dinosaur fossils have become famous and have been displayed in museums around the world. Although the refuge has been visited by paleontologists since the late 19th century, the first scientifically documented *Tyrannosaurus rex* fossil was excavated near Jordan, Montana, in 1902 (Graetz and Graetz 2003). Among the most recognizable dinosaur fossil finds to come from the refuge are *T. rex*, *Triceratops*, *Albertosaurus*, *Mosasaurus*, and duck-billed dinosaurs. The quality of the fossils is such that recently one of the most complete (*T. rex*) fossils excavated was found at the refuge and a group of several associated *T. rex* fossils were identified on the refuge. Many of these fossils can be seen at the Museum of the Rockies in Bozeman. The interpretive center at Fort Peck Field Station has many complete dinosaurs on exhibit.

In 2009, the Paleontological Resources Protection Act became law and requires the protection of these resources using scientific principles and expertise. Agencies are to develop plans for inventory, monitoring, and scientific and educational use of these resources in accordance with agency policies. Casual collecting or recreational digging is not allowed on the refuge. Special use permits are issued to institutions such as the Museum of the Rockies. Many of the paleontological sites known to refuge staff have not been formally reported to the Montana State Historical Preservation Office because the refuge has a problem with paleontological looters and wants to keep this knowledge as safe as possible to prevent attracting more looters. The refuge's law enforcement personnel regularly write citations for looting and try to monitor as many of these resources as possible.

4.8 Socioeconomics

Information on the socioeconomic conditions were obtained with the assistance of the USGS through the Policy and Science Assistance Branch of the Biological Resources Division, in Fort Collins, Colorado.

For CCP planning, an economic analysis provides a means of estimating how current management (no-action alternative) and proposed management activities (alternatives) affect the local economy. This type of analysis provides two critical pieces of information: (1) a refuge's contribution to the local community; and (2) an analysis that can help in determining whether economic effects are or are not a real concern in choosing among management alternatives.

The report for the refuge provides a description of the local community and economy near the refuge. Next, the methods used to conduct a regional economic impact analysis are described. An analysis of the final CCP management strategies that could affect interested groups, residents, the public, and the local economy is then presented. The refuge management activities of economic concern in this analysis are:

- Refuge purchases of goods and services within the local community
- Refuge personnel salary spending
- Grazing operations
- Spending in the local community by refuge visitors
- Revenues generated from refuge revenue sharing

REGIONAL ECONOMIC SETTING

For the purposes of an economic impact analysis, a region (and its economy) is typically defined as all counties within a 30-60 mile radius of the impact area. Only spending that takes place within this regional area is included as stimulating changes in economic activity. The size of the region influences both the amount of spending captured and the multiplier effects. The six-county area is large (15.3 million acres) and remote with much of the regional economic activity confined within the six-county area. The 1.1 million-acre refuge boundary accounts for 1 percent of total land and water within the six-county area including: 11.6 percent of Garfield County; 8.7 percent of Phillips County; 6.6 percent of Valley County; 5.3 percent of Petroleum County; 5.1 percent of McCone County; and 2 percent of Fergus County. Based on the relative self-containment in terms of retail trade, the surrounding six counties comprise the local economic region for this analysis.

During the last century, ranching, farming, mining, natural gas development, and the railroad have all been important factors in the social and economic history of the area. More recently, outdoor recreation and tourism have been increasingly important contributors to the local economies. The next sections describe the socioeconomic characteristics and trends in the six-county area.

POPULATION and DEMOGRAPHICS

This section describes the characteristics of the population for Montana and the six counties surrounding the refuge. This includes population projections, employment, income, and refuge activities that affect the local economy.

Population and Density

Table 17 summarizes the population estimates and trends for Montana and the six counties surrounding the refuge. In 2008, there were 25,278 residents in the local six-county area, comprising approximately 2.6 percent of the State's population while covering 16 percent of the State's land area. In 2008, Fergus County had the largest population in the six-county area with 11,195 residents, while Petroleum County had the least populated county with 436 residents. While Montana's population grew by more than 7 percent from 2000 to 2008, all six counties experienced a declining population during that time ranging from a 5.9-percent decline in Fergus County to a 15.2-percent decline in McCone County.

As shown in table 17, all six counties have substantially lower densities (0.3–2.6 persons per square mile) compared to that of Montana (6.6 persons per square mile). Nearly half of the residents in Fergus County live in the city of Lewistown, creating a local density of 3,055 persons per square mile. Similarly, over 40 percent of Valley County's residents reside in the city of Glasgow, resulting in a local population density of 2,075 persons per square mile. The higher local densities in these major communities indicate that rural areas outside of these communities are more sparsely populated than the county densities shown in table 17.

Communities near the Refuge. Lewistown, the county seat of Fergus County, is the largest city in the six-county area, with a total of 5,954 residents in 2008 (U.S. Census Bureau 2008). Located in the geographic center of Montana, Lewistown has historically been an important regional trade center for the surrounding farms and ranches (Destination Lewistown 2009). Recently, there has been a great deal of growth and diversification in the local economy including recreation, tourism, and a wide variety of businesses in the small manufacturing and service sector (Destination Lewistown 2009).

Established as a railroad town in the 1880s, Glasgow, the county seat of Valley County, is the second largest city (2,921 residents in 2008) near the refuge. The construction of Fort Peck Dam (approximately 18 miles southeast of Glasgow) and the establishment and subsequent closure of Glasgow Air Force Base have been important historical events for the Glasgow economy.

Other communities near the refuge include the agricultural community of Malta (1,801 residents in 2008 and the Phillips County seat), which is also a notable stop on the Montana Dinosaur Trail. The terrain between the towns of Jordan (336 residents and the Garfield County seat) and Circle (542 residents and the McCone County seat) offers numerous recreational opportunities and is known well known among paleontologists for its fossil beds (Travel Montana 2009). The agricultural town of Winnett (163 residents in 2008 and the Petroleum County seat) was formerly an oil-boom town with more than 2,000 residents in the 1920s (Travel Montana 2009).

Population Projections. As shown in table 17, Montana's population is projected to increase by 34 percent from 2000 to 2030. Based on recent trends, most of the increase in statewide population can be expected to come from the in-migration of new residents who are aged 30-49 and have children or who are older than 50 and retired, and those who are attracted to the wilderness and mountains (Kemmimck 2002,

Young and Martin 2003). However, most of the increase in population is expected to occur in western Montana. In contrast, the six-county area surrounding the refuge is expected to continue to lose population in the next 20 years. Much of the loss in eastern Montana is expected to come from the emigration of people aged 20–29 leaving the region for better opportunities (Young and Martin 2003). By 2030, the counties of McCone, Petroleum, Phillips, and Valley are expected to lose more than 20 percent of their populations compared to 2000 (table 17). Garfield County is expected to lose 15 percent by 2030. Fergus County is expected to lose 4 percent by 2010 but is expected to regain some of its population, for an overall loss of approximately 2 percent by 2030. Overall, the six-county area surrounding the refuge is expected to lose approximately 13 percent between 2000 and 2030, with most of the loss occurring by 2020 (NPA Data Services 2007).

Age and Racial Composition. The six-county area surrounding the refuge has an aging population beyond that of the State of Montana as a whole. Whereas the median age of Montana in 2007 was 37.5 years, the six adjacent counties had a median age ranging from 40.8 years to 42.4 years (U.S. Census 2009). In addition, the six-county area had substantially higher proportions of residents between the ages of 65 and 84 (14.9–17.7 percent) compared with the entire State (11.7 percent) and substantially lower proportions of residents between the ages of 25 and 40 (26.8–28.0 percent) compared with the State (33.7 percent). The aging trend in the six-county area is likely driven by the trend of the young generation (particularly between the ages of 20 and 29) emigrating out of eastern Montana (Young and Martin 2003) in addition to the aging baby-boomer generation. The impact of retirement-age people on a community can be complex, but can include bringing in other sources of income and the desire for different types of recreation or amenities. For example, as the older recreation user groups increase, more hunters may request increased vehicle access to retrieve game and may rely on off-highway vehicles or motorboats as means to access otherwise remote hunting areas.

In 2000, the proportion of white persons not of Hispanic or Latino origin in Phillips County (89.4 percent) and Valley County (88.1 percent) was close to than the State average (90.6 percent) while the averages in Fergus County (97.1 percent), Garfield County (99.1 percent), McCone County (97 percent), and Petroleum County (99.2 percent) were greater than the State (U.S. Census Bureau 2008). The percentage of residents identifying themselves as American Indian or Native Alaskan was 6.2 percent for the State while the Phillips and Valley Counties were higher than the State average, 7.6 percent and 9.4 percent respectively, due to the presence of Indian reservations (U.S. Census Bureau 2008). The percentage of residents identifying themselves as American Indian or Native Alaskan was significantly lower than the State average for the remaining counties, ranging from 0.2 percent for Petroleum County to 1.2 percent for Fergus County.

EMPLOYMENT and INCOME

The following narrative contains information about employment trends, types of employment, current employment, and related income for Montana and the six-county area of the refuge.

Employment Trends

Employment trends in the six-county area from 1975 to 2006 are shown in figure 37 (U.S. Department of Commerce 2008). During the 30-year period, the State as a whole experienced a substantial increase in total employment. Fergus County was the only county that followed the State trend with a steady increase in employment since the early 1980s. Petroleum, McCone, and Valley Counties experienced loss in total employment until around 1990 and have been experiencing a steady recovery since. Phillips County experienced an increase in employment between 1975 and 1990, but its current total employment has been declining since the 1990 peak level. Garfield County's employment has remained relatively stable compared to the other counties in the region.

Based on the long-term trend data for employment by industry (U.S. Department of Commerce 2008), several trends explain the total employment fluctuations seen in figure 37. Decline in total employment observed in most counties before 1990 is largely attributed to the decline in farm employment as well as some rapid declines in the manufacturing industry (Valley County). Phillips County's boom and bust in employment was largely attributed to the rise and fall of the mining industry, creating a sudden decline in employment in mining as well as associated services after the gold mine closures in the 1990s. Fergus County also experienced a short boom and bust in the mining industry around 1990, but the loss of employment from the mining industry did not negatively affect total employment in the county due to the presence of other stronger industries (such as retail trade, services, and construction) that experienced growth during the same time period. The employment trend data suggest that counties with higher dependency on farming, (Garfield, McCone, and Petroleum Counties) may be more likely than others to be impacted by refuge management that influence surrounding counties' farming practices.

Overall, employment in all counties in the area except Phillips County has been steadily increas-

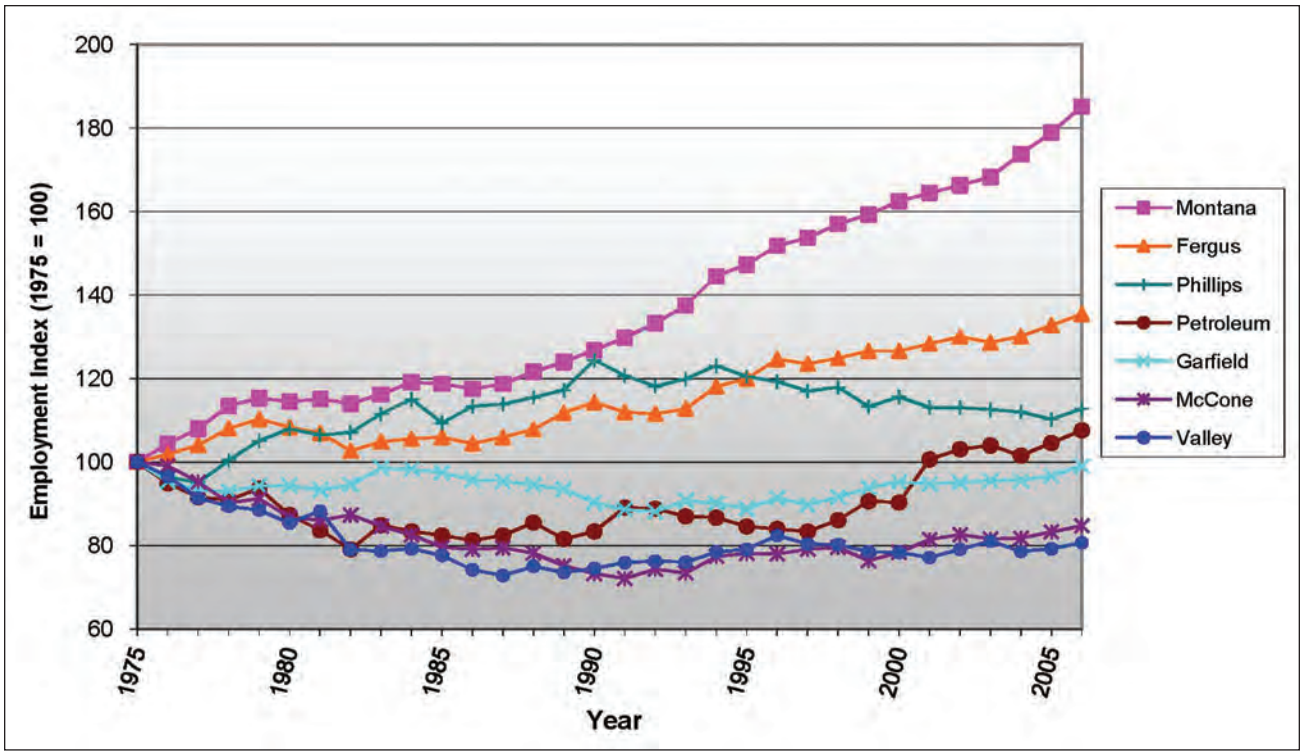


Figure 37. Graph of the total employment index for Montana and counties surrounding the Charles M. Russell and UL Bend refuges (1975–2006). Source: U.S. Department of Commerce, CA25 (2008).

Note: Total employment includes all jobs filled within each area. Full-time and part-time jobs are counted at equal weight, and those holding two or more jobs are counted multiple times. The trend data for each of the counties and Montana are presented as an index, and are standardized with 1975 as the base year.

ing since the mid-1990s. This increase is not easily explained by the area's population trend (table 17) or the trend in employed labor force (number of persons 16 years and older who are employed) (Montana Department of Labor and Industry 2009), because both population and labor force has mostly declined in the six-county area during the same period. It is likely that the recent increase in employment in the six-county area is explained by an increase in people with multiple jobs. The increase in people with more than one job is likely attributed to small farmers and ranchers who require supplemental income, as many are unable to make enough profit from their crops or livestock (Gruenert 1999).

Table 17. Population estimates for the Nation and the counties surrounding the Charles M. Russell and UL Bend refuges.

Area	*2008 Population†*	*Percent Change from 2000†*	*Persons per Square Mile†*	*Expected Population Percent Growth (2000–30)‡*
United States	304,059,724	8.0	80.1	—
Montana	967,440	7.2	6.6	34.2
Fergus County	11,195	–5.9	2.6	–1.6
Garfield County	1,184	–7.4	0.2	–14.8
McCone County	1,676	–15.2	0.6	–23.6
Petroleum County	436	–11.6	0.3	–20.9
Phillips County	3,904	–15.1	0.7	–21.5
Valley County	6,892	–10.2	1.4	–23.0
Six-county Area	25,287	–9.4	1.1	–13.3

†Source: U.S. Census Bureau, 2008 Population Estimates, GCT–T1 and DP–1.
‡Source: NPA Data Services, Inc. (2007); U.S. Census Bureau (2008).

Table 18 shows the percentage of total employment in Montana and the six-county area for 2005 and the percent change from 1995 to 2005. Employment is broken into two categories: (1) by wage and salary employment (people who work for someone else); and (2) proprietors (self-employed–includes sole proprietorships, partnerships, and tax-exempt cooperatives). In 2005, all six counties surrounding the refuge had substantially higher proportions of proprietors (39.0–65.5 percent) compared to the State as a whole—27.1 percent (refer to table 18). Approximately half of all proprietors in the six-county area are farm proprietors (those who are self-employed and operate a farm, producing or expected to produce at least $1,000 worth of crops and livestock in a typical year), whereas that of the entire State is substantially lower.

As shown in figure 37, five out of six counties surrounding the refuge have been experiencing increases in total employment since the mid-1990s. During that time, Montana also had an increase in total employment, with the majority of the increase coming from wage and salary employment (refer to table 18). However, in the six-county area, wage and salary employment has declined in many of the counties and much of the loss has been compensated by the increases in proprietor employment, particularly in the nonfarm sector. These data indicate that, unlike the State as a whole, the six-county area is becoming more dependent on self-employment as wage and salary employment decline. In addition, while farm proprietorships have not shown substantial growth and have decreased in some cases, they are still significant components of the economic structure in the six-county area.

Current Employment and Income

Table 19 summarizes industry output, employment, and labor income (employee compensation plus proprietor income) for the six-county area. Industry output, as used here, is the value of an industry's total production expressed as a single dollar figure. The data presented in this section were compiled by the Minnesota IMPLAN (impact analysis for planning) Group from a number of sources, including Census Bureau economic censuses, Bureau of Economic Analysis output, and employment projections developed by the Bureau of Labor Statistics (Minnesota IMPLAN Group 2007).

Consistent with the information presented in the previous section, the six-county area has substantially higher farm and ranch employment (proprietors and salary and wage employment combined) than the State as a whole, indicating that farming is an important sector in the area in terms of employment numbers. Aside from farming and governmental employment, retail trade and the service sectors also have high employment across all six counties.

During the past 30 years, Montana and the six-county area experienced a steady increase in total personal income (U.S. Department of Commerce 2008). This increase was attributed to a steady increase in both labor and nonlabor-source incomes, but non-labor-source incomes (transfer payments and dividends/interests/rent) increased at a greater rate than that of labor source income despite decreasing populations in the area (U.S. Department of Commerce 2008). Such a trend suggests that there are greater proportions of individuals receiving transfer payments in the form of Social Security, Medicare,

Table 18. Employment by type for Montana and the counties surrounding the Charles M. Russell and UL Bend refuges.

Location	*Total Employment*		*% Wage and Salary*		*% Proprietors*		*% Nonfarm*		*% Farm*	
	2005	% change 1995–2005	2005	% change 1995–2005	2005	% change 1995–2005	2005	% change 1995–2005	2005	% change 1995–2005
Montana	615,864	22.0	73	19	27	29	23	34	4	8
Fergus County	7,654	11.0	61	6	39	19	27	27	12	6
Garfield County	872	9.0	48	–1	52	20	25	44	27	4
McCone County	1,283	7.0	51	–1	49	15	19	30	30	8
Petroleum County	345	24.0	35	–3	66	45	36	151	30	–4
Phillips County	2,645	–9.0	58	–16	42	4	23	4	19	5
Valley County	4,706	0.1	65	–2	35	4	20	2	15	6

Source: U.S. Department of Commerce, CA30 (2008).

Table 19. Employment by industry for the counties surrounding the Charles M. Russell and UL Bend refuges.

Industry	*Industry Output ($millions)*	*Employment (number of full- and part-time jobs)*	*Labor Income ($millions)*
Agriculture, forestry, fishing, and hunting	368.9	4,093	22.6
Mining	40.5	74	8.3
Construction	147.4	1,206	44.7
Manufacturing	184.2	618	22.8
Transportation and public utility	214.4	578	41.9
Wholesale trade	62.2	586	22.3
Retail trade	78.6	1,402	33.5
Finance, insurance, and real estate	237.3	1,129	32.1
Professional, scientific, and technical services	33.3	447	17.1
Health and social services	112.3	1,688	54.4
Arts, entertainment, and recreation	12.2	413	3.6
Accommodation and food services	45.6	1,026	12.6
Other services	119.0	1,887	29.2
Government (Federal, State, local, and military)	158.3	2,799	121.2
Total	1,814.2	17,945	466.4

Source: Minnesota IMPLAN Group 2007.

Note: County level data are available for employment but are not shown because the new North American Industrial Classification System introduced in 2001 prevents disclosure of employment numbers for many industries in small communities.

and Medicaid in these counties, further supporting the aging trend of the area.

Median household income, earnings per job, and unemployment data for the region, State, and Nation are displayed in table 20. Median household income and earnings per job are below the national average. The unemployment rate is the percentage of the labor force that is not working, but is actively seeking work. In general, the six counties' unemployment rate is similar to or less than the State average (U.S. Department of Labor 2008). Unemployment rates in all six counties along with Montana have followed a declining trend since 2000. In 2008, unemployment rates were lower for Montana and the six-county area than the national average. McCone and Garfield Counties have the lowest unemployment rates in the region despite having lower average earnings per job than all but one of the other counties in the region. The lower median income, earnings, and unemployment in the six-county area compared to the State average aligns with the aging population (less people actively seeking work) and the growing number of people with more than one job to supplement their income.

KEY REFUGE ACTIVITIES that AFFECT the LOCAL ECONOMY

The ability of the refuge to influence local economic activity and desired economic conditions is related to the Service's land use decisions and associated land uses. Livestock grazing, tourism, and recreation are the prominent resource-based industries with ties to the refuge, and are described in more detail in the next section.

Livestock Grazing

Farming and ranching are important cultural forces in Eastern Montana, including the areas surrounding the refuge. As was shown in table 19, farming is the largest employer in each of the six counties surrounding the refuge. From 2001 to 2007, agricultural employment in the six-county area has remained fairly stable, averaging 3,408 jobs, with a high of 3,487 in 2002 and a low of 3,373 in 2007 (Bureau of Economic Analysis 2008). In 2007, Fergus County comprised the highest percentage of agricultural jobs of the six counties surrounding the refuge with 1,075 jobs, or 32 percent of total farm employment. As shown in figure 38, Valley County had the second highest farm employment with 826 jobs, or 25 percent of the total for the area. Phillips County consisted of 613 jobs (18 percent), McCone County had 444 jobs (13 percent), and Garfield County had 298 jobs (9 percent). Petroleum County had the fewest farm jobs with only 117, or 3 percent of total agricultural employment of the six-county total.

More United States farmers now hold off-farm jobs in addition to their farm operation, and off-farm income now comprises a larger proportion of the total household income of United States' farmers

Table 20. Income, earnings, and unemployment for the Nation, Montana, and counties surrounding the Charles M. Russell and UL Bend refuges.

Area	*Median Household Income ($)†*	*Average Earnings per Job ($)*	*Unemployment Rate‡*
United States	50,740	48,900	5.8
Montana	43,000	34,433	4.5
Fergus County	37,259	28,417	4.2
Garfield County	32,694	21,053	3.3
McCone County	38,535	21,135	2.6
Petroleum County	28,254	17,851	5.3
Phillips County	33,798	22,685	4.5
Valley County	37,019	27,091	3.8
Six-county Average	34,593	23,039	4.0

†*Source: State and County QuickFacts 2007.*
‡*Source: USA Counties 2008.*

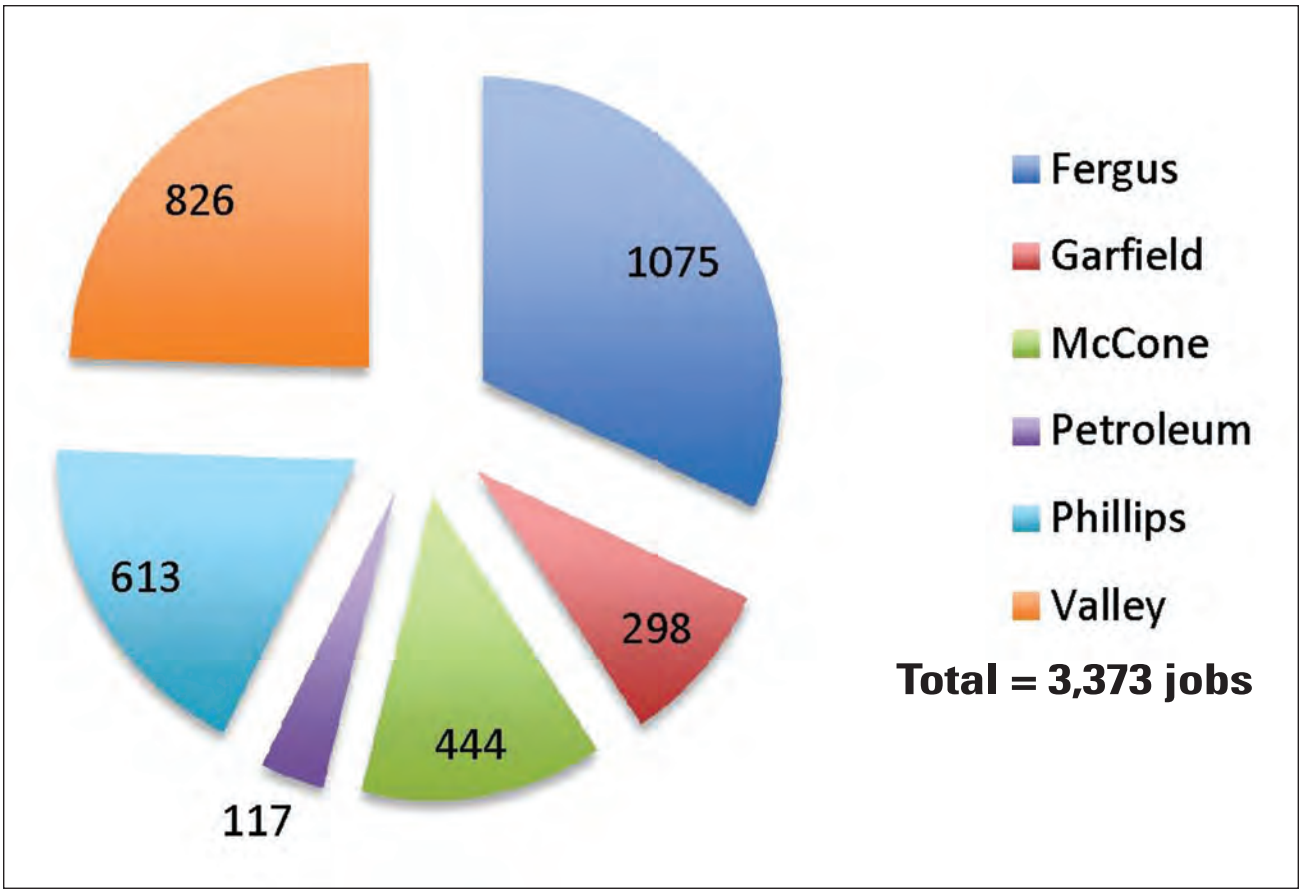


Figure 38. Chart of agriculture employment in the six counties surrounding the Charles M. Russell and UL Bend refuges. Source: Bureau of Economic Analysis (2008).

(Fernandez-Cornejo 2007; Gruenert 1999). This trend is apparent in Montana and in the six-county area. Although the proportion of farm operators primarily employed in farming is higher in the region compared to the State, this proportion has decreased in recent years (refer to table 21). Garfield County has the highest proportion of farmers whose primary occupation is farming, while Valley County had the lowest.

From 2001 to 2007, agricultural earnings in the six counties surrounding the refuge were stable, with an average of $17.1 million dollars per year (Bureau of Economic Analysis 2008). The highest value (just

Table 21. Farm operators whose primary employment is farming in Montana and the counties surrounding the Charles M. Russell and UL Bend refuges.

Year	*Montana*	*Fergus County*	*Garfield County*	*McCone County*	*Petroleum County*	*Phillips County*	*Valley County*
2007	51%	60%	77%	69%	72%	65%	58%
2002	64%	69%	84%	70%	73%	72%	73%

Source: USDA 2007 Agricultural Census, table 46.

over $18 million) occurred in 2002, and the lowest (just under $16 million) occurred in 2003. In 2007, agricultural earnings totaled just under $18 million, with the largest earnings in Fergus County of $4.5 million, or 25 percent of total earnings in the six-county area. Phillips County had the second largest earnings in 2007 with $4.2 million, or 24 percent of the total. Valley County comprised $3.5 million (20 percent), McCone County $2.6 million (14 percent), and Garfield County $2.3 million (13 percent). Petroleum County had the lowest agricultural earnings with only $812 thousand, or 4 percent of the total agricultural earnings in the six-county area in 2007.

Agricultural Revenues from Livestock. Gross revenues from livestock have averaged about 46 percent of total gross revenue from agricultural operations over the past 40 years (see figure 39). The lowest percentage (37 percent) of livestock revenue occurred in 1996, while the highest (62 percent) occurred back in 1971. Gross revenues from crops averaged 35 percent over this time span, with a low of 24 percent in 1971, and a high of 60 percent in 1974. Other agricultural income averaged 19 percent, with a low of 3 percent in 1974 and a high of 32 percent in 1986. Other sources of revenue for agricultural operations include Government payments, value of home consumption, machine hire/custom work, rental income, and income from forest products.

In 2007, gross revenue for agricultural operations in the six counties surrounding the refuge totaled $364.7 million (Bureau of Economic Analysis 2008). This total consists of $164 million (45 percent) from livestock, $133 million (36.5 percent) from crops, and $67.7 million (18.5 percent) from other sources. Fergus County had the largest gross revenues from agriculture ($107.5 million), followed by Valley County ($81.2 million), Phillips County ($64.6 million), McCone County ($56.1 million), and Garfield County ($53.1 million). Petroleum County had the lowest total gross revenue from agricultural operations with $14.5 million, or 3.8 percent of the six-county total.

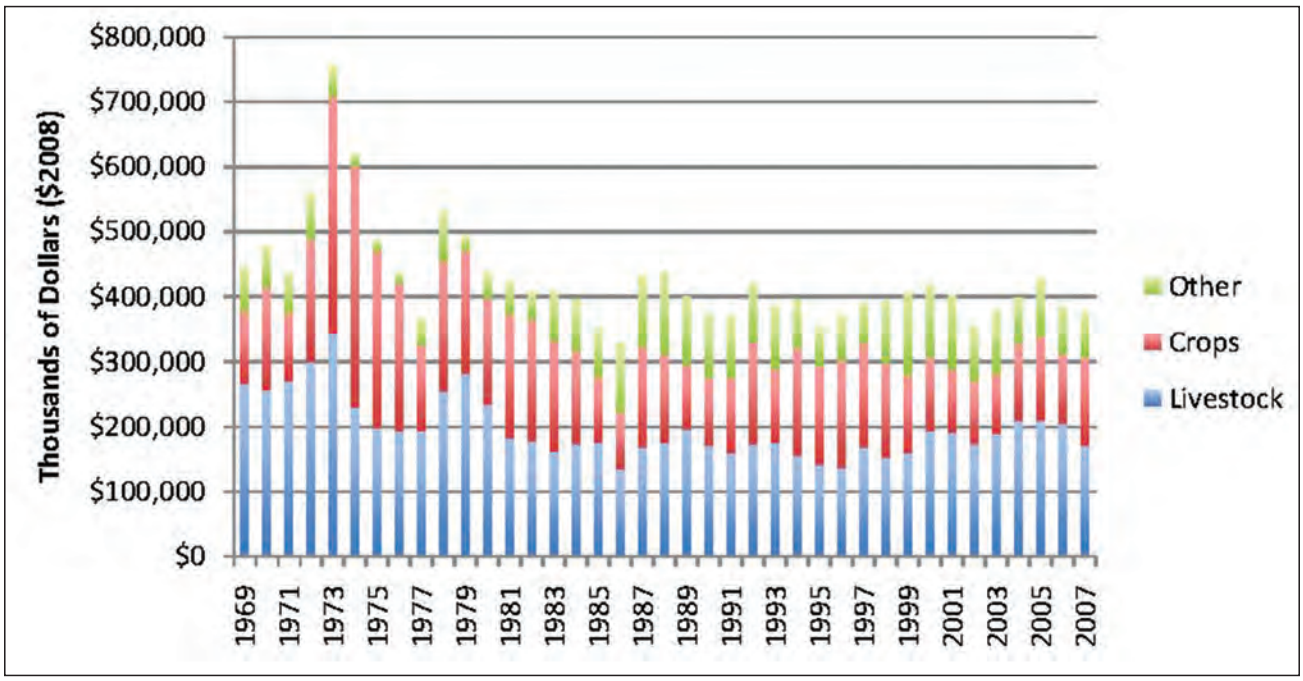


Figure 39. Chart of trends in gross revenues from agriculture in the area surrounding the Charles M. Russell and UL Bend refuges (1969–2007)**.** Source: Bureau of Economic Analysis (2008); other sources of revenue for agricultural operations include Government payments, value of home consumption, machine hire/custom work, rental income, and income from forest products.

As shown in figure 40, livestock ranged from a low of 23 percent of total gross revenue from agricultural operations in McCone County to a high of 67 percent in Petroleum County. Valley (35 percent) and Fergus (48 percent) were the only two other counties that had less than 50 percent of total gross revenue from agricultural operations from livestock. In Phillips County, livestock accounted for 53 percent of total gross revenue from agricultural operations, while in Garfield County it account for 61 percent.

Cattle Inventories. Between 1950 and 2009, cattle inventory for the six counties surrounding the refuge has averaged 378,988 head. During this time, the cattle inventory has ranged from a low of 244,100 in 1950 to a high of 513,400 in 1975 (figure 41). As shown in figure 41, the name change to Charles M. Russell National Wildlife Refuge was initiated in 1976 when there were 474,700 head of cattle in the six-county area. When the 1986 EIS for the refuge was completed in 1986, cattle numbers in this area were 338,000 head. When the 1986 EIS was implemented in 1991, cattle numbers were 329,400 head. In 2008, there were 382,400 head of cattle in the six-county area, while the refuge supplied 18,872 AUMs. This number has steadily declined from 22,470 AUMs supplied in 2001 to 17,883 AUMs in 2007, with a slight increase to 18,872 AUMs in 2008 (+5.5 percent over 2007 levels, yet –16 percent from 2001 levels). However, over this same period, the number of cattle in the six-county area has increased from 361,400 in 2001 to 382,400 in 2008 (+2.8 percent over 2001 levels).

AUM Inventory by County. In 2008, Fergus County had the highest inventory of cattle and calves, while Garfield County had the highest inventory of sheep and lambs (table 22).

As shown in table 23, of the Federal agencies supplying AUMs in the six-county region, the BLM supplied the largest proportion (21 percent) in 2008, followed by the DNRC with 7 percent and the Service with just less than 1 percent. Non-Federal grazing permits or owned/leased land supplied the remaining 72 percent of AUMs in the region.

As shown in table 23 and figure 42, nongovernment lands supplied the most AUMs (ranging from 55 percent for Valley County to 87 percent in Fergus County) while FWS supplied the least amount (ranging from 0.1 percent for Fergus County to 1.5 percent for Garfield County). Although Valley County had the largest number of AUMs supplied by a Government agency (143,975 BLM AUMs), Petroleum County

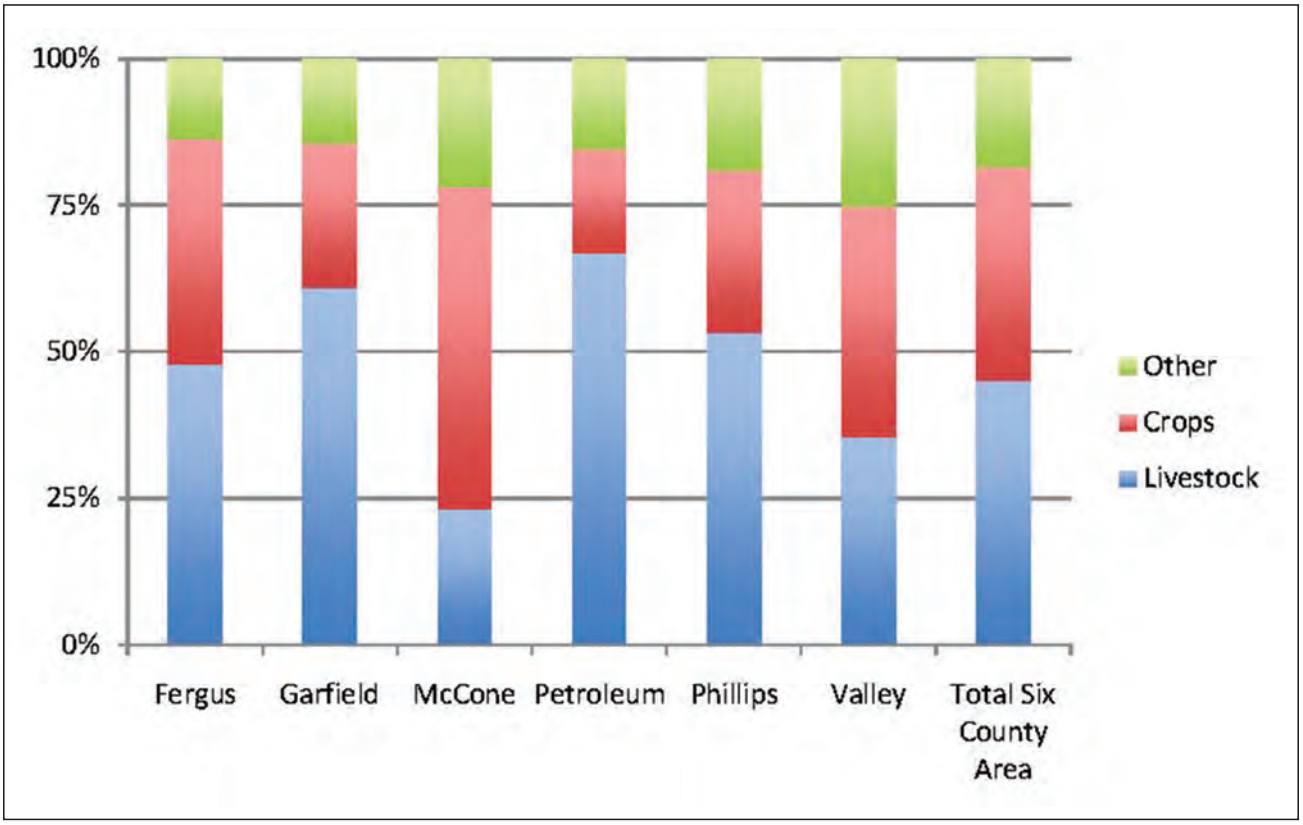


Figure 40. Chart of the breakdown of gross revenues from agriculture for the six counties surrounding the Charles M. Russell and UL Bend refuges (2007)**.** Source: Bureau of Economic Analysis (2008). Other sources of revenue for agricultural operations include Government payments, value of home consumption, machine hire/custom work, rental income, and income from forest products.

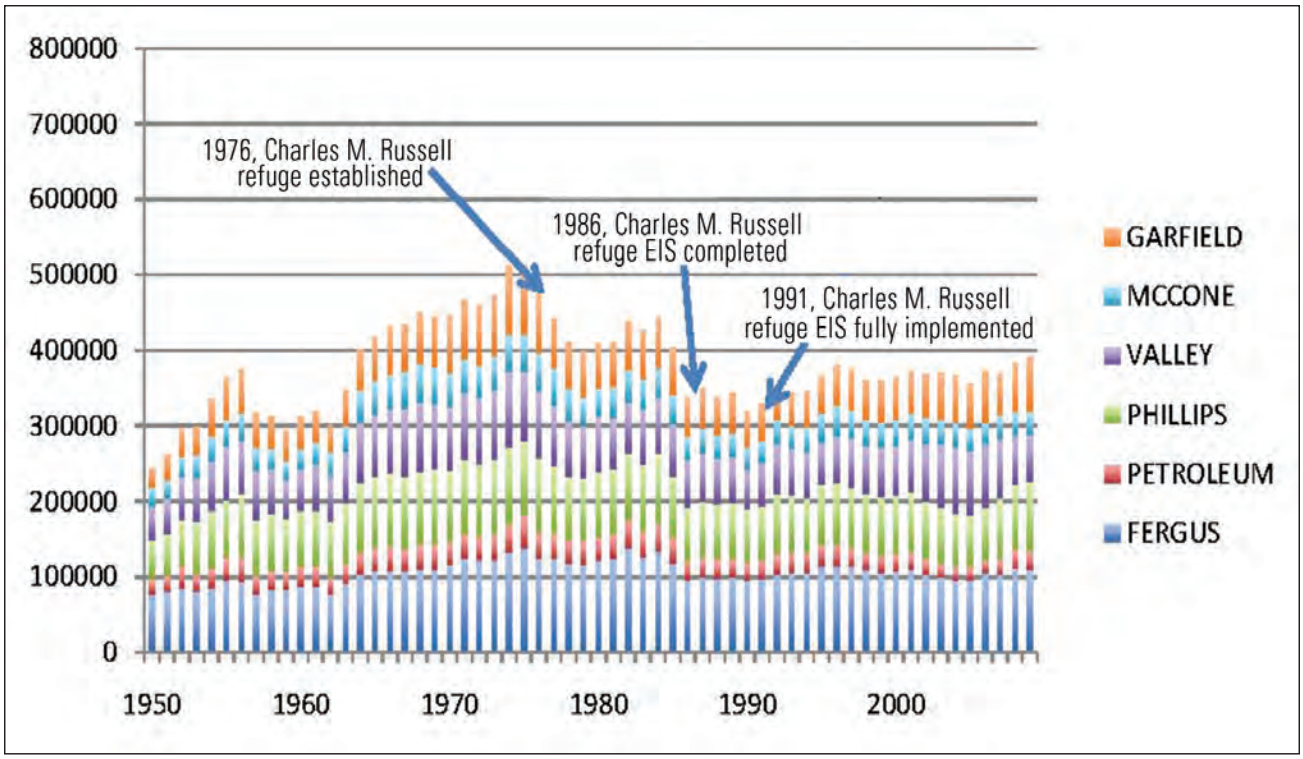


Figure 41. Chart of the cattle inventory for the six counties surrounding the Charles M. Russell and UL Bend refuges (1950–2009). Source: USDA (2008).

Table 22. Animal inventory and AUMs of feed needed for the counties surrounding the Charles M. Russell and UL Bend refuges.

County	*Cattle and Calves Inventory**	*Sheep and Lamb Inventory*	*Total AUMs of Feed Needed***
Fergus	116,094	6,062	711,113
Garfield	68,390	23,444	466,606
McCone	38,780	6,763	248,911
Petroleum	26,155	4,032	166,607
Phillips	80,791	10,511	509,972
Valley	71,167	2,184	432,244
Total	401,377	52,996	2,535,452

Source: USDA 2007 Census of Agriculture, table 12 and table 17.

**Cows and calves are each counted as one unit. The Agricultural Census figure is the physical number of animals at the end of December, not the annual average, so is likely an underestimate.*

***Calculated as [(cattle and calves inventory / 2) × 12 months] + [(sheep and lamb inventory / 5) × 12 months]*

had the largest percentage of AUMs supplied by a Government agency (39.2 percent of BLM AUMs). Valley County had the largest reliance (both in absolute and percentage terms) on DNRC lands, with 44,208 AUMs (10.2 percent of total county AUMs).

Tourism and Recreation

This section describes how tourism and recreation in Montana and around the refuge affect the local economy.

Tourism and Outdoor Recreation in Montana and Counties Surrounding the Refuge. Montana residents and visitors to the State participate in a variety of outdoor recreation activities. According to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, approximately 950,000 residents and nonresidents participated in wildlife-associated activities in Montana (FWS 2008f). Of all participants, 31 percent participated in fishing for a total

Table 23. Total AUMs for the counties surrounding the Charles M. Russell and UL Bend refuges (2008).

County	TOTAL Annual AUMs of Feed Needed [1]	U.S. Fish and Wildlife Service [2]		Bureau of Land Management [3]		Montana Department of Natural Resource Conservation [4]		Other	
		AUMs	% of total AUMs	AUMs	% of total AUMs	AUMs	% of total AUMs	AUMs	% of total AUMs
Fergus	711,113	857	0.1	58,943	8.3	31,160	4.4	620,153	87.2
Garfield	466,606	7,088	1.5	91,961	19.7	32,784	7.0	334,773	71.7
McCone	248,911	2,601	1.0	40,135	16.1	18,951	7.6	187,224	75.2
Petroleum	166,607	501	0.3	65,302	39.2	13,017	7.8	87,787	52.7
Phillips	509,972	6,020	1.2	120,801	23.7	37,475	7.3	345,676	67.8
Valley	432,244	4,514	1.0	143,975	33.3	44,208	10.2	239,547	55.4
Total	2,535,452	21,581	0.9	521,117	20.6	177,595	7.0	1,815,159	71.6

[1]*Calculated as [(cattle and calves inventory / 2) × 12 months] + [(sheep and lamb inventory / 5) × 12 months] Dependency = agency AUMs/Total AUMs of feed needed.*

[2]*U.S. Fish and Wildlife Service numbers are a 10-year annual average.*

[3]*BLM source: Rhodes (personal communication, April 2009).*

[4]*DNRC source: C. Rooney (personal communication, April 2009).*

[5]*Other = private and other non-State or non-Federal lands. This is actually an underestimate; the Ag Census is thr physical number at the end of December, not the annual average.*

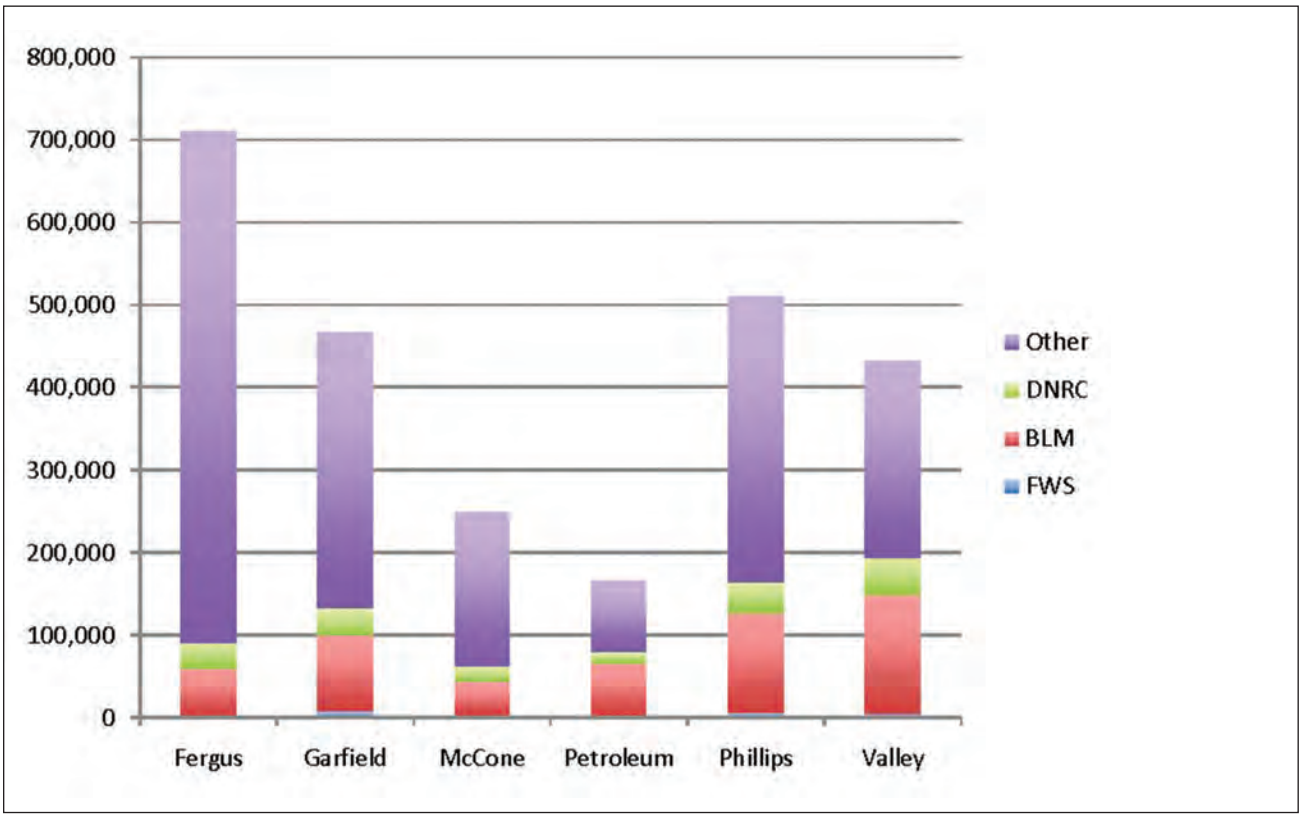


Figure 42. Chart of animal unit months by agency for the six counties surrounding the Charles M. Russell and UL Bend refuges (2007)**.** Source: 2007 Census of Agriculture.

of 2.9 million fishing days, 21 percent participated in hunting for a total of 2.1 million hunting days, and 79 percent participated in wildlife-watching for a total of 3.1 million activity days. Montana residents had the highest per capita hunting participation in the country at 20 percent, and fishing participation was high at 23 percent. The majority of all anglers (59 percent) and hunters (74 percent) in Montana were State residents, while the majority of away-from-home, wildlife-watching participants in Montana were nonresidents (67 percent). These wildlife-associated activities in Montana generated a total of $1.1 billion in 2006, with $231 million generated from fishing activities, $311 million from hunting activities, and $376 million from wildlife-watching activities.

Tourism and Recreation in Travel Regions Surrounding the Refuge. Montana is divided into six travel regions for similar historic, cultural, climatic, and geological features. The six-county area surrounding the refuge falls into two travel regions. Fergus and Petroleum Counties are included in the Russell Country travel region, which encompasses the north-central portion of the State including Great Falls. Garfield, McCone, Valley, and Phillips Counties are included in the Missouri River Country, which encompasses most of the refuge and the northeastern portion of the State.

While travel, tourism, and recreation contribute significantly to Montana's economy, most of these activities occur in the western portions of the State, bringing substantially less benefits to the Russell Country and Missouri River Country travel regions compared to the other regions. Among all of the nonresident overnight stays in Montana in 2005, only 8 percent of nights were spent in the Russell Country and 3 percent in the Missouri River Country (Rademaker and Nickerson 2006). Similarly, nonresident expenditures in Russell Country accounted for 8 percent of the State total (Oschell and Nickerson 2006b), while Missouri River Country accounted for 1 percent (Oschell and Nickerson 2006a). Lodging tax revenue growth was also lower in Russell and Missouri River Country travel regions. Both regions experienced approximately 8 percent growth from 1995 to 2005 (adjusted for inflation in 2005 dollars) while the other four travel regions experienced 19–39 percent growth during the same time period (Montana Department of Commerce 2008).

Nevertheless, Russell Country received 976,140 visitors in 2005 who spent a total of $216.8 million in the travel region for various travel-related expenses (Oschell and Nickerson 2006b). Travelers to Russell Country participated in similar activities as those visiting Missouri River Country, such as driving for pleasure (55 percent), wildlife watching (40 percent), visiting Lewis and Clark sites (31 percent), recreational shopping (29 percent), day hiking (29 percent), visiting historical sites (26 percent), picnicking (26 percent), and visiting museums (26 percent). The refuge was visited by 8 percent of the Russell County visitors, and was the sixth most visited site.

Likewise, 283,013 nonresident visitors traveled to the Missouri River Country, spending a total of $32.9 million in the area for expenses such as gas, food, shopping, and lodging (Oschell and Nickerson 2006a). Visitors to Missouri River Country participated in activities such as driving for pleasure (46 percent), wildlife watching (39 percent), visiting museums (31 percent), day hiking (29 percent), picnicking (28 percent), visiting Lewis and Clark sites (27 percent), visiting historical sites (20 percent), developed camping (20 percent), and fishing (16 percent). Fort Peck Lake, which lies within the refuge, was the second most visited site among all Missouri River Country nonresident visitors (21 percent), and the refuge was the fourth most visited site (14 percent).

LAND USE and OWNERSHIP CHANGES SURROUNDING the REFUGE

Outdoor recreational amenities are an important factor in attracting and retaining residents and small businesses in the West (Rasker and Hansen 2000, Rasker 2006). Migrants to the West have been found to select work and residences based on scenic amenities, access to recreational opportunities, and a desire to escape urban problems (Egan and Luloff 2000, Rudzitis 1999, Rudzitis and Johansen 1989, Salant et al. 1997, Vias 1999). Rapidly rising land prices in western Montana are also spurring demand, especially among recreational buyers, for large tracts of land in eastern and central portions of the State (Norman C. Wheeler and Associates 2008). The aging landowner population has further contributed to the turnover of land from production to rural residential development (Johnson 2004).

Seasonal and Recreational Housing

The number and proportion of housing units designated for seasonal or recreational use can provide insight into the types of landowners in an area, which is important for a number of reasons. Absentee landowners may have different opinions of how the refuge should be managed. Seasonal or part-time residents typically do not generate as much local economic activity because they make fewer purchases within the region and generate less income tax revenue. However, they will continue to pay property taxes and, because they do not require services year-round, they will typically require fewer local government services over the course of a year compared to full-time residents.

Much of the land surrounding the refuge is owned by the BLM. The remaining is mostly in private ownership. As shown in table 24, the six-county area surrounding the refuge experienced an increase in

Table 24. Seasonal housing in the counties surrounding the Charles M. Russell and UL Bend refuges.

	Seasonal Housing Units		*% of Total Housing Units*
County	2000	% Change from 1990	2000
Fergus	187	3.0	3.4
Garfield	293	12.0	30.5
McCone	107	–14.0	9.8
Petroleum	28	–30.0	9.6
Phillips	264	4.0	10.6
Valley	376	43.0	7.8
Total	1,255	3.0	12.0

seasonal housing units between 2000 and 2008, which may reflect the recent trend in private property purchases for hunting and other recreational uses in areas surrounding the refuge (Barron Crawford, project leader, Charles M. Russell National Wildlife Refuge; personal communication, fall 2009). However, the proportion of seasonal-use housing units rose only very slightly. Valley and Garfield Counties have the highest number of seasonal units, which can be partially attributed to the presence of leased cabin sites within refuge recreation areas in those counties. Garfield County has the highest proportion, by far, of seasonal housing, which is in line with its designation as a retirement destination, assuming that a significant number of those retirees are only part-time residents of the county.

Historically property sales in eastern Montana were made primarily by agricultural operators from western Montana seeking to move or expand their operations to a more affordable area. This trend is shifting more toward individuals and investors interested in the recreational amenities such as hunting and fishing. As a result, the number of seasonal units is expected to continue increasing in eastern Montana, including the areas surrounding the refuge.

Most of the access roads to the refuge lands cross private lands. These predominantly dirt roads are not designated as public roads or do not have right of ways or easements owned by local, State, or Federal governments. As a result, some roads on private lands that the public have traditionally used to access the refuge are being closed by private land owners, and the closures are reducing the number of access roads available to the public (Barron Crawford, project leader, Charles M. Russell National Wildlife Refuge; personal communication, fall 2008). These closures are seen more on lands that have recently been sold to new owners, many of whom have bought land for private hunting access or paleontological resource use.

Changing Land Use near the Refuge

Adjacent to the north border of the refuge near the eastern end of the UL Bend National Wildlife Refuge in Phillips County lies the American Prairie Reserve managed by the American Prairie Foundation. As of 2008, the foundation had over 86,000 acres in deeded and leased land acquired since 2004 for a prairie-based wildlife reserve (American Prairie Foundation 2008). Within the reserve is a 2,600-acre enclosed bison range that supports a herd of nearly 200 bison (as of spring 2010) initially translocated from Wind Cave National Park in South Dakota. The foundation plans to continue acquiring land for the preserve, as well as expand the bison heard and bison range, restore other native prairie wildlife, preserve human history, and manage the preserve for public use such as hiking, bird watching, camping, and hunting.

A socioeconomic impacts analysis conducted for American Prairie Foundation in 2002 concluded that, under most examined scenarios, the regional economic impacts of eliminating cattle grazing on the proposed prairie reserve would be more than offset by conservation management expenditures (Duffield and Neher 2002). However, as a result of the establishment of the American Prairie Reserve, Phillips County has experienced negative economic impact from the loss of grazing as well as associated retail sales (Dunbar and Robinson, Phillips County commissioners; personal communication, fall 2008). Other residents fear that the purchases of large acreage of land by nonprofit conservation groups as well as nonresident buyers are replacing family-oriented farms with absentee owners who contribute little to local schools and businesses (Thackeray 2006).

The Nature Conservancy manages the 60,000-acre Matador Ranch located north of the refuge along Highway 191 near Zortman, Montana. The ranch is leased out to area ranchers at discounted rates, and ranchers agree to take certain conservation actions on their own grazing lands in exchange (Red Lodge Clearinghouse 2008). As part of the partnership, ranchers protect prairie dog colonies and sage-grouse leks, control invasive plants and agree not to plow their grazing lands during their leases. As a result, many of the ranchers have received the Montana State University's Undaunted Stewardship Certification. The partnership also resulted in the formation of the Ranchers Stewardship Alliance, a community-based conservation group that promotes "ecological, social and economic conditions that will sustain the biodiversity and integrity of America's northern mixed-grass prairie for present and future generations" (Ranchers Stewardship Alliance 2008).

A recent report by the World Wildlife Fund (Freese et al. 2009), highlights the expanding role of nature-based economic activities in supporting and diversifying the economic structure in north-

ern Great Plains communities. The report suggests that "landowners, businesses, and local communities may be able to increase and diversify economic activities through three major categories of nature-based economic development: (1) natural amenities, which include those natural features of the landscape that make a place attractive for visiting (for example, ecotourism and hunting) or living; (2) ecosystem products, which include commercial products harvested from native or semi-native ecosystems, such as native plant seeds and native vegetation, whether harvest directly as hay or indirectly by livestock grazing; and (3) other ecosystem services, which include many services from healthy ecosystems for which no or only quasi-markets exist, such as provisions for clean water, prevention of soil erosion, and carbon sequestration, and nonuse services such as the value people derive from knowing wildlife exists and from conserving wildlife for future generations" (Freese et al. 2009).

ATTITUDES, VALUES, and BELIEFS

As much of the data presented in this report indicate, eastern Montana is a changing landscape. Over the past several years, there have been changes in demographics, changes in prevailing economic sectors, and changes in land use and ownership patterns. Many of these changes are interrelated. When evaluating both historical and anticipated future change, it is important to understand public attitudes, values and beliefs toward the resources the refuge aims to protect and the impacts of refuge management on the community. This information provides insight into closely held opinions about quality of life issues not as easily captured with demographic information provided in this report.

Public values toward wildlife are changing across the United States, in particular in the western United States. A study examining people's views about wildlife in 19 western States (Teel et al. 2006) identified four types of values people hold toward wildlife, called wildlife value orientations. These wildlife value orientations are related to people's support toward management actions and participation in wildlife-associated recreation. The "utilitarian" value orientation is associated with the belief that wildlife should be used and managed for human benefit, whether it is for recreational, personal, or economical purposes. On the other hand, the "mutualist" value orientation is associated with the belief that humans and wildlife are meant to coexist or live in harmony. Those who possess both utilitarian and mutualist values are called "pluralist." The final category, "distanced," is given to those who do not have either a utilitarian or a mutualism orientation, and generally have a lack of interest in wildlife-related issues and less participation in wildlife-related activities compared to the other value orientation types.

Results from the study suggest that the western United States as a whole is gradually moving away from the more traditional utilitarian value orientation and moving more toward the less traditional mutualist value orientation (table 25). In Montana, however, nearly half of the State (47 percent) was found to hold the traditional utilitarian value orientation, while only 19 percent were categorized as mutualists. Considering that the area surrounding the refuge is considerably more rural compared to some of the western portions of Montana, it is likely that even higher proportions of residents around the refuge hold utilitarian value orientations toward wildlife, while those living in urban areas of the State hold more mutualist value orientations. This suggests that visitors to the refuge from nearby counties may be more interested in hunting and other consumptive activities on the refuge, while those

Table 25. Wildlife value orientations and proportions in western States and Montana.

Wildlife Value Orientation Type	*Description*	*% in 19 Western States*	*% in Montana*
Utilitarian	Believe that wildlife should be used and managed for human benefit.	34	47
Mutualist	Believe that humans and wildlife are meant to coexist or live in harmony.	33	19
Pluralist	Hold both a mutualism and utilitarian value orientation toward wildlife.	20	27
Distance	Distanced from the issue of wildlife. Do not hold either a mutualism or a utilitarian orientation toward wildlife.	13	7

Source: Teel et al. (2005).

coming from urban areas may be more interested in nonconsumptive activities such as wildlife watching. This may also affect the type of hunting experience visitors are seeking.

In addition to people's general perceptions about wildlife and natural resources, their attitudes toward the refuge and its management specifically form the basis of their level of support for management actions. The Service's public scoping process revealed several important qualities of the refuge that residents of the six-county area value. Some people expressed appreciation for the intrinsic values of the refuge (such as its scenic beauty, remoteness, abundance of wildlife, and unique ecosystem), while others expressed appreciation for the recreational value that the land provides (such as hunting, fishing, and wildlife watching) (FWS 2008c). In addition to these intrinsic and recreational values, local residents emphasized two other values associated with the refuge: historical value and economic value. Many residents in the area have had family ties to the land for several generations, and strive to maintain unique traditions and way of life for its historical value. Local communities derive economic value from the refuge through grazing leases, as well as the money that recreational visitors spend in the region. However, some local residents believe that past management approaches in the refuge have negatively affected the local economy, while others believe that increasing visitor numbers to the refuge will require additional infrastructure maintenance in local communities.

5—Environmental Consequences

USFWS

Large wildfires like the King Island fire in 2006 affect air quality, visual resources, soils, and habitat.

This chapter summarizes and compares the potential effects of implementing the four management alternatives described in chapter 3 on the physical and biological environment, management of special area designations, public use opportunities, cultural and paleontological resources, and other social and economic factors. The environment that would be affected by the alternatives proposed by the Service is described in Chapter 4–Affected Environment.

5.1 Analysis Method

Under each topic (resource) the actions or things that could affect that resource are discussed. Usually, these are the actions stemming from the objectives and strategies identified in Chapter 3–Alternatives. Often the effect of an action cuts across several resources. For example the use of motorized equipment or vehicles, prescribed fire, livestock grazing, fencing, and hunting have different consequences that are specific to a resource.

The environmental effects are evaluated at several levels, including whether the effects are negative (or adverse in the case of threatened or endangered species) or beneficial, and whether the effects are direct, indirect, or cumulative with other independent actions. The evaluation of environmental consequences also uses the duration of an effect, whether it is long term or short term.

Direct effects are those where the impact on the resource is immediate and is a direct result of a specific action or activity. Examples of a direct effect might include the effect of ungulate grazing or prescribed fire on vegetation or the effect of hunting on wildlife.

Indirect, or secondary, effects are those that are induced by implementation actions, but occur later in time or farther removed from the place of action through a series of interconnected effects. Examples of indirect effects include the downstream water quality effects from an upstream surface disturbance, or the effect that a use along a road could have on nearby plant communities because of the periodic introduction of invasive plants from outside sources.

A cumulative effect is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Reasonably foreseeable future actions independent of the CCP for the refuge are described in chapter 3.

Effects are often described in terms of their context, intensity, and duration:

- Negligible—The effect would be at the lower levels of detection (less than 5-percent change, compared to existing conditions).
- Minor—The effect would be detectable (a change of 5–24 percent).
- Moderate—The effect would be readily apparent, and it would have the potential to become major (a change of 25–50 percent).
- Major—The effect would be severe, or if beneficial, it would have exceptional beneficial effects (a change of more than 50 percent).

The duration of effects are described as short term or long term. Short-term effects would persist for a period of 1–5 years, and would consist primarily of temporary disturbance due to habitat restoration, prescribed fire, facility construction, and subsequent revegetation efforts. Long-term effects would last more than 5 years after project initiation, and may outlast the 15-year life of the CCP. For example, there could be a long-term benefit to wildlife habitat resulting from a short-term management action.

Organizationally, under each resource the effects that are common to all alternatives are discussed first. This is followed by a discussion of specific subtopics that are related to the aspect of the environment being affected. If the topic is short, all the alternatives are discussed together, but where there are distinct differences between the alternatives they are broken out by alternative.

In compliance with the provisions of the Improvement Act, the Service has made a thorough assessment of the environmental effects using available science, which is consistent with National Environmental Policy Act and department and bureau policies. Wherever possible, the degree of effect was quantified using known numeric information or modeled estimates, or where extensive monitoring or research provided pertinent numeric information. The Service used GIS data that was provided from a number of sources including other agencies, organizations and researchers to evaluate and make measurements, and those sources are identified. Although GIS is useful tool for evaluating and answering questions, it is not the same as a formal land survey and discrepancies can exist. Where sufficient numeric information was not available, qualitative or relative assessments were made using scientific literature or professional field experience.

The analysis of environmental consequences is documented in the seven major sections of this chapter:

- 5.4 Environmental Consequences for the Physical Environment
- 5.5 Environmental Consequences for Biological Resources
- 5.6 Environmental Consequences for Visitor Services
- 5.7 Environmental Consequences for Special Areas
- 5.8 Environmental Consequences for Cultural and Historical Resources
- 5.9 Environmental Consequences for Paleontological Resources
- 5.10 Environmental Consequences for the Socioeconomic Environment

In addition, the Service analyzed the following aspects of implementing the alternatives, as documented in these sections:

- 5.11 Irreversible and Irretrievable Resource Commitments
- 5.12 Short-term Uses of the Environment and Maintenance of Long-term Productivity
- 5.13 Adherence to Planning Goals
- 5.14 Unavoidable Adverse Effects
- 5.15 Conflicts with Federal, State, Tribal, and Local Agencies

5.2 Assumptions

Assessments were based on a variety of information, including meetings and other communications with natural resource and other professionals, published scientific information, site monitoring, agency reports, and computer modeling, among other sources. The following assumptions have been made in the analysis presented in this chapter:

- Funding and personnel would be sufficient to implement any alternative selected. This does not constitute a commitment for funding, and future budgets could affect implementation.
- Monitoring programs would be implemented and monitoring activities would be conducted a minimum of once every 5 years, and adjustments or revisions would be made to management as indicated by evaluations (but within the scope of the particular alternative).
- Standard operating procedures would be followed.
- The CCP would be reviewed at 15 years.

5.3 Cumulative Impacts

Following the discussion of direct and indirect effects, at the end of each topic (physical environment, biological environment public uses, special areas designations, cultural and paleontological, and social and economic conditions), the anticipated cumulative impacts of each alternative and the reasonably foreseeable actions are disclosed. Reasonably foreseeable actions are described near the end of Chapter 3–Alternatives.

The cumulative effects discussion focuses on four broad categories of reasonably foreseeable actions:

- Federal land management activities
- State wildlife management
- Nongovernmental conservation activities
- Regional demographic and economic changes

5.4 Environmental Consequences for the Physical Environment

The following sections discuss the effects of implementing the alternatives on the physical environment.

EFFECTS on CLIMATE CHANGE

The specific effects of the Service's actions with respect to influencing climate change at a global level are addressed in this section. The likely effects of climate change on the refuge's habitat and wildlife resources are addressed under the biological environment.

All Alternatives

Over 15 years the refuge would implement departmental and bureau policies regarding climate change including biological planning, landscape conservation, monitoring and research, becoming more carbon neutral in day-to-day refuge operations, partnering with others on climate change, and educating the public and others. This would be achieved by adopting specific objectives and strategies for habitat management or public use (refer to the climate change sections in chapters 1 and 3 for a complete discussion). To reduce the effects of climate change stressors, the refuge would protect the heterogeneity of species and structure, protect grassland types across environmental gradients, promote connectivity and corridors to facilitate migration, restore natural fire regimes, and promote sustainable herbivory. In the long-term, habitat management actions would benefit the refuge's vegetation and habitats, which are important for carbon sequestration and reducing the loss of carbon currently stored in the terrestrial biosphere.

Carbon dioxide from motorized vehicles, boats, and equipment from public and activities and refuge operations would continue to contribute directly or indirectly to climate change. It is estimated that about 10,000 vehicles use the auto tour route annually (refer to access in chapter 4) and many visitors stop at the contact stations while traveling through to other places. With an annual visitation of 250,000, the number of motorized vehicles including boats would exceed 100,000 annually (based on 2.5 persons per vehicle). However, when compared to other tourist attractions in western Montana such as Glacier National Park, which receives 2 million visitors annually (National Park Service 2008), the refuge's direct contribution to carbon emissions from refuge operations and refuge visitation would be low. The differences in visitation numbers between the alternatives would be negligible for climate change (see visitation projections under the next section on air quality). Nonetheless, under all alternatives the Service would be committed to driving cleaner vehicles, increasing fuel efficiency or reducing driving. A transportation plan would be developed including identifying options for alternative forms of transportation.

Fire

The Great Plains, including the refuge, evolved with fire on the landscape. Fire, whether a wildfire or prescribed fire, would release carbon dioxide (CO^2) directly into the atmosphere from the biomass consumed during combustion. In the Missouri River Breaks where wildfire is inevitable due to lightning strikes or human causes, modeled wildfire scenarios indicate that landscapes managed by prescribed burning would store more carbon as compared to landscapes where constant fire suppression leads to higher intensity wildfires (Hurteau and North 2009). It is likely that prescribed fire has similar smoke impacts as a wildfire as the above ground grass fuels are all consumed. In other areas where there are more trees, prescribed fire is likely to produce less emissions than a wildfire, particularly ones that consume large stands of trees. Alternative A would provide the least carbon storage for reduction of carbon gases due to constant fire suppression followed by high-intensity fires across a broader area (refer to below sections on air quality and habitat for more information), followed by alternatives B and C. Alternative D would store the greatest amount of carbon over the long term because the wider use of light prescribed fire is expected to lead to fewer and lower intensity wildfires.

Conclusion

Implementation of the CCP under any alternative would negligibly affect global climate change. All alternatives would provide positive benefits for

carbon sequestration due to the large amount of vegetated land the refuge provides. Carbon dioxide emissions from motorized vehicles would occur under all alternatives, although the effects on global climate change (and the differences between the alternatives) would be negligible. Alternative A would provide less benefit for carbon storage due to constant fire suppression and higher intensity fires over the long term, followed by alternatives B and C. Alternative D would store the greatest amount of carbon over the long term. Implementing carbon neutral refuge programs also would be positive steps for reducing the refuge's carbon emissions.

Mitigation

Reducing the carbon footprint of the refuge by driving fuel-efficient vehicles, upgrading offices to make them more energy efficient, conducting more teleconferencing, recycling, and setting an example for the public and partners would all be positive ways to mitigate for the Service's contributions to carbon emissions (refer to air quality below for additional information).

EFFECTS on AIR QUALITY

Impacts to air quality occur from several sources including motorized vehicles, boats, prescribed fire, and wildfires.

All Alternatives

Under all alternatives, the class 1 air shed within UL Bend Wilderness would continue to be protected and monitored. Short-term increases in particulates from a large wildfire would result in direct, negative effects to air quality that could vary from negligible to major depending on the acreage and fire conditions, but overall the long-term effects to the class 1 air shed in UL Bend would be negligible as a result of the implementation of any alternative.

Implementation of all alternatives would result in varying levels of equipment usage. Construction of public use facilities, habitat restoration activities, and on-going refuge management including operating motor vehicles or conducting wildlife surveys would require the use of motorized equipment including the use of aircraft, causing localized increased dust, carbon monoxide and hydrocarbon emissions. Equipment usage by the refuge would have an overall negligible effect on air quality in the region, and any impacts could be mitigated by best management practices (refer to mitigation).

Emissions from Motorized Vehicles or Boats

Some effects are common to all and some are specific to the alternatives.

All Alternatives. Emissions including dust, carbon monoxide, and hydrocarbon from motor vehicles would occur in varying degrees under all of the alternatives. Road use, especially of dirt, gravel, or other soft-surface roads, generates and disperses dust in levels that vary depending on soil moisture content, particle size, and traffic volume (Havlick 2002). Nearly all of the refuge's roads are dirt, and emissions from dust particulates would be common during dry periods. Emissions from motorboats would be the same regardless of which alternative was selected. The Service would develop a transportation plan under all alternatives that would address parking, congestion, and other issues.

Alternative A. Under alternative A, motor vehicles would continue accessing the 1.1 million-acre refuge on 670 miles of road open to the public. Visitation would remain near current levels of 250,000 (refer to effects on the socioeconomic environment in section 5.10). During the fall months, as many as 175 vehicles have been counted at one time in the elk-viewing area. These localized and concentrated emissions including dust and hydrocarbons would continue to occur during periods of high use, which is typically during the fall hunting season or in the spring when paddlefish fishing is popular.

Alternative B. Five hundred sixty-four miles of road would remain open for motor vehicle access. In some localized areas, there would be fewer particulates (dust) and hydrocarbon emissions from road closures because of a larger footprint where there were no vehicles. There would be a modest increase in visitation (253,000) over the long-term, which would result in negligible to minor increases in emissions (less than 10 percent) from vehicles. Closing 106 miles of road would not reduce the concentrated number of motorized vehicles using popular viewing areas during the fall months or paddlefish fishing in the spring, and short-term increases in emissions during these periods would continue.

Alternative C. Similar to alternative A, motorized vehicles would access the refuge on 670 miles of road, and on some roads, there would be improvements (for example, gravel for all-weather access), which would likely increase the number of vehicles using the refuge. Long term, there would be a moderate increase in the number of visits to the refuge (275,500), which would increase emissions by a minor amount, particularly during high-use seasons.

Alternative D. Under alternative D, there would be a modest number of miles of road closed (23) as compared with alternative A, which is less than 5 percent. But as with alternative B in some localized areas, there could be fewer emissions, especially in areas that are adjacent to wilderness, increasing the overall footprint of an area where motorized vehicles were not used. Long term, there would be modest

additions in visitation to 258,000 visits, which would raise emissions by a minor amount, particularly during high-use seasons.

Fire

Some fire effects are common to all alternatives and some are specific to each alternative.

All Alternatives. Prescribed fire would be used in all alternatives, although the acreage burned annually in alternative A would be minimal. All prescribed fires would be subject to approved fire management plans, and factors such as weather conditions, fuel conditions, adequate firebreaks, and preparedness of fire management and emergency response crews would be assessed before using prescribed fire.

In Montana, the open-burning season is March 1 through October 30. The periodic use of fire could result in short-term, localized increases in particulates and decreased visibility. The refuge would be assessed a fee based on particulate matter produced by prescribed fires (refer to air quality in chapter 4). The amount of smoke and particulates generated by a prescribed fire would depend on variables such as wind, soil and vegetation moisture, and fire intensity. Although the objectives and strategies for prescribed fire vary for alternatives B, C, and D, the differences in increased particulates or decreased visibility would not be significantly different when compared to the entire land base on the refuge. Alternative C would have less prescribed fire than alternatives B and D. Alternative A would have the least amount of short-term increases in particulates stemming from the use of prescribed fire. The use of prescribed fire in any alternative would have negligible long-term effects on air quality.

Wildfires on the refuge are usually concentrated in June, July, and August during the height of tourist season. Depending on the size and intensity, small wildfires would result in minor to moderate short-term increases in particulates and decreased visibility in localized areas. Nevertheless, for a large wildfire, increases in particulates could have major, short-term, negative effects to a larger region (refer to the uplands section under vegetation in chapter 4).

Alternative A. The large wildfires of 2003 and 2006 directly affected the visual and air quality of the refuge's class 1 air shed—UL Bend Wilderness—as well as the downwind communities of Jordan, Fort Peck, and Glasgow. These types of short-duration impacts from wildfire would continue into the near future. Effects would vary from negligible increases in emissions to major, short-term, negative effects.

Alternatives B and D. These alternatives would make greater use of prescribed fire or naturally caused fires to reduce hazard fuel and fuel buildup. In the long-term, this could result in fewer large wildfires that produce more smoke and particulates. Alternatives B and D would incorporate the most patch burning to reduce fuel buildup, with alternative D having the greatest emphasis. The increased emphasis of pyric herbivory would allow the refuge to spread impacts over an 8-month burning period.

Wildfires would continue to have significant short-term, air quality impacts, but these effects would be lessened as more acreage is treated with prescribed fire.

Alternative C. As compared to alternative A, alternative C would have slightly more prescribed fires. With a greater emphasis on public and economic uses, there would be fewer prescribed fires than under alternatives B and D.

Fine fuel such as grass would decrease, which would initially result in fewer wildfires escaping initial attack efforts and, therefore, having less air quality impact. As grassland encroachment by woody fuel such as trees increased, tree-stand density and biomass volume would increase significantly. Eventually wildfires would consume this fuel and, in the process, release significant amounts of particulate matter with significant, negative effects on air quality and visual resources.

Conclusion

The implementation of any alternative would have negligible long-term effects on the class 1 air shed in UL Bend Wilderness. The use of equipment for habitat restoration or construction of public use facilities would also result in negligible effects to air quality on the refuge. Overall, the emissions from motor vehicles or the use of aircraft by the public or the Service would stay relatively low for much of the year, although short-term concentrations of higher emissions during popular use seasons would continue. As compared to alternative A, road closures under alternatives B and D would increase the areas with no emissions, but those improvements may be offset by increases in visitation of some localized areas where there were no emissions, thus resulting in only minor beneficial effects.

The use of prescribed fire—which results in localized, short-term increases of particulates—would be the least under alternative A. However, without prescribed fire to reduce fuel buildup and restore a more natural fire regime, the severity of wildfires would likely be greatest under alternative A. Alternatives B, C, and D would result in more frequent, short-term, negligible effects from prescribed fire and less frequent severe wildfires with short-term moderate to major effects. Overall, the implementation of any alternative would have negligible long-term negative effects on air quality in the area.

Mitigation

The Service could minimize emissions and particulates by following the best management practices

when using motorized equipment or conducting restoration activities; these practices include limiting tilling during windy periods, reducing the footprint of bare soil, and using vehicles that are more fuel-efficient and well maintained. As identified under alternatives B, C, and D, a well-though-out visitor services plan and transportation plan could identify ways to diversify and spread out visitors more during popular seasons or perhaps offer tours or find other methods of reducing short-term concentrations of higher emissions.

All prescribed fires would be initiated in accordance with an approved fire plan. Impacts of prescribed fire can be mitigated by ignition patterns, for example, only burning when convection is good to excellent so heat and smoke quickly rise or with winds that preclude smoke from critical areas. Using a management response as described in an approved fire management plan would enable the Service to respond quickly to changing conditions, thus reducing some of the risk of severe wildfires developing. Reducing a buildup in fuel and restoring a natural fire regime would also reduce the risk of larger wildfires.

EFFECTS on VISUAL RESOURCES

As discussed in chapter 4, the refuge has outstanding scenic values and special management areas where scenic values are important to preserve. Scenic resources could include a large landscape view of the refuge, wildlife viewing in a natural setting, or close-in views of vegetation, topography, water, and wildlife. Impacts to visual resources are often qualitative in nature depending on the individual, location, and time of year. Effects from facilities and structures, fire, grazing, and other habitat and wildlife management programs were assessed.

Facilities, Structures, and Camping Areas

The Service manages several primitive recreation areas (USACE recreation areas are not evaluated, refer to Chapter 4–Affected Environment). Additionally, a network of roads crisscrosses the refuge. The Service uses fencing and other equipment for managing habitat.

Most of the scenic values of the refuge—including the special management areas identified in chapter 4 (section 4.4), along with wildlife viewing and the rugged and remote vistas—would be largely preserved and maintained, but in localized areas, the scenery could be interrupted or marred by facilities and structures, management activities, or other impacts.

The primitive recreation areas managed by the Service would continue at Slippery Ann, Rock Creek, Turkey Joe, Withrow Bottoms, Jones Island, and Rocky Point, in addition to a few outgranted areas that have no facilities (Bear Creek and Bob Cat) (see figure 15 in chapter 4). Although, tents, camping gear, and the minor losses of vegetation marking the campsite could be visible in foreground views and in some places from higher vantage points, these are low-key facilities, and any effect would be negligible.

Under all alternatives, the small cluster of buildings located at Sand Creek Field Station, Jordan, UL Bend, and the Fort Peck Interpretive Center would exist with the Interpretive Center at Fort Peck Field Station being the most visible. Under alternatives B, C, and D, a small science or interpretive center would be built at Sand Creek Field Station. There could be some short-term impacts from construction of new facilities or structures such as trails, viewing blinds, kiosks, and parking areas that would cease following construction. The installation of alternative energy structures such as solar panels or a small wind turbine at any of the stations would be negligible.

A three-strand wire fencing scheme would be used across the refuge for a variety of purposes (refer to Chapter 4–Affected Environment). Although there are some differences in how fencing would be used between the alternatives and the amount of fencing, generally the effects on visual resources would be negligible even in foreground views. Currently fencing does not block wildlife viewing in the elk-viewing area where cross fences are used or fences are located away from the road.

Havilick (2002) states that the effects of roads on public lands can be lumped broadly into two categories: use effects and presence effects. Among other impacts such as edge effects, just the presence of a road can have a long-lasting visual impact on the landscape. From differing perspectives, the same road could be either a "boon or bane" (Havlick 2002). On the refuge, roads would likely be visible from higher vantage points or looking down ridgelines and from further away in many areas of the refuge. Areas where severe rutting and braiding occurs particularly during wet seasons would result in localized negative effects. The visibility of roads decreases up to 20 percent in proposed wilderness units as compared to refugewide (see figure 43).

The 670-mile network of roads would continue under both alternatives A and C. Alternative C would have about 16 miles of road improvements such as graveling the roads for better access along Knox Ridge (Route 209 and Route 108). Knox Ridge would also be considered for graveling under alternative D. In a few localized areas, the visibility of roads could increase because of road improvements from more vehicles and dust. Roads under alternatives A and C would have the greatest visibility (see figure 44). As shown in figure 44, percentage wise the differences in visibility between alternatives A and C and B and D are negligible to minor, but in some localized areas, the differences could be more

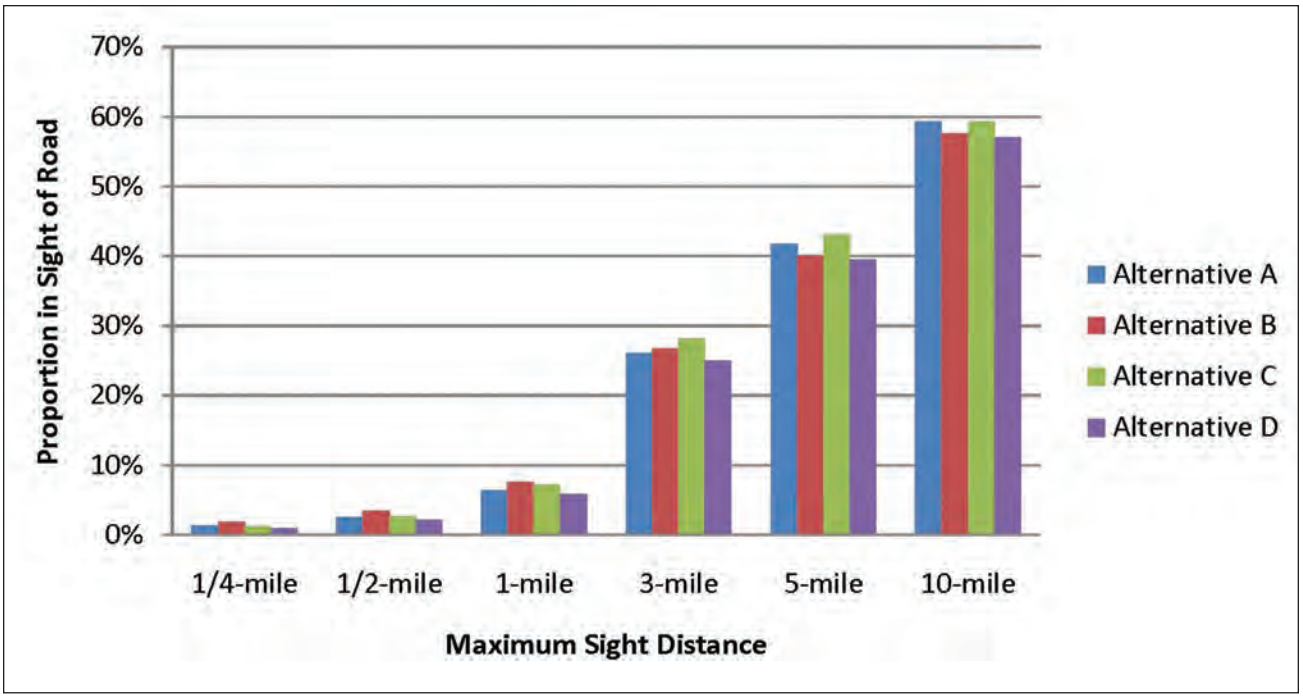


Figure 43. Chart of the visibility of roads from proposed wilderness units in the Charles M. Russell and UL Bend refuges by alternative. Source: The Wilderness Society (2009).

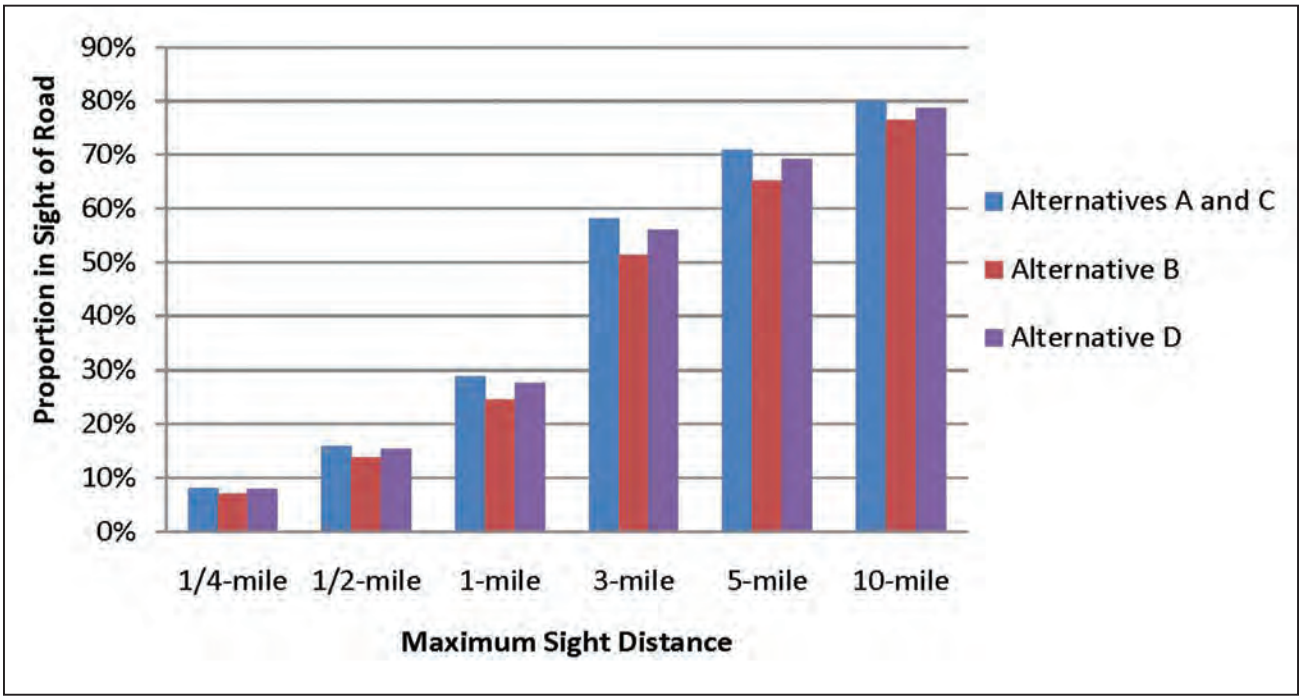


Figure 44. Chart of the visibility of roads refugewide by CCP alternative for the Charles M. Russell and UL Bend refuges. Source: The Wilderness Society (2009).

pronounced particularly from vantage points that were further away.

Closing 106 miles of road in alternative B, would result in about 16-percent fewer roads than under alternatives A and C. Under alternative D, the amount would amount to less than 5-percent fewer roads. However, in several areas, the footprint of areas without roads would increase, which would benefit scenic values by a negligible to minor degree, particularly in the eastern portion of the refuge under alternative B and a lesser extent in alternative D.

Overall, the differences in total road miles and road visibility between the alternatives would be negligible.

Habitat Management

The effects for these activities are broken out below.

Invasive Species. In general, the Service's on-going weed management efforts in all alternatives would benefit scenic values. The proliferation of weeds moving up drainages, or blowing in from other areas or being transported from outside sources would continue regardless of the alternative selected, and controlling invasive species in cooperation with USACE and others would be a priority. Reducing saltcedar infestations would be an ongoing effort by the Service and USACE, but because of the extent of the infestations, it would unlikely yield significant improvements to visual resources in short term.

Restoration of the river bottoms on the western portion of the refuge would decrease weedy species, which would improve the quality and diversity of views in these areas under all alternatives. During the restoration process, there would continue to be bare, patchy, or weedy areas for several years, but in the long term, scenic values would improve. As compared with alternative A, alternative C would have the greatest potential for moderate to major localized benefits, while alternatives B and D could potentially result in moderate long-term benefits.

Prescribed Fire. During a prescribed fire, there would be short-term, localized negative effects to visual resources as a result of smoke (refer to air quality above). Blackened vegetation would be visible in localized areas immediately after a fire. Depending on the time of year and moisture levels, many areas would green up within several weeks, but some trees and shrubs that were affected would take longer to recover. Across the refuge, negative effects would be negligible in the short term from the use of prescribed fire. In the long term, implementing a patch-burning program under alternative B and, to a greater extent, under alternative D would create a greater mosaic effect as compared to alternative A, where little prescribed fire would be used. This would increase species diversity of both plants and wildlife, resulting in beneficial effects for scenic values and wildlife viewing. Alternative C would not use prescribed fire to this extent.

Wildfire. As with prescribed fire, blackened vegetation would be visible after a wildfire. During and immediately after a fire, there could be moderate to major negative effects on scenic values in localized areas. Generally, grasses and other vegetation quickly green up by the following year, reducing the visual contrast. Furthermore, some areas could have large crown fires that may cause significant visual scarring of the landscape for many years (refer to wildfire suppression under vegetation in section 5.6 below). The visual scarring would decrease in the long term.

Livestock Grazing. The use of grazing as a management tool may result in short-term and long-term impacts to visual or scenic resources in some areas due to manure, trampling, livestock trails, and most significantly, degradation of riparian areas. Livestock grazing would continue under all alternatives, although there would be differences in the timing and application of prescriptive grazing or annual between the alternatives (refer to soil discussion for specific percentages below). Not all areas of the refuge are currently grazed (see figure 16 in chapter 4), and areas that were rested or no livestock grazing occurred , there would be fewer visual impacts as compared to areas that are grazed frequently (refer to the discussion on grazing and monitoring under riparian areas and wetlands in chapter 4). On the refuge, some of the proposed wilderness units are under a prescriptive grazing program, and visual impacts would likely decrease in the long term, benefiting some users. There would still be several proposed wilderness units where annual grazing would be allowed and, in these areas, impacts would continue to be apparent and negatively affect some visitors. In areas where prescriptive grazing has been implemented, or where riparian areas are fenced, signs of visual degradation of the resource would decrease over the long term.

Conclusion

Most of the Service's structures, fencing, and facilities would have negligible effects to visual resources including special management areas. In localized areas, the impacts would be greater. Roads would have the greatest potential to affect visual resources because of number and extensive area they cover (670 miles). Overall, the differences in the total road miles between alternatives would result in negligible to minor differences in visibility (see figures 43 and 44 above).

The use of prescribed fire would result in short-tem negative effects to visual resources and long-term benefits due to an increase in species diversity. These impacts and benefits would be greatest under alternatives B and D and to a lesser extent under alternative C. There would be little impact or benefit under alternative A. Wildfire would result in short-term and potentially long-term impacts to visual resources in some areas from loss of vegetation or where severe scarring of the landscape occurred.

The degree to which refuge visitors are negatively affected by the visual effects of livestock grazing varies by type of user and location of use. The greatest potential impact would occur under alternative A and to a lesser degree under alternative C, where there may be minor to moderate impacts to some users In alternatives B and D, where there would be a greater emphasis in moving toward a prescriptive grazing regime and riparian restoration, there could be moderate benefits to scenic resources in areas that are currently being affected.

Mitigation

Hardening and delineating campsites that are impacted would reduce the spread and overall visibility of the site. Restoring closed roads would benefit views by creating larger patches of undisturbed habitat. Successful revegetation efforts in the river bottoms would reduce visual impacts from invasive species.

EFFECTS on SOUNDSCAPES

Like visual resources, impacts to the natural acoustical environment from external noises are often qualitative in nature. These would result of public use activities and other management activities.

Public Use

Many restrictions would remain in effect, thus minimizing sound impacts. These would include seasonal and day-of-the-week restrictions on motorized boat access along the Upper Missouri Breaks Wild and Scenic River, prohibitions on motorized access in UL Bend Wilderness and the proposed wilderness units, prohibitions on aircraft landing in upland areas, and designated landing zones on Fort Peck Reservoir (refer to soundscapes in chapter 4). Similar to visual resources, effects from various mechanized noises would vary on the user, type of noise, and location. Wilderness users would likely have a greater expectation of solitude and from being away from external noises. A number of roads border these areas, and it could be possible to hear sounds along the edges from motorized equipment or vehicles including four-wheel drive vehicles, ATVs, and quadricycles. These would be short-term impacts that would decrease with distance.

Because alternative C would look to improve road access and maximize public use, in localized areas, noise impacts could increase as compared to alternative A. Under alternative C, there would be about 76 miles of graveled roads, and under alternative D there would be about 65 miles of graveled roads compared to alternative A with 60 miles and those areas would see increased use. Proposed road closures under alternative B and to a lesser extent in alternative D would augment the buffer zone of several proposed wilderness units providing minor benefits for soundscapes.

Construction of viewing facilities, the science and/or interpretive center in alternatives C and D, parking lots, and road maintenance would require the use of heavy equipment for site excavation, grading, and other activities. This equipment would produce higher, short-term noise levels in the immediate vicinity of the construction activities. Noise levels would return to existing levels after construction or maintenance ceases.

Public hunting would continue to be a popular activity under any alternative. Gunshots associated with the sound of a variety of weapons could be audible from on- and off-refuge, depending on hunter location, wind, and topography. Some nonconsumptive users (those who only participate in such activities as wildlife viewing, photography, and interpretation) could be negatively affected by the sounds of gunshots, and nonconsumptive use is generally increasing on the refuge. Presumably, not all hunters fire their weapon during their visit, and given the immense size of the refuge, the overall effect on noise levels and nonconsumptive users would be negligible.

Habitat and Wildlife Management

Restoration activities in all alternatives would require the use of motorized equipment, which would result in short-term minor increases in noise levels in the immediate vicinity of the restoration activities. Noise levels would return to existing levels after the activity ceases. Similarly, the use of aircraft to conduct wildlife counts would also result in distractions and disturbance for and could negatively affect wilderness users. Overall, the Service's use of aircraft for wildlife monitoring or other purposes is low and is not likely to increase to any degree over the long term.

Conclusion

Although there are a number of potential external noises, which could affect visitor experiences, many restrictions and policies in place would limit external noises and these would continue to benefit visitors, wildlife, and the special management areas (refer to section 4.4 in chapter 4). All alternatives would result in negligible to minor effects due to motorized boats, road use, and facility construction. Road closures could reduce the effects in alternatives B and D.

The effect of gunshot noise from hunters would be negligible.

Mitigation

Over the next few years, the Service expects to assess the amount of motorized boat access to upland areas, which would provide baseline information about the extent of this type of use. Refuge staff would develop a transportation plan under all alternatives, and through this planning effort, ways to address potential sound impacts would be addressed.

EFFECTS on SOILS

Habitat management activities and public use activities have a variety of effects on soils.

Restoration Activities in River Bottoms

Restoration generally involves disking and tilling of the soil, planting food crops to remove weeds, applying herbicides, limiting livestock in restoration areas, and burning areas for invasive plant removal. Under all alternatives except B, the Service would actively restore approximately 15 former agricultural fields plus two fields that are currently being restored. The number, timing, and intensity of restoration efforts would vary by alternative. Alternative A would have the least aggressive schedule, and restoration would occur when funding and staff time permitted it. Alternative C would have the most aggressive restoration schedule with 50–60 percent of the restoration completed within 15 years. Under alternative B, the bottomlands would not be restored, but would become permanent food plots. Alternative D would restore 20–30 percent of the fields within 15 years, and native plantings could follow after weeds have been removed.

Restoration activities would result in short-term minor disturbances of soil resources during site preparation and planting. Disking and tilling of soil has the potential to result in localized, short-term erosion, soil loss, and the release of soil particles (dust) into the air. Once restoration activities were complete, soil protection and productivity would be maintained long term.

Prescribed Fire

When used as a habitat restoration tool, prescribed fire would temporarily reduce vegetation in a treatment area. Generally, the use of prescribed fire would stimulate new plant growth and increase the vigor of existing plant communities. However, prescribed fire has the potential to cause short-term, soil erosion and loss resulting from the loss of vegetation. Alternative A would result in negligible soil erosion and loss, because little prescribed would be used, as compared to minor impacts in alternatives B, C, and D.

Wildfire

At a minimum, large wildfires would temporarily reduce vegetation in an area. If severe enough—for example, a large crown fire in overgrown decadent vegetation—a wildfire could result in moderate to major short-term and long-term, severe sterilization of soil, subsequently leading to further loss of vegetation and soil erosion. Alternative A likely would result in the most soil erosion and loss due to continued fire suppression. In alternatives B, D, and to a lesser degree in C, there would be more use of prescribed fire to reduce heavy fuel buildup, as compared to alternative A.

Livestock Grazing

With defined habitat objectives, livestock grazing can stimulate new plant growth and increase the vigor of plant communities. However, livestock tend to use the same trails to access water or graze in riparian areas, which has resulted in localized major, soil compaction, long-term losses of vegetation, soil erosion and sedimentation. These effects are particularly evident in areas with higher stocking rates or where there is also heavy grazing by wild ungulates such as elk (refer to livestock grazing in riparian areas in chapter 4).

Under all alternatives, livestock grazing would continue either prescriptively or through annual grazing. Alternatives A and C would continue the annual grazing regime across half (currently 55 percent) of the refuge with some movement toward prescriptive grazing when possible. Under existing conditions, a number of units are not meeting the objective of 70-percent residual cover (refer to vegetation monitoring in uplands in chapter 4), and the short-term and long-term effects from soil erosion and loss would likely continue compared with lands where prescriptive grazing was used. In some habitat units such as the Big Dry Arm where there is more forage allocated to cattle (refer to vegetation, uplands, and livestock grazing later in this chapter), moderate to major negative effects from soil compaction, erosion and loss of soil would continue. In areas where a prescriptive grazing regime was implemented with defined habitat objectives and a comprehensive monitoring plan, soil compaction, erosion, and loss could be reduced in the long term. Thirty-four percent of the refuge is currently is prescriptively grazed. Although alternative B would convert to prescriptive grazing over 50–75 percent of the refuge within 4–7 years, because of the emphasis on maximizing wildlife populations, including large ungulates, it could take longer for vegetation and subsequently soils to recover particularly in areas that continued to be heavily grazed by elk. Alternative D would implement prescriptive grazing over 50–75 percent of the refuge and a comprehen-

sive monitoring program within about 9 years, and in the long term this would benefit soil resources due to greater vegetation cover.

Fishing

Under all alternatives, impacts to soils would continue to occur during the spring paddlefish season when refuge roads and riverbanks are frequently wet and muddy. In localized areas, compacted soils and erosion would be moderate to major.

Roads

In all alternatives, maintenance of nearly 137 miles of road by the refuge and 90 miles by the counties would reduce soil erosion and loss. During wet seasons, unmaintained roads often become rutted and braided resulting in short-term and long-term effects from soil disturbance and erosion. Refuge-wide impacts to soils from roads are minor, but in localized areas, moderate to major impacts from soil erosion would occur. Under alternative C, several roads would be considered for all-weather access (graveled), and one road (Knox Ridge) would be considered under alternative D. Properly maintained, all-weather access roads could reduce rutting and braiding and soil disturbance over the length of the road. Activities related to upgrading a road would likely increase the overall width of the road resulting in direct, short-term impacts to soils.

Camping

Under all alternatives, camping would be allowed along the river, in the primitive campgrounds the Service manages and most areas on the refuge. Motorized vehicles must stay within 100 yards of a road to camp. In a few popular camping sites or areas, there are varying levels of impact from minor vegetation loss to denuded vegetation, soil compaction, and soil erosion and loss.

Public Use Facilities (excluding roads and camping areas)

Currently under alternative A, there are only a handful of facilities such as kiosks, hunting blinds, pullouts, and few new facilities that would be built. Under alternative B, there would be a 5–10 percent increase in new facilities as compared to alternative A. In alternative C, there would be a 5–15 percent increase in new facilities, and under alternative D, a 10 percent increase. In alternatives C and D, a science and/or interpretive center with parking facilities would be built at the Sand Creek Field Station. This would require soil excavation, grading, and other surface disturbances. Temporary increases in soil erosion would occur during construction of new facilities, resulting in direct, short-term impacts to soils. The anticipated footprint of soil disturbance for the science or interpretive center would be about 1-3 acres within the Sand Creek complex. Long-term losses in soil productivity could occur from construction of visitor-related structure. The effects from these activities on soils would be negligible considering the small area that would be affected compared to the size of the refuge.

Management of Cultural and Paleontological Resources

Effects on soils from excavation of cultural resources during surveys would be temporary and negligible as most areas are already disturbed or eroded. As with public use facilities, under all alternatives, the excavation of paleontological resources (refer to paleontological resources in chapters 3 and 4 and later in this chapter) would result in direct, short-term increases in soil disturbances during any digging of fossils. Large equipment would be used. The footprint of soil disturbance would vary by the size of the dig but would be limited to the area needed for the dig and estimated to be less than a few acres. Effects from these activities on soils would negligible considering the small area that would be affected. In the foreseeable future, most excavations would occur in central portion of refuge in the Hell Creek formation where fossils are often exposed. In localized areas, there would be temporary increases in soil erosion, but permittees would be required to reclaim areas. As compared with alternative A, under alternative C, an increase in opportunities for research would increase the area of soil disturbance.

Conclusion

In all alternatives, the Service's restoration of 15 former agricultural fields would cause short-term minor disturbances of soil resources, followed by long-term minor benefits. The use of prescribed fire in all alternatives would result in short-term, localized soil erosion and loss due to the temporary loss of vegetation. These short-term effects would be negligible for alternative A, and minor under alternatives B, C, and D. Large wildfires would likely lead to greater soil erosion and loss due to greater fire severity and vegetation loss compared to prescribed fires. The potential for severe major effects would be greatest under alternative A, while alternatives B, C, and D would use prescribed fire more lightly across the landscape to produce a patchwork effect for vegetation.

Impacts from livestock grazing on soils would continue in areas where annual grazing was used, and would be reduced in areas under prescriptive grazing. Alternatives A and C would continue to have moderate to major impacts to soils in some areas, with long-term improvement in areas under prescriptive grazing. Under alternatives B and D, improvements from prescriptive grazing would be greater.

The Service would continue to provide for a number of public use activities including road access, camping, and fishing that would negatively affect soil resources. Under all alternatives, these general refugewide effects would be minor, but in some localized areas, moderate to major negative impacts would continue to occur from roads, camping areas, and heavily used fishing areas. Construction of a science center or interpretive center at Sand Creek Field Station would result in temporary increases in soil erosion during any construction, with negligible long-term effects. Cultural resources and paleontological excavations under all alternatives would result in localized soil disturbances. The overall effects on soils would be negligible.

Mitigation

The Service could minimize losses in vegetation and subsequent soil disturbance and loss by ensuring that the best management practices were followed during construction activities, restoration of the river bottoms, or excavation of paleontological resources. Better definition of popular campsites or fishing areas or hardening sites would limit soil impacts from these public use activities. Planning for these actions should be incorporated into the visitor service's step-down plan and the transportation plan.

Similarly, by managing grazing areas with prescriptive grazing or reducing annual grazing to lighter grazing levels, limiting livestock grazing during the hot season and fencing cattle out of riparian areas, the Service would minimize soil erosion and loss over the long term.

Permittees for paleontological excavations would be required to reclaim areas.

EFFECTS on WATER RESOURCES

Effects on water resources were evaluated based on existing information on the distribution and quality of water at the refuge and potential for refuge activities to impact water resources.

Water Development, Water Rights, and Water Quality

Currently 215 reservoirs designed to store about 705 acre-feet have been developed across the refuge (refer to chapter 4). Under all alternatives, select stock ponds would be maintained and rehabilitated although the number and schedule would vary by alternative. Riparian habitat would be restored where possible and standard watershed management practices would be enforced. Water rights would be adjudicated and defined. Under alternative B, the Service would work to restore water quality for fish and wildlife habitats by addressing soil erosion from livestock and wildlife grazing and public use activities. Under alternative C, future water developments would be allowed on site-specific basis and consideration of effects. Alternative D would encourage more natural water development within streams such as increased flow, pools, and beaver ponds. The Service would assess the uses and needs of current reservoirs and restore the hydrologic condition of those reservoirs when they were no longer needed for wildlife or livestock. Additionally, the Service would work with others to restore dynamic hydrological processes where possible.

River Bottom Restoration

All alternatives except B would restore the 15–17 river bottoms (former agricultural fields) although the timing would vary. In localized areas during restoration activities, particularly under alternatives B and C, planting crops for reduction of invasive plants could result in short-term, direct negative effects on water quality in the Missouri River particularly if herbicides were applied to large areas. Given that current water quality monitoring indicates few problems (refer to chapter 4), and the Service judiciously applies all herbicides, any negative effects would likely be short term and negligible overall. Using best management practices during restoration activities would limit any potential impacts to water quality.

Riparian Area Restoration

Healthy riparian systems enhance water quality by filtering out organic and chemical pollutants (Ehrhart and Hansen 1997). Water quality is closely related to soil erosion and sedimentation. These can be associated with vegetation cover, concentration of livestock grazing, and geologic erosion. High concentrations of sediment loads, and fecal coliforms can have a major impact on altering an existing stream ecosystem or even creating an entirely new ecosystem (Kauffman and Krueger 1984).

Many streams on the refuge are intermittent, lasting only a short time. Under all alternatives, any restoration activities would be conducted when streams are dry or minimal flow to minimize the direct introduction of sediments. Planned revegetation and stabilization of the stream channels would reduce the potential for stream sedimentation during precipitation events. Additional benefits from improved streamside habitat conditions would include bank stabilization and the retention and removal of sediments and pollutants from the water.

Invasive Species

Herbicides would be used under all alternatives for invasive species management. The Service implements its invasive species program in a variety of habitats including areas where there are water impoundments or riparian areas. Under all alternatives, the invasive species program would be carried out through an approved step-down plan. All person-

nel who use chemicals would be trained in the proper application of where, when, and how to apply them. All chemicals would be required to be safely stored and identified. Under alternatives B, C, and D, the Service would step up efforts to stop encroachment of saltcedar, Russian olive, and other invasive species. Short-term, negligible effects could occur to water quality due to soil erosion or sedimentation, but following required protocols would greatly limit the potential of influencing water quality downstream.

Livestock Grazing

Because this issue is closely connected with riparian health, it is addressed under riparian areas and wetlands in section 5.6 below and is not discussed further here.

Public Use

Construction activities involved in developing facilities, structures, parking areas, viewing blinds, or other facilities, in addition to existing public use activities could result in indirect, short-term effects to water resources due to erosion, sedimentation, and contamination. The extent of facility development and corresponding effects would vary among the alternatives with alternative A having the least potential for impacts with few if any new facilities built or developed. Alternative B would have a few new facilities (5 percent greater than alternative A), alternative C would have about 15 percent more, and alternative D would have about 10 percent more. Considering the relatively small amount of facility development and likely distance from water, the any subsequent effects would be negligible.

Conclusion

Activities related to river bottom restoration, riparian restoration, public use activities, and invasive species could result in negligible short-term effects on water quality.

Mitigation

By limiting the amount of bare soil, using soil erosion barriers, limiting the use of herbicides, hardening popular public use areas, and following other best management practices, the Service would reduce potential impacts on water quality as a result of areas any of its activities related to restoration, invasive species management or public uses.

CUMULATIVE IMPACTS on the PHYSICAL ENVIRONMENT

None of the proposed alternatives would result in cumulative effects on climate change, air quality, visual resources, soils, soundscapes, or water resources.

The long-term benefits of various management actions on global climate change may result in cumulative benefits when combined with current and future programs and initiatives, such as the Department of Interior Climate Change Initiative, to reduce carbon emissions and mitigate the effects of climate change on refuges. The overall cumulative benefit, however, would be negligible.

5.5 Environmental Consequences for Biological Resources

This section analyzes the effects of the actions on vegetation communities or habitats and the wildlife resources of the refuge. In general, it follows the organization of Chapter 4–Affected Environment.

EFFECTS on UPLANDS

Implementation of varying approaches to upland habitat management under the alternatives would result in a range of effects on the condition, structure, and function of upland vegetation.

All Alternatives

Both prescribed fire and wildfire have positive and negative effects, because different species of plants and wildlife respond differently to the effects of fire. The short-term negative effects of fire on a specific species are usually compensated by the long-term benefits to the overall plant and wildlife community.

Prescribed fires can be very labor intensive. Implementation of the alternatives would result in varying levels of equipment use and associated impacts. Prescribed burning in wilderness or proposed wilderness units would require using the minimum tool necessary to accomplish management objectives, per Federal wilderness policy. Impacts from prescribed fire would vary by project and by location, but would generally result in short-term, localized effects that would be offset by long-term benefits.

Wildfire is a natural occurrence that will continue to significantly alter the landscape of the refuge. Not all wildfire is unwanted or destructive. Naturally occurring wildfires would be managed for multiple objectives, and human-caused wildfires would be suppressed using tactics and strategies that result in the least damage to values at risk and costs while providing for firefighter and public safety. Fewer opportunities would be available in alternatives A and C, because most wildfires result in short-term negative economic effects to livestock grazing interests. All suppression efforts would be evaluated to ensure the least human impact on the natural resource as possible, while allowing for the timely control of the incident.

Management Approaches

The general effects of the management approach for uplands under each alternative are evaluated.

Alternative A. This alternative would maintain the current management emphasis of fire suppression, annual livestock grazing, invasive species control, and water development. The Great Plains evolved through a complex interaction of fire and grazing (refer to uplands in chapter 4), and the continued emphasis on constant grazing and fire suppression across the uplands would greatly limit the composition, structure, and functioning of vegetation, resulting in continued loss of plant diversity and habitat function (FWS 2001).

The past and present effects of current management are represented by existing conditions and are described in chapter 4. For example, fire-intolerant species such as big sagebrush and junipers have benefited at the expense of sentinel plants such as chokecherry, green ash, and golden currant. Likewise, grazing and fire suppression have reduced or locally eliminated palatable forbs. Upland habitats would be increasingly vulnerable to continued loss of palatable plant species, loss of ancient trees due to fuel buildup when fires occur, and increased insect and invasive plant infestations. These conditions are the result of more than 120 years of fire suppression and livestock grazing. While the management approach under alternative A would continue these conditions and their impacts over the long-term, the incremental effect of alternative A would be minor.

Alternative B. The Service would actively manage and manipulate wildlife habitat using both natural ecological processes and active management practices to promote target wildlife species. The target species would be primarily animals that are important game species such as elk, mule deer, bighorn sheep, pronghorn, sharp-tailed grouse, and sage-grouse. Different parts of the refuge would be managed for different species. This approach would improve the overall composition, structure, and functioning of habitat refuge-wide. However, the emphasis on managing for individual species may not result in improvements in biological integrity within individual habitat units and could be harmful to the habitat in some areas if overbrowsing continued.

The overall effects on habitat quality, integrity, and resilience would vary geographically based on the target species that are chosen and the management tools that are used. For example, using sporadic fire and grazing to manage habitat for sharp-tailed grouse, which use a broad range of habitat gradients, would likely result in more diverse and resilient areas that would provide for a wider range of other species. Areas managed for sage-grouse habitat, which is tied to a narrow range of habitat gradients, would become less resilient and would benefit few other species.

Some areas would require management practices that favor vegetative diversity, ecological processes, and sentinel species and would result in localized benefits. Other areas would continue management practices that emphasize grazing, fire suppression, and uniform grass production and would result in localized impacts and overbrowsing. Overall, this management approach would improve habitat conditions and habitat function and diversity, resulting in moderate long-term benefits to upland vegetation.

Alternative C. Under alternative C, the Service would manage uplands to emphasize wildlife-dependent recreation (primarily hunting opportunities or wildlife viewing) and livestock forage needs. The Service would implement a prescriptive grazing and pyric-herbivory program on appropriate habitat units. In most areas, the current management conditions and disturbance cycles (constant grazing and limited fire) would prevail.

This management approach would be similar to existing conditions, with additional emphasis on improving the uplands for wildlife and livestock grazing and balancing use by wild and domestic ungulates. This approach would more closely follow NRCS guidelines for improving grass cover and vigor, which promotes tall, productive grasses and provides the most forage for ungulates. The additional use of prescribed grazing, fire, and range condition monitoring would provide additional tools to reach desired rangeland conditions. These changes in rangeland conditions, however, would not necessarily translate to improvement in overall habitat resilience and diversity. Early successional species, including sentinel forbs and shrubs, would not be a management priority. Implementation of alternative C would result in minor long-term benefits for upland vegetation.

Alternative D. Under alternative D, the Service would mimic and restore natural processes on the refuge, managing for a diversity of upland plant species. This approach would restore the historical disturbance cycles of sporadic fire and grazing (pyric herbivory) and re-create the habitat conditions in which native species of plants and wildlife evolved and are most adapted.

Alternative D would incorporate a broad range of disturbance factors on the landscape, facilitating the development of a diverse and changing mosaic of habitat conditions with high heterogeneity. This approach is based on the resiliency concept, which is described in Chapter 3–Alternatives. For example, the combination of prescribed fire, prescribed grazing, and other active management techniques would likely result in an improvement in highly palatable shrubs (such as saltbush, winterfat, silver

sagebrush, and chokecherry) and forbs (such as purple prairieclover, dotted gayfeather, and Maximilian sunflower), as well as vigorous and diverse grasses. Specific management would be based on sentinel species monitoring.

This approach would not optimize vegetation conditions for livestock or any single wildlife species and would result in less area focused on uniform grass production. Instead, it would promote a dynamic and shifting mosaic of vegetation that provides a variety of vegetation at different successional stages, which ultimately supports habitat for a variety of wildlife species. Implementation of this approach would result in major long-term benefits for upland vegetation.

Livestock Grazing, Prescribed Fire, and Other Practices

The effects of achieving each alternative's objectives for grazing, prescribed fire, and other practices are evaluated below.

Alternative A. Some of the vegetation management objectives outlined in alternative A would benefit habitat conditions. Successful implementation of efforts to increase deciduous shrub quality and quantity through prescribed fire and plantings would provide minor, localized benefits. However, successful reestablishment of shrubs would be difficult due to grazing by ungulates (both wild and domestic), and the overall acreage goals are relatively small. The benefits on vegetation and habitat conditions would be negligible.

The gradual transition to prescriptive grazing under alternative A would result in long-term, minor benefits. While recent reductions in grazing numbers (AUMs) have already benefited vegetation in some locations, these benefits have not resulted in a recovery of sentinel plants and may be offset by increases in native ungulates. Additional fencing of one habitat unit and portions of the refuge boundary may result in minor to moderate benefits to vegetation in localized areas, but the overall effect on the refuge would be negligible.

The refuge would continue to burn about 525 acres of upland habitat per year. There would be short-term benefits to deciduous shrub quality and quantity, because fire initiates new, succulent growth, but overall benefits to habitat would be negligible due to the small acreage being treated. Livestock grazing would be restricted on prescribed burn units, but impacts from native ungulates on these isolated, small, patches would intensify as ungulates are attracted to new growth from burn areas. Prescribed burns would include areas of isolated and dense stands of ponderosa pine and Douglas-fir. Small portions of these areas would also be hand thinned. Benefits to forested areas would continue to be minimal as the acreages treated would be relatively small.

Alternative B. The implementation of a prescriptive grazing plan under alternative B for over half of the refuge lands would generally benefit vegetation conditions and the viability of sentinel species. This would be complemented by the removal of 25–50 percent of the interior fences, which would allow wild and domestic ungulates to access burned areas. This would benefit the burned area as well as the unburned areas that are allowed to rest. However, management of some localized areas may result in negligible to minor effects if the targeted wildlife species favors a single plant species or specific vegetative condition. For example, Baird's sparrow prefers tall vegetation, whereas mountain plover prefers short prairie grasses (refer to birds in chapter 4).

Once the patch-burning program was fully implemented, about 2,500 acres of upland habitat would be treated each year with prescribed fire. These burned patches would be purposefully located across the entire refuge and would have a significant positive effect on fire-adapted plants, fire-dependent plants, and highly palatable plant species. Formerly diverse upland communities would respond with an increased abundance of fire-adapted shrub species such as saltbush, winterfat, silver sagebrush, and gray rubber rabbitbrush. The current monoculture of relatively unpalatable and fire-intolerant big sagebrush would gradually diversify into a natural mosaic of heterogeneous plant communities, resulting in moderate, long-term benefits.

There are numerous old-growth stands of forest on the refuge. When feasible, the Service would thin the forest's volatile, fire-prone understory with mechanical treatment or prescribed fire, or both. Once treated, these stands would be less prone to be consumed by wildfire, which would preserve old-growth trees that in some instances exceed 750 years of age.

Douglas-fir and ponderosa pine have gradually encroached into what was formerly treeless needlegrass-wheatgrass prairie. Prescribed fire is the most cost-effective tool to set back this encroachment.

© Diane Hargreaves

Eastern Kingbird

Sites with the greatest encroachment would be targeted for prescribed fire and lower priority units would be treated by wildfire managed for multiple objectives. The use of prescribed fire would result in long-term benefits: supporting efforts to reestablish natural prairie; reducing highly volatile hazard fuel; revitalizing decadent, fire-dependent vegetation; and restoring the natural ecological process.

Alternative C. The prescriptive grazing program under alternative C, while less aggressive than alternatives B and D, would generally result in minor to moderate benefits to vegetation conditions, although the scale of the benefits would be more limited than the other action alternatives. Prescribed fire on habitat units with prescriptive grazing, as well as on those identified to have fair to poor range condition, would benefit the range conditions and some sentinel plants. This would be complemented by the removal of interior fences in areas where prescriptive grazing is applied. The combination of these factors would better establish ecological gradients and heterogeneity between the habitat units, benefiting the overall conditions and improving forage for both wild and domestic ungulates.

Habitat units with excessive fuel loading of grass, shrub, or forest would be evaluated for wildfire risk and, if compatible with management objectives, increased use by grazing ungulates would be allowed to reduce the fire danger. There may be some areas, such as heavily forested slopes, where prescribed fire or mechanical treatment may be the only option to reduce the risk. It would be important to strike a balance between the needs of wildlife and improved forage for livestock and lower fire danger. Effects would be positive for reducing fire danger and economic benefits to the permittee. There may be decreased plant vigor due to increased use but, under a prescriptive grazing program, this could be minimized.

Prescriptively grazed habitat units that are in fair to poor range condition would be rested to allow the vegetation to recover to the point that the units could be treated with prescribed fire. Once treated, grazing may be allowed but at a level that would promote species diversity and increased plant palatability, vigor, and heterogeneity. Because a permittee could be required to use other grazing units until rested units recover, this may have an initial negative effect on the permittee. However, the increased biomass production resulting from prescribed fire could be better used by grazing ungulates and should ultimately be a positive effect. Effects on native vegetation would be positive.

Alternative D. The effects of vegetation management objectives under alternative D would be similar to alternatives B and C, but would more aggressively promote biological diversity. The extent of prescriptive grazing (50–75 percent of the refuge) would be the same as alternative B and more than alternative C. However, a pyric-herbivory dynamic would be applied to the entire area where prescriptive grazing is used. The construction of boundary fencing and removal of interior fencing on 10–25 percent of the refuge would improve wild and domestic ungulate access to burned areas. If successfully implemented, the combination of these and other management approaches are anticipated to benefit upland vegetation over the long term.

Wildfire

As the northern Great Plains climate continues to change, it is expected wildfire frequency and intensity will increase. The past decade has produced the most intense and largest wildfires the area has seen since establishment of the refuge. Even though the northern Great Plains is an ecosystem that evolved with fire, historically, fires did not burn with near the intensity. This is mostly due to past grazing practices that reduced fine fuel (grass) and fire suppression, which resulted in a massive buildup of woody fuel from Douglas-fir and ponderosa pine.

The effects of achieving each alternative's objectives for wildfire are evaluated below.

Alternative A. Under alternative A, wildfires would increase in size and intensity as the natural fire regime continues to be altered. Large blocks of forest would most likely be eliminated. These conditions could result in moderate to major detrimental effects on vegetation.

Alternatives B and D. Wildfires would continue to increase in intensity and severity until the Service established a semi-natural burn mosaic across most of the landscape, which may not occur during the life of this CCP. Eventually, a seminatural fire-return interval would be established across the landscape, which would have a positive effect on fire intensity and severity. Wildfires would continue to occur, but with the gradual reduction of hazard fuel using prescribed fire and mechanical treatments, a natural mosaic of burned and unburned fuel would begin to appear across the landscape. This mosaic would limit the potential of wildfires to consume vast portions of the refuge during any one event. The refuge would use wildfire to benefit natural resources and to reestablish natural fire regimes. The short-term negative effects of wildfire would gradually change into a positive effect on species diversity, plant palatability, plant vigor, and heterogeneity.

Alternative C. With an increased emphasis on economic uses in alternative C, much of the forested habitat would see greater use by grazing ungulates. This would reduce the fine fuel that carries a fire but would also continue to alter the natural fire regime. Wildfire size and intensity should decrease as the fine fuel that carries a fire was significantly reduced

by grazing. However, this would also continue to dramatically alter the natural fire regime of the area and result in significant buildup of woody fuel. In the short term, the number of fires would decrease in intensity and severity. Eventually a wildfire would burn through these areas with considerably greater intensity than is normal, inflicting far more damage to the habitat. This was experienced on the refuge in 2003 and 2006 when more than 100,000 acres of refuge habitat (mostly dense stands of trees) were consumed by fire. These type of fires usually engulf entire landscapes and leave very little unburned mosaic; in addition, these fires consume practically all but the most isolated pockets of old-growth forest.

Water Impoundments

Artificial water impoundments—stock ponds and reservoirs—contribute to the degradation of nearby vegetation by facilitating the congregation of large animals and the development of radiating stock trails to and from these water sources. Alternative A would not change management of water impoundments, resulting in minor long-term impacts by allowing the current conditions to persist. The aggressive removal of almost all water impoundments under alternatives B and D would result in major localized benefits to vegetation near the impoundments. Under alternative C, long-term efforts to evaluate water impoundments for rehabilitation, removal, or new pond development would have a negligible to minor benefit on nearby upland vegetation.

Wildlife Management

The effects of achieving each alternative's objectives for wildlife management are evaluated below.

Alternative A. Continued management of big game populations under alternative A to achieve target levels outlined in the 1986 EIS record of decision could contribute to long-term impacts to some sentinel forbs and shrubs. Monitoring at some sites has indicated that wild ungulate populations have exacerbated the effects of livestock grazing on highly palatable forbs and shrubs or have offset the gains made by reduced livestock numbers. If ungulate population targets are based on habitat condition (such as the "good to excellent condition" expressed in the objective) these effects could be reduced. Overall, continued big game management under alternative A would result in minor, incremental impacts to upland vegetation.

Alternative B. Under alternative B, the effects of wildlife management objectives on vegetation would vary based on the habitat and needs of target species. Wild ungulate objectives could result in minor benefits to habitat conditions if they were successfully implemented in concert with prescriptive grazing plans and meeting habitat needs of target species. Unsuccessful implementation of those objectives could result in minor to moderate negative effects to vegetation in localized areas due to overgrazing by all ungulates. The elimination of predator control in alternative B potentially could benefit vegetation if the uncontrolled predators reduced ungulate numbers, thereby reducing wild and domestic grazing pressure.

Alternative C. The wildlife management objectives in alternative C, which seek to maintain a balance between big game and livestock numbers, would result in minor benefits to upland vegetation conditions if they were successful. However, it would be difficult to achieve this balance because of the competing and additive demands of wild and domestic ungulates for the same forage, and the differences in scale at which MFWP's big game objectives and the refuge's grazing targets are set. Therefore, the implementation of wildlife management objectives would likely result in upland vegetation conditions that are similar to existing conditions (negligible long-term effects).

Alternative D. Wildlife management in alternative D would complement the vegetation management approach. Big game population targets would be managed to promote ecological resilience while minimizing impacts on sentinel plants. This would provide a comprehensive approach to total ungulate (wild and domestic) use. This management approach to wild ungulates would contribute to the overall benefits to upland vegetation. However, it could be difficult to effectively limit big game populations through hunting if major reductions were necessary. The elimination of predator control would help limit big game populations.

Expansion of prairie dog populations would improve the overall diversity of upland habitats and would provide another disturbance factor that would increase diversity and heterogeneity. Under alternative A, prairie dog populations would be able to expand up to 10,000 acres, resulting in minor benefits. Under alternatives B, C, and D, the Service would more actively seek to expand prairie dog colonies to at least 10,000 acres, resulting in moderate benefits to upland vegetation diversity.

Invasive Species

Much of the upland areas have not been mapped for invasive species as much of the treatment efforts have been focused along the river corridor. The Service would continue mapping for invasive species along roads, running the weed wash station in the fall, and requiring horse users to use weed-seed-free hay. Many of these existing preventive actions would continue to benefit upland areas by prevent-

ing and detecting large infestations from occurring. Under alternatives B, C, and D, the Service would increase its detection and treatment efforts of invasive species in the upland areas.

Roads and Access

While the existing 670 miles of road are important for administrative, recreational, and emergency access, excessive roads can fragment vegetation and provide conduits for invasive plants. The effects of fragmentation are more important for wildlife, but should nonetheless be considered for vegetation. The effects of achieving each alternative's objectives for access are evaluated below.

Alternative A. Alternative A would maintain the current number of roads, resulting in negligible effects over the long term.

Alternative B. The closure of about 106 miles of road under alternative B would result in moderate benefits to vegetation in areas adjacent to the closures. Once closed, most roads recover without restoration. While the actual proportion of total roads to be closed would remain small, the selected closures would restore large blocks of unfragmented vegetation and habitat. Closing roads could have impacts in localized areas from overbrowsing if harvest objectives are not met. Working with MFWP before implementation of road closures or allowing for game retrieval could limit those impacts.

Alternative C. Efforts to expand recreational access and upgrade roads and facilities would result in localized impacts to vegetation next to the improvements. The overall effects on upland vegetation, however, would be negligible.

Alternative D. The beneficial effects of 23 miles of road closures would be similar to alternative B, but less extensive. Benefits from road closures could be slightly diminished by invasive plant infestations if roads were unsuccessfully restored. As with alternative C, improving the Knox Ridge Road would result in some localized impacts to vegetation, but overall the impact to the area would be negligible. Allowing access on closed roads outside of proposed wilderness areas for game retrieval would allow for harvest objectives to be met, benefitting upland habitats.

Conclusion

Implementation of alternative A would continue the current management approach and vegetation conditions, resulting in minor, short-term, incremental impacts. However, the long-term implications would be moderate to major impacts on upland habitat composition, structure, and function.

Alternative B effects would vary depending on the target species that are chosen for each habitat unit. Some areas would have moderate to major benefits, while benefits to other areas would be negligible. Overall, the implementation of alternative B would result in long-term moderate benefits to upland habitat composition, structure, and function.

Alternative C would result in minor benefits to upland habitat composition, structure, and function over the long-term.

Alternative D would benefit habitat conditions and the viability of sentinel species and promote biological diversity and integrity. Implementation of alternative D is anticipated to result in long-term, major benefits to the composition, structure, diversity, and function of upland habitats.

Mitigation

Several measures have been built into the alternatives to mitigate for impacts to upland areas from excessive livestock or wild ungulate grazing. The Service would implement a more comprehensive monitoring program in order to fully assess impacts on plants by all ungulates. Moving toward a greater reliance on prescriptive grazing, particularly in alternatives B and D, and to a lesser extent in alternative C would help to limit impacts. Controlling the numbers of ungulates (domestic and wild), using fire to move ungulates to other areas, reductions in livestock grazing, expanding boundary fencing, removing fencing, and management of water structures are all examples of measures that would be incorporated into the plan.

EFFECTS on RIVER BOTTOMS

Figure 20 in chapter 4 identifies the river bottoms that would be restored.

All Alternatives

The establishment of healthy, native plant communities is the best long-term defense against invasive weeds (Riley and Wilkinson 2007). While it is nearly impossible to eliminate all invasive plants, the planting of native forbs, shrubs, and grasses combined with ongoing monitoring and spot treatments would eliminate many of the large monotypic weed patches that currently exist in many river bottom areas. By planting and cultivating native plants, additional seed sources will also be available for the spreading of seeds to other locations. reestablishment of healthy native plant communities would benefit the ecosystem and a suite of native bird and wildlife species.

River bottoms tend to be fire-exclusive environments by their very nature. Subsurface moisture allows for greener, lush vegetation, which restricts fire development and growth. Great Plains cottonwoods are easily killed by low intensity fire and these areas would not be targeted for prescribed burning and would not be negatively affected. The river bottoms that were farmed in the past are now infested

with invasive plants. Prescribed fire would be used in these units to prepare the seedbed for planting of native vegetation.

Alternative A

The initiation of five to seven restoration efforts in the river bottom would benefit these habitat areas by improving native species composition, habitat resiliency, and the historical character of these plant communities. However, these benefits would be limited to the areas that are successfully restored. The minimal commitment of resources and personnel to river bottom restoration in alternative A could lengthen the timeframe and ultimately reduce the success of restoration efforts. Untreated areas would likely continue to be overtaken by expanding invasive weed patches, which would ultimately increase the rate of spread and the cost of restoration. Overall, alternative A would result in minor to moderate benefits to river bottom habitats.

Alternative B

Seed removal and planting of wildlife food crops or agricultural crops such as alfalfa would benefit affected areas by reducing or removing weeds by competing with weeds for resources and space. These plantings would also provide wildlife value, particularly for large ungulates.

The planting of nonnative monoculture crops could reduce the plant diversity in some areas, reducing available habitat for some bird and wildlife species. The attraction of wild ungulates to these areas could also exacerbate impacts to nearby riparian areas. The reapplication of herbicide, and the need to replant cover crops over time could provide opportunities for invasive plants to reinvade the bottomlands over time, reducing the long-term effectiveness of these efforts.

USFWS

White-tailed Deer

Overall, weed reduction efforts outlined in alternative B would result in minor to moderate benefits to river bottom habitats.

Alternative C

The effects and benefit of river bottom restoration through partnerships with cooperative farmers in alternative C would be similar to alternative B, with some exceptions. Cooperators would plant river bottoms to nonnative corps for multiple years to make it profitable (and to reduce or eliminate invasive plants), and would then plant to native forbs and grasses. One of the main benefits of this approach is that the first step of the process (planting economic/cover crops) would occur more quickly since the cooperators would do most of the on-site work using their own equipment. It is not clear how long it would take to successfully implement the second step of the process (planting native forbs and grasses).

In addition to the negative effects described under alternative B, the restoration approach proposed under alternative C would result in the need to apply herbicide over the entire area at least twice—once to remove invasive plants before planting crops, and again to remove the crops before planting native seeds. Another drawback would be the increased number of wild ungulates that would be conditioned to frequent planted areas. Besides the subsequent impacts on nearby riparian areas, the continued browsing and grazing of wild ungulates could also decrease the chances of survival of newly emerging native plants.

Overall, the alternative restoration approach outlined in alternative C would result in minor to moderate benefits to river bottom habitats over the long term.

Alternative D

The bottomland restoration efforts in alternative D would be similar to alternative C, but with a less aggressive approach. These efforts would result in minor benefits to river bottom habitats over the long term.

Conclusion

Each of the alternatives would use a different approach to treating river bottoms, and all would result in minor to moderate benefits to river bottom habitats over the long term. The minimal commitment in alternative A would lengthen the timeframe for restoration. Alternative B would have a more comprehensive and aggressive approach, although the application of herbicides and the planting of cover crops could provide opportunities for invasive plants to reinvade the bottom lands, reducing long-term effectiveness. The effects of implementing alternative C would result in the need to apply herbicides several times. Alternative D would be similar to C but would involve a less aggressive approach. While each alternative differs in its approach to restoration, all alternatives would result in minor to moderate long-term benefits to river bottom habitat.

Mitigation

Mitigation measures are primarily discussed under soils. Adhering to best management practices in disking, tilling, and applying herbicides would limit impacts from restoration of river bottoms.

EFFECTS on RIPARIAN AREAS and WETLANDS

The effects on riparian areas were assessed as part of the Service's work with the Riparian and Wetland Research Program.

Method Used to Analyze Effects

Sources of information used to assess the level of impact on riparian areas included (1) scientific literature on the effects of management activities of riparian areas, (2) site-specific assessment of the refuge's riparian areas, and (3) professional judgment of refuge biologists and other professional biologists and ecologists familiar with the refuge's riparian areas. The Service also consulted with members of the National Riparian Service Team, an interagency effort to accelerate riparian restoration primarily in the Western United States. Ultimately, the Service contracted with Paul Hansen, a riparian ecologist who worked with the National Riparian Service Team in developing a functional stream analysis, to conduct a follow-up riparian assessment. Hansen had previously evaluated riparian communities on the refuge in the mid-1990s. Information from Hansen's assessment in 2009, in addition his work in the mid-1990s was used in the effects analysis. Past and current riparian assessment and monitoring efforts are described in chapter 4.

Invasive Species

The localized short-term effect of invasive plant management may be a moderate negative trend in riparian health with the initial removal of "cover" to trap sediment. If restoration occurs, the long-term effect with restoration may be a minor to moderate positive effect on riparian health. Much of the gain in health rating on riparian areas refugewide due to increased vegetation cover is offset by the further invasion of invasive plants (Ecological Solutions Group 2009).

Water Impoundments

Artificial water impoundments (stock ponds and reservoirs) provide for alternative watering sites away from riparian areas releasing these areas from impacts of large animals. However, impoundments also contribute to the degradation of riparian health downstream by preventing and reducing the flow regime. Precipitation and runoff levels would determine the amount of sedimentation deposition below the impoundment, building a floodplain on which riparian vegetation may establish and capture more sediment. Improvements to the water impoundment, including additional woody species along a portion of the edge, could have a moderate positive effect on riparian wildlife species that use lentic wetlands (Pilliod and Wind 2008, Taylor and Tuttle 2007).

Alternative A. Alternative A would not change management of water impoundments, resulting in minor long-term effects by allowing the current conditions to persist.

Alternatives B and D. The aggressive removal of almost all water impoundments on the refuge in alternatives B and D would result in major to moderate localized benefits for riparian habitat surrounding the existing impoundments. Immediate effects include increased in-stream water flow, sedimentation, and floodplain building. Restoring hydrologic function of streams and drainages would have a moderate to major benefit for riparian areas that are affected by altered hydrology. These benefits would also result in moderate positive benefits on riparian wildlife species that use lotic wetlands such as beaver.

Alternative C. Under alternative C, long-term efforts to evaluate existing water impoundments for rehabilitation, removal, or new pond development would have a negligible to minor benefit on riparian health, compared to existing conditions.

Livestock Grazing

Alternatives A, B, C, and D all include livestock grazing at varying levels. Livestock grazing in riparian areas affects water quality, stream morphology, hydrology, soils, streambank vegetation, and aquatic and riparian wildlife (Belsky et al. 1999, Hansen 1992, Kaufman and Krueger 1984). A livestock grazing management strategy designed for an area should be tailored to the conditions, problems, site potential, objectives, and livestock management consideration on a site-specific basis that will best meet the resource needs. Hansen (1992), Meehan and Platts (1978), and Platts and Wagstaff (1984) found no grazing system that was compatible with healthy aquatic ecosystems.

Riparian health assessment surveys in 1995 and 1997 indicated the riparian areas across the refuge on average were not functioning (Cook et al. 1996, Parker and Hansen 1996, Thompson and Hansen 1999). Hansen (1992) stated that livestock grazing is a compatible use in riparian-wetland areas only when the functions of the riparian system guide the development of the grazing strategy. This includes sediment filtering, bank building, water storage, aquifer recharge, energy dissipation, potential of the site, and the needs of the riparian vegetation. Riparian areas grazed without above considerations have a major negative effect (Belsky et al. 1999, Kaufman and Krueger 1984, Hansen 1992). Management changes since the 1985 EIS include a significant reduction

in AUMs refugewide and the construction of fences along the Missouri River and other streams across the refuge. Excluding livestock from riparian areas using fencing has allowed riparian areas to improve, thereby increasing riparian function (Ames 1977, Duff 1983, Hollow et al. 2001). However, if cattle were not excluded from other riparian areas, then any benefits of the exclosures to riparian areas would be negligible due to increased use by native ungulates (Miles 2006).

Alternative A. Alternative A would maintain the current management approach of annual livestock grazing and water development. The past and present effects of the current management regime are represented by existing conditions and are described in chapter 4.

Based on 2009 surveys completed on most of the same locations as in 1995–7, riparian health on the refuge has improved over the past 14 years with most of the improvement seen in the soil and hydrology. Implementation of alternative A would improve riparian habitat in general, but localized sites could continue to experience a negative trend. The 2009 survey shows the current trends to be improving in some areas with no livestock. An example of this is in the UL Bend refuge where 100 percent of the area was rested and the riparian health assessment increased 58 percent from nonfunctional to healthy (Ecological Solutions Group 2009). However, if AUMs are reduced but cattle are not fenced out of riparian areas then no change in riparian health would be expected and a negative trend would occur. This is evident in the area between Rock Creek (east) to Fort Peck Dam where total AUMs in the habitat units decreased slightly but the riparian health assessment decreased 24 percent from healthy to functioning at risk.

Overall, the continuation of current grazing management practices under alternative A would result in negligible to minor incremental benefits to riparian habitat areas over the long term. However, some localized areas would continue to decline, resulting in moderate long-term impacts to some riparian areas.

Alternative B. Under alternative B, the Service would actively manage and manipulate wildlife habitat using both natural ecological processes and active management practices to promote specific target wildlife species.

The potential benefits of implementing prescriptive grazing across 50–75 percent of the refuge and fencing riparian areas are moderate refugewide, but potentially could vary from major to negligible benefits at local sites. Fencing cattle away from the river and shorelines would have a moderate to major benefit on riparian habitat. The woody draws from Rock Creek (east) to Fort Peck would experience major long-term benefits due to fencing along riparian areas. However, excluding livestock from riparian areas could potentially have a long-term impact on upland sites as wild and native ungulates are displaced (refer to uplands above).

Elk are an example of the target wildlife species under alternative B. The Service would actively manage and manipulate elk populations at the highest levels possible. These potential increases in elk populations could offset the benefits of livestock management on riparian habitat due to increased elk browsing. An example of this is the Slippary Ann Elk Viewing Area, where, during the fall, hundreds of elk gather for a few months. The short-term impact is moderate and may be major over the long-term.

The effects from aggressive restoration along 50 percent of streams would depend on precipitation, site potential, fencing, and prescriptive grazing (Ecological Solutions Group 2009). The short-term benefits to the refuge as a whole would be moderate with possible long-term benefits being major for previously degraded, currently nonfunctioning areas. However, the benefits for an area that was functioning at risk could be minor or negligible. The long-term benefits could be major with an increase in vegetation capturing sediment for floodplain building.

The benefits of increased monitoring would be major if prescriptive grazing occurs in the monitored area. If negative effects are found, rapid adaptive management can occur, lessening the impact. A few weeks of unauthorized use or overgrazing could set back years of progress in improvements of riparian-wetland systems (Duff 1983). A few head of unauthorized livestock throughout most of the hot season would negate any positive riparian-wetland habitat response (Myers 1981).

Overall, the implementation of livestock grazing management objectives in alternative B would result in moderate, long-term benefits to riparian habitats refugewide. However, some localized areas could continue to be degraded and increased browsing by wild ungulates could offset some of the benefits.

Alternative C. Under alternative C, the Service would manage riparian habitats to emphasize wildlife-dependent recreation (primarily hunting and fishing opportunities) and livestock forage needs. Prescriptive grazing would be gradually implemented on up to 50 percent of the refuge. The overall management approach for alternative C would be similar to existing conditions (alternative A) in areas with annual grazing and similar to alternative B where prescriptive grazing is implemented. The effects of these approaches on riparian habitat would be similar to alternatives A and B, depending on where prescriptive or annual grazing approaches are used.

Alternative D. Under alternative D, the Service would mimic and restore natural processes on the refuge, managing for a healthy riparian area. Prescriptive grazing would be implemented on 50–75 percent of the refuge. Actions are the same as alternative B only the magnitude of the effects may be different. Overall, alternative D includes a more aggressive approach to riparian habitat protection and management, and therefore the long-term benefits would be greater, ranging between moderate to major.

Wildlife Management

Under all alternatives, continued management of furbearer, threatened and endangered species, fish, reptiles, amphibians, small mammals, and most birds would have no effect on riparian areas.

Alternative A. Continued management of big game populations under alternative A to achieve target levels outlined in the 1986 EIS record of decision may result in minor, incremental impacts to riparian health, due to increased grazing and browsing pressure on riparian habitat areas.

Continued management for bald eagle migration habitat and to improve or maintain riparian habitat are moderate refugewide, but potentially could have varied benefits to local sites depending on site potential, restoration techniques, and precipitation.

Alternative B. Under alternative B, the effects of big game management objectives on riparian health would vary depending livestock management and spatial interactions between wild and domestic ungulates and riparian habitat. This could result in minor benefits to riparian habitat conditions refugewide with varied localized effects. If wolves were to naturally recolonize the refuge, the presence and management of wolves on the refuge would provide predation pressure on wild ungulates, which would benefit riparian health by potentially reducing wild ungulate grazing pressure in some areas. If bison were reintroduced to the refuge, their presence as another large ungulate could result in negligible to minor effects on riparian health. Restoring riparian habitat in the tributaries in an effort to promote furbearers could result in moderate to major benefits to riparian health.

The effects of fish management objectives would be the same as those described above under water impoundments—short-term impacts followed by long-term benefits. Removal of fish passage impediments could result in minor to major benefits to habitat conditions.

Alternative C. The overall big game management objectives in alternative C would depend on livestock management and may result in minor, incremental impacts to riparian health refugewide with varied localized effects. The effects of bison or wolf management, should they occur on the refuge, would be negligible. The effects of fish management would be the same as those described above under Water Impoundments—negligible to minor benefits.

Alternative D. Big game objectives in alternative D would result in an incremental positive trend, with minor to moderate benefits to riparian health. The elimination of active predator removal and incorporation of wolf management objectives on the refuge would provide predation pressure on wild ungulates, which would benefit riparian health by potentially reducing wild ungulate grazing pressure in some areas.

The effects of management objectives for bison, furbearers, and fish would be the same as described under alternative B.

Roads and Access

While roads are important for administrative, recreational, and emergency access, excessive roads can disrupt natural drainage patterns when water is diverted and prevented from infiltrating into soils. Soil compaction increases runoff, soil displacement, and funneling of water leading to increased erosion. Impacts from roads result in introduced sediment into streams, snowmelt redirection and concentration, and surface flow production. Roads can affect both the volume of water available as surface runoff and the efficiency by which water flows through a watershed. More water and sediment in channels alter their physical structure, usually with negative effects on aquatic habitat. When culverts fail, large amounts of sediment can be delivered directly to the channel and from there down into lower streams potentially affecting sensitive fish habitat (Douglass et al. 1999). Indirect effects from roads on riparian areas include impacts to wildlife that use riparian areas, particularly reptiles, amphibians, small mammals and birds (refer to wildlife sections below).

Alternative A. Alternative A would maintain the current number of roads, resulting in negligible effects over the long term.

Alternatives B and D. The closure of about 106 miles of road on the refuge in alternative B could result in moderate refugewide benefits, though the effects to local sites would vary. Benefits from road closures could be slightly diminished by invasive plant infestations if roads are unsuccessfully restored. In alternative D, the beneficial effects of road closures (23 miles) would be similar to alternative B, but less extensive (minor benefit). Graveling Knox Ridge road in alternative D would have minimal impacts on riparian areas.

Alternative C. Under alternative C, efforts to expand recreational access and upgrade roads and facili-

ties on the refuge could result in localized impacts to riparian health in the immediate vicinity of the improvements. The overall effect on riparian health, however, would be negligible.

Conclusion

Under alternative A, the continuation of current grazing management practices would result in minor to moderate incremental benefits in some riparian areas over the long term. However, some localized areas would continue to decline, resulting moderate long-term impacts. The implementation of livestock grazing management objectives in alternative B would result in moderate, long-term benefits to riparian habitats refugewide. Some localized areas could continue to be degraded, and increased browsing by wild ungulates could offset some benefits. Alternative C would be similar to alternative A, but where prescriptive grazing occurred, long-term benefits would be similar to alternative B. Under alternative D, the actions would be similar to alternative B, but the magnitude of effects would be different. Alternative D would include an aggressive approach to riparian habitat protection and management, and the long-term benefits would be greater, ranging between moderate to major.

The continued use of water impoundments under existing conditions would result in minor long-term impacts to riparian areas under alternative A. Alternatives B and D, which would remove nearly all water impoundments would result in moderate to major localized benefits for areas surrounding the impoundments. Some rehabilitation of water impoundments would occur in alternative C having a negligible to minor benefit.

The continued management of big game populations in alternative A could result in minor, incremental impacts on riparian health due to increased grazing and browsing. The effects under alternative B would vary depending on spatial interactions between wild and domestic ungulates and riparian habitat. Under alternative C, impacts would be similar to alternative A and would depend on livestock management. Big game objectives in alternative D would result in an incremental positive trend in riparian health. Reducing active predator removal would provide predation pressure on wild ungulates, potentially reducing grazing pressure in some areas.

Alternative A would maintain the current road configuration resulting in negligible effects to riparian health. The closure of roads in alternatives B and D would have varied (minor to moderate) benefits to riparian areas. Alternative C would have negligible effects.

Overall, the long-term benefits to riparian habitat would be minor under alternative A, moderate under alternative B, minor to moderate under alternative C, and moderate to major under alternative D. In all alternatives, localized moderate impacts would still occur from grazing.

Mitigation

In addition to the mitigation measures discussed under soils, the alternatives incorporate several measures for mitigating negative impacts on riparian areas and wetlands from excessive grazing by livestock or wild ungulates. These include utilizing prescriptive grazing and fire for improved ungulate management, using exclosures to fence off riparian areas, rehabilitating stock reservoirs that are no longer needed, planting riparian species, strategic placement of salt or mineral blocks, establishing or improving off-stream watering sites, installing stable access points to limit streambank trampling, requiring permittees to keep livestock out of riparian areas, restoring beaver colonization, and monitoring impacts.

EFFECTS on SHORELINE

The USACE controls reservoir levels and has primary jurisdiction for management of the lakeshore areas. Most of the issues related to any action the Service would take that would impact shoreline areas are addressed under threatened and endangered species, invasive species management, uplands, river bottoms, and riparian and wetland areas. There would be some delineation of routes down to the river for public access when water levels were low (refer to fishing objectives, rationale, and strategies) but the effect on shoreline vegetation would be negligible.

Mitigation

No mitigation would be required.

EFFECTS on BIG GAME

Pronghorn, mule deer, white-tailed deer, Rocky Mountain elk, Rocky Mountain bighorn sheep, and mountain lion are addressed.

All Alternatives

The effects of management objectives for furbearers, threatened and endangered species, species of concern, birds or other wildlife would have minimal, if any, effects on big game populations under any of the alternatives.

The effects the alternatives would have on hunting opportunities and experience do not directly affect big game populations and are addressed under public use. However, under all of the alternatives, hunting and harvest levels would be a major factor affecting big game populations. Harvest levels can be adjusted more easily than weather or other factors that would also influence population levels. The aim would be to adjust harvest to achieve specified objectives under each of the alternatives.

Invasive Species. Management objectives for shorelines and working with the USACE to address habitat needs for threatened and endangered species and management actions to reduce invasive species will have negligible effects on big game populations. Overall, efforts to reduce invasive species and maintain/restore native plant communities will benefit big game species and other wildlife.

Fire. Overall, wildfire and prescribed fire would have negligible effects on big game animals. Animals do not flee wildfire as is commonly believed. When mortality of large animals does occur, it is usually from smoke inhalation in very large, very fast-moving fires. The refuge has experienced some fast-moving wildfires in the past, which have likely resulted in some animal mortality. However, documentation of mortality is very rare, indicating minimal overall effects.

The biggest effect fire has on wildlife is the change in their habitats. Wildlife habitats, like forests, are not static; they adapt and respond to disturbances as do other natural systems. Fire changes the proportion, arrangement, and characteristic of habitats across the landscape. Immediately after a fire, there can be temporary loss of food and shelter; animal populations may shift from species that prefer cool, moist conditions to ones that prefer warm, dry conditions. Unburned areas and adjacent burned areas result in a mosaic of habitats with a range of vegetative conditions in which wildlife can find food and cover (Forest Encyclopedia Network 2009).

Roads and Access. Existing road access would remain under alternative A and would result in few new effects on big game populations. However, if more hunters continue to access the refuge from the river, which has been a trend in recent years, there could be additional wildlife disturbance affecting use and movements by elk in some local areas. It is also well documented that roads and traffic during the hunting season affect big game movements and distribution (especially for elk) with animals avoiding roads. Less easily accessed areas may provide a degree of refugia for big game from hunters and allow more animals, especially males, to survive the hunting season. In addition, decreased road access almost certainly reduces poaching.

Road access objectives in alternatives B, C, and D intend to reduce or improve road access to some degree. Effects on big game would be expected to be commensurate with the degree of road access change. The amount of open roads under all of the alternatives provides sufficient vehicular access to the hunting public and essentially the entire refuge is open to hunting. Hunting season structure and length, combined with permit levels for some species, will have the dominant effect on big game populations regardless of road management changes that may occur under each of the alternatives.

Wilderness. Since the biggest difference in proposed wilderness units on the refuge and other areas is roads, any effects the adjustments to proposed wilderness units suggested in each alternative might have on big game populations would parallel effects outlined above for vehicle access via roads.

Grizzly Bear Management. Similar to wolves, in itself, the drafting of a grizzly bear management plan would have no effect on big game populations, but implementation of management strategies developed in the plan could have major effects on big game populations should grizzly bears colonize the refuge. Grizzly bears would likely replace a portion of big game mortality now attributed to hunter harvest, but the degree to which this would occur is unknown and speculative.

Alternative A

There would be no changes from current objectives and management practices for big game under this no action alternative. The big game density objectives that were established for native ungulates are thought to be well within habitat capacities for long-term population viability and allow for maintenance of or improvement in habitat quality. Continued management for habitat conditions and diversity that support healthy big game populations would also result in habitat conditions favorable for a wide range of other wildlife, especially migratory birds, many Special Status Species, and sharp-tailed grouse. Opportunities remain for expanding bighorn sheep populations into previously occupied habitat. Such expansion would restore a missing wildlife component to those areas and could provide additional recreational opportunities. Overall, wildlife management objectives under alternative A would result in minor benefits to big game populations.

Mountain lion presence or management was not considered in the 1986 EIS. With no changes proposed for management under alternative A, there would be negligible effects on mountain lion populations. Their abundance, distribution, population composition, and trends would remain unknown.

USFWS

A mountain lion on the refuge.

Habitat Management. The objectives for uplands, river bottoms, riparian areas and wetlands, shorelines and invasive species under alternative A would result in negligible effects compared to status or trends in big game populations that have always been variable and dependent on local conditions and management circumstances. Although a positive approach, the proposed objectives to increase the quantity and quality of shrubs on about 1 percent of the refuge over 15 years would have negligible effects on wildlife populations. The speed at which transition to prescriptive grazing progressed would determine its utility to achieve specified wildlife and habitat objectives.

Fire. Both prescribed and wildfire objectives under alternative A would continue current management strategies and resource protection policies. It is difficult to predict the effect fire alone may have on big game populations without specifics. The effects could be positive or negative depending on the situation, species, locale, previous management, disturbances, or other factors. Fire in some pine–juniper areas could dramatically reduce thermal cover that is essential to mule deer survival during severe winter weather. However, reduction of conifer cover in other areas may improve habitat suitability for bighorn sheep. There would certainly be immediate short-term effects depending on fire intensity and spatial extent in addition to intermediate and more long-term effects that would be complex and variable across the refuge. These same short- to long-term effects would apply to all alternatives.

Alternative B

With this alternative emphasizing big game abundance, management actions would strive to increase big game populations and distribution wherever possible within habitat limits. Such increases would necessitate reductions in livestock grazing to reduce competition and to provide adequate forage and space for native ungulates without adversely affecting habitat quality and conditions for other wildlife species.

Habitat objectives and monitoring on the refuge would be the primary guide for determining allowable big game population levels. As one tool to increase and sustain big game populations at higher levels, harvest rates would be reduced from current levels for some species. To achieve population composition ratios similar to a lightly hunted population, harvest intensity of males would be reduced from current levels, affording the opportunity for ecological processes to occur in a more natural fashion compared to the current heavy emphasis on harvest of the largest antlered males, especially for mule deer and elk. As indicated by habitat monitoring, population levels would be largely controlled through harvest of antlerless animals.

Alternative B objectives for bighorn sheep are consistent with current management. Ram harvest is comparatively conservative and ewe harvest or removal has been limited, as there remains suitable but unoccupied habitat where populations may expand. All elk hunting is currently by permit only and compared to bighorn sheep, harvest intensity is greater for elk. Comparatively, big game harvest pressure is greatest on mule deer as there are no limits on how many people can hunt in all but one small hunting district in McCone County. Portions of the refuge have a shortened season compared to adjacent lands, but there are no limits on mule deer harvest like there is with permits for elk, pronghorn, and bighorn sheep hunting.

Compared to current conditions, the consequences of adjusting harvest rates under this alternative would be minor for bighorn sheep, moderate for elk, and major for mule deer. These changes would generally result in populations and ecosystem processes more closely approximating naturally functioning systems as the current intense pressures to harvest the largest antlered males would be reduced. Although harvest opportunities for male elk and mule deer would be reduced from current levels, many would welcome such management for quality public land hunting. However, some members of the public and MFWP would find such a management approach unacceptable and would consider the limitations an unnecessary restriction on hunting opportunity.

When big game populations are managed for higher densities and near the carrying capacities of habitats, disease risks generally increase. Although chronic wasting disease has not yet been detected in wild cervids in Montana, the potential exists. Should chronic wasting disease present, high cervid populations would likely increase risk, incidence, prevalence and spread of the disease. Continued efforts to monitor for chronic wasting disease would benefit cervids by providing an opportunity for early detection and necessary mitigation (specified in the refuge's chronic wasting disease management plan), should it occur.

Other diseases such as bovine brucellosis, bovine tuberculosis, and paratuberculosis are not currently known to be present, but should they become an issue, management for high native ungulate densities would be counter to management needs to minimize such diseases. Because of the susceptibility of bighorn sheep to nearly complete die-offs from pneumonia and other diseases, there would be little change from current management practices that aim to keep sheep populations below carrying capacity in an effort to reduce risks to disease and maintain stable populations over the long term.

Success in coordinating big game surveys and research projects with MFWP would result in a better understanding of big game population dynamics, effects of harvest and native ungulate ecology in relation to other biotic and abiotic factors at a scale larger than the refuge. An improved understanding of natural ecological processes involving big game at a landscape scale would provide a better basis for management decisions and adaptive adjustments, and would result in major long-term benefits to big game.

There are no changes proposed for mountain lion management under alternative B, but there could be effects on mountain lion populations resulting from how native ungulates are managed. Management for abundant native ungulate populations would likely result in greater mountain lion abundance with more abundant prey compared to management under the other alternatives. In contrast, if the stated objectives for sentinel plants are not met, native ungulate populations may be reduced to low levels for a long time resulting in corresponding effects on mountain lion populations with limited prey availability. A consequence could be increased lion depredation.

In contrast to alternative A, there would be efforts to document mountain lion abundance, distribution, population composition and trends in an attempt to better understand their ecology and function in a larger landscape.

Overall, successful implementation of wildlife management objectives in alternative B would result in moderate benefits to big game species.

Habitat Management. The objectives for uplands listed under alternative B call for writing plans and developing monitoring approaches and would have no immediate effects on big game. Success in fencing boundaries and reducing "common" pastures would facilitate management actions that could promote habitat quality in support of big game populations. Compared to the other alternatives, the objectives for uplands under alternative B move most quickly to prescriptive grazing and that should reduce conflicts between livestock and native ungulates and be a benefit to big game. However, if the stated objectives for sentinel plants are not met, big game populations may be reduced to low levels for a long time resulting in moderate short-term effects on big game. Monitoring results would provide a feedback loop for evaluation of management actions and adopting adaptive management changes for the next iteration of attempts to improve habitat conditions and maintain abundant big game populations.

The objectives for planting food plots attractive to big game in previously cultivated river bottoms would likely benefit big game populations and could reduce conflicts with adjacent landowners by luring animals away from private land. With reduced landowner conflict, managing for greater big game populations levels may be possible.

Efforts to improve the health and function of riparian and wetland areas would benefit big game populations by providing additional high quality habitat, forage and flowing streams. Removal of reservoirs and restoration of natural hydrological systems would likely have multiple and complex effects on big game and would be variable, depending on the proportion of a watershed involved. Big game species did not evolve with the numerous constructed impoundments present today and their removal would move systems toward more naturally functioning processes. Both native ungulate and livestock distribution and use patterns would change with reservoir removal and it would take time for riparian systems to respond to changes in water flow patterns. With changes in ungulate foraging patterns over time (for example, more intensive grazing near remaining water sources and reduced grazing where reservoirs had been removed), vegetative communities would shift over time. In the long term, the result would probably be favorable for big game populations, but the extent and magnitude are hard to predict.

Overall, habitat management objectives in alternative B would result in minor to moderate benefits to big game.

Fire. Several objectives for prescribed fire in alternative B set priorities for areas to burn, areas not to burn, and development of plans. Until such plans are implemented, the effects of fire on big game populations would be the continued selection of resources and use of habitat by animals in response to ongoing vegetation succession. Those selection patterns would be the result and expression of a multitude of complex and changing influences that include human disturbance, previous fires, and livestock management practices on and adjacent to the refuge.

Alternative B includes an objective to develop a patch-burning system to treat at last 2,500 acres annually, which would be up to 40,000 acres over 15 years. It would be difficult to demonstrate the effects of such a system on big game populations, because there are numerous other variables involved. Several burns that were spatially distributed annually would be relatively insignificant, given the movements and home range sizes of most big game species. There could be some local effects—positive, neutral, or negative—on individuals, depending on the location and local situation. Considering that the density of mule deer on the refuge averaged about 6 per square mile from 2000–5, if the refuge reached the stated burn targets each year, annually those fires would affect at most 8 square miles on the refuge, and overall the effect on the refuge's mule deer population would be negligible.

Given the different life histories and ecology of the various big game species, burning would have both positive and negative effects depending on the species involved and specifics of the situation, locale, and site history. For example, applying prescribed fire to sagebrush and juniper could reduce habitat quality for wintering pronghorn and mule deer but could increase forage production for elk and bighorn sheep, depending on local conditions and surrounding land use and management practices. The fire objectives for hazard fuel reduction would have no effect on big game populations; the areas targeted for treatment are small and have an insignificant influence on big game populations compared to factors such as weather, harvest intensity, and tolerance for depredation of crops or grasslands on neighboring ranchlands.

© Diane Hargreaves

Pronghorn

Wolf and Bison Management. Under alternative B, wolf colonization would represent a step forward in ecosystem restoration and stewardship (Licht et al. 2010). Among the alternatives, wolves would likely have the most effect on big game, especially elk, mule deer and white-tailed deer under alternative B. Depending on established population level objectives, wolf predation would likely replace a portion of big game mortality now attributed to hunter harvest.

Should efforts to reintroduce bison materialize, adjustments in management and population objectives for other big game species may, or may not, be necessary. A detailed evaluation of how bison restoration may affect other resources is beyond the scope of this planning effort, but would be completed during a MFWP planning effort and framework development for the refuge.

Alternative C

In contrast to alternative B, management of big game populations would be geared toward maximizing sustainable harvest levels. As a result, populations would have younger age structures and sex ratios skewed toward females compared to management under alternatives B or D. A high priority would be given to adjacent landowner concerns about big game abundance, game damage outside the refuge and would likely result in management for big game densities below ecological carrying capacity. Adjustments of livestock grazing may be considered if the result could be greater opportunity for increasing the number of big game animals that could be harvested annually. As with all the alternatives, habitat monitoring would help guide appropriate population target levels. Wildlife management objectives under alternative C would result in moderate to major impacts to big game species and natural ecological processes as management would intentionally skew populations toward younger and female dominated populations to maximize harvests.

The effects of management under alternative C on mountain lion populations would likely be minimal as prey base management would not be much different from management under alternative A. Evaluation of establishing a hunting season for mountain lions is called for under this alternative. A prerequisite for creating a new hunting season would be collection of sufficient data to understand mountain lion abundance, distribution, population composition and trends that also provided a basis for responsible harvest management that assured the long-term sustainability of mountain lion populations. That monitoring data would provide a better understanding of mountain lion ecology than with no monitoring under alternative A. Should a mountain lion season become established, mountain lions would likely be managed for lower population levels than under any of the other alternatives in an attempt to minimize any livestock depredation issues.

Habitat Management. Similar to alternative B, the upland and river bottom objectives of writing plans and developing monitoring strategies would have no immediate effects on big game. The speed at which boundary fence is constructed to facilitate management treatments and transitioning to prescriptive grazing is slowest under alternative C, hence any positive results for big game populations would also be expected to be delayed. It is doubtful any meaningful relationships could be established between big game population responses to achievement of the specified upland forb and shrub objectives. Restoration of native vegetation to river bottoms would be beneficial to big game.

Riparian area and wetland management objectives under alternative C, which generally seek to restore degraded riparian areas and systems, would be generally favorable to big game populations. However, with the emphasis of managing riparian resources toward maximizing livestock grazing and meeting NRCS range conditions, more uniform distribution of grazing would be expected. With changes in water distribution and availability, livestock and big game distribution and foraging patterns would also be expected to interact and to change. With such changes (for example, more uniform forage utilization), vegetative communities would likely shift, but the extent and magnitude are hard to predict without specifics.

Development of additional water impoundments would hinder restoration of riparian areas and expand the distribution of livestock, resulting in negative effects on big game populations, depending on livestock stocking rates. The maintenance or creation of new reservoirs by itself would likely result in a negligible effect on big game populations in the absence of livestock grazing.

Habitat management objectives in alternative C would have negligible overall effects on big game populations.

Fire. With the prescribed fire objectives in alternative C being much less aggressive and taking place over a longer timeframe than fire objectives in alternative B, there would be minimal effects on big game populations for the same reasons discussed under alternative B above.

Wolf and Bison Management. The effects of wolf colonization and management under MFWP's wolf management plan on big game populations would be similar under alternative C. Wolves would be managed to minimize conflicts with livestock and for recreational viewing.

The concept of bison restoration in Montana is in its infancy, and MFWP has only recently begun preliminary scoping discussions and has not initiated a planning process. For these reasons, it is difficult to predict how bison restoration, if pursued, would affect big game populations on the refuge under a MFWP management plan as called for under alternative C.

Alternative D

Many of the environmental consequences of big game management under alternative D would be similar to those described under alternative C, but to a lesser degree. It would seek a more balanced approach that still achieves natural ecological function, natural density, and sex/age composition makeup of big game populations. This approach provides for reasonable recreation and harvest opportunities and fulfills the quality wildlife-dependent recreational use emphasis directives of the Improvement Act.

The main big game objective under alternative D calls for cooperatively developing population and habitat monitoring strategies with MFWP and establishing desired population and abundance levels. Successful accomplishment of the big game objectives under alternative D could result in big game populations meeting the Service's goal of increasing biological diversity and integrity, but numbers of ungulates would likely need to be reduced in some areas. Ideally, distribution and density targets would be tailored to ecological units and their ability to support native ungulates.

Additionally, alternative D would provide quality wildlife-dependent public uses and experiences. Management under alternative D would provide more recreational opportunity than under alternatives A and B, but less than alternative C.

The effects of limited mountain lion hunting would be similar to alternative C. If wildlife and sentinel plant monitoring indicates stable and robust populations, a limited mountain lion hunt would have negligible effects on the population.

Habitat Management. The upland, river bottom, and riparian area and wetland objectives for alternative D would strive to manage toward functional vegetative communities with the full compliment of native plant species and processes. Once achieved, such habitat conditions could be expected to support abundant big game populations, perhaps not unlike those described by early explorers, and a complex system of co-evolved flora and fauna. Such habitat conditions would result in moderate to major long-term benefits for big game populations, but could result in moderate short-term impacts for several years with reduced livestock and big game populations to reduce total ungulate herbivory until stated objectives for sentinel plants are achieved.

Fire. Although Frost (2008) used fire scar chronologies, vegetation, soil, and topography among other methods to reconstruct the approximate fire frequency on the refuge, the response of plants and ungulates in the diverse habitat types of the refuge is not fully understood; furthermore, there are multiple and competing perspectives on what the historical fire regimes were. Only well-executed monitoring of plant and animal responses to fires would lead to an assessment and better understanding of the effects of management actions such as patch burns and restoration of pyric-herbivory systems, which could alter forage selectivity and abandonment by animals or change the ecological resilience. The effects of fire management objectives on big game and other wildlife would vary by location, timing, fire behavior, and other factors and result in a negligible, short-term impact in some areas and potential minor to moderate long-term benefits.

The objectives for prescribed fire and wildfire in alternative D are similar to alternative B, although there would be a greater emphasis on patch burning in alternative D. As discussed under alternative B above, there would be few if any effects on big game populations directly attributable to fire.

Wolf and Bison Management. The objectives for wolf management and bison restoration potential under alternative D is the same as alternative B (develop a plan), hence the effects on big game populations would be the same as described under alternative B.

Conclusion

Under all alternatives, hunting and harvest levels would be the greatest factor affecting big game populations. Alternative A would continue current management with minor benefits. Alternative B would result in populations and ecosystem processes more closely approximating natural functioning systems, with moderate overall benefits for big game. Alternative C would result in moderate to major impacts to big game populations as natural ecological processes are intentionally skewed to maximize harvests. Alternative D would result in moderate to major benefits to big game, using a balanced approach to management.

With few changes in habitat management under alternative A, there would be negligible effects on existing big game populations that have always been variable and dependent on local conditions. Over the long term, habitat management objectives would result in minor to moderate benefits to big game under alternative B because of reducing livestock conflicts. Alternative C would have negligible effects. Similar to alternative B, alternative D would result in minor to moderate benefits to big game populations with a greater emphasis on prescriptive grazing. However, alternatives B and D could also result in moderate impacts if big game populations are reduced to achieve sentinel plant objectives.

Drafting of a wolf management plan or evaluating the potential would have negligible effects on big game populations. Should wolves colonize the refuge or bison be reintroduced, in the long term, there could be impacts on big game, and adjustment in management and populations could be necessary. Effects on mountain lion populations would vary by alternative, depending on big game and prey population levels and hunting opportunities–the overall effects would be negligible.

Overall in the long-term, alternative A would have minor benefits on big game populations, while alternative B would have minor to moderate benefits, and alternative D would have moderate benefits (health), although numbers could be reduced to improve diversity across the refuge. Alternative C would result in moderate impacts to big game populations.

Mitigation

Generally, mitigation would not be required under this alternative. However, under alternative B, because big game populations would be managed for higher densities, the potential for diseases being introduced into the herds increase. If this occurred, depending on the disease and its prevalence, mitigation measures could be necessary.

EFFECTS on FURBEARERS and SMALL PREDATORS

Furbearers include swift fox (discussed under species of concern), coyotes, beaver, muskrat river otter and mink, raccoons, badgers, and other small mammals.

Alternative A

There would be no changes from the current status or management practices for furbearer species under this alternative. Effects would be negligible. All furbearing species, excluding coyote, would remain protected from hunting or trapping. Protection from harvest should result in maximum abundance, if not already obtained.

Overall, current management practices would continue to benefit furbearing species by maintaining current upland habitat levels, restoring riparian habitat, continuing an active fire management program, and moving towards a prescriptive livestock-grazing program on some portions of the refuge. Riparian area restoration and protection would result in moderate to major benefits for all furbearer species; especially the beaver and muskrat (refer to riparian habitat above). Additional benefits would be expected for furbearer species that are currently below acceptable population levels (for example, river otter, beaver, and swift fox) by continuing to protect from harvest and by promoting range expansion. However, furbearer species currently at viable, self-sustaining levels (for example, badger and coyote) may remain relatively unaffected under this alternative.

It is unknown how predatory furbearer species would be affected by changes in grazing or changes in prescribed fire frequency. Certain prey species may benefit from these management objectives, but how they affect the predators is unknown.

Alternative B

In addition to alternative A, additional benefits would result from active reintroduction of species not currently found on the refuge or are considered rare (for example, swift fox and river otter). These benefits would be major and long-term for the affected species.

Alternative C

This alternative could promote sustainable harvest of furbearing species, which have been identified as

self-sustaining, through hunting or trapping for the sole purpose of maximizing public use opportunities. Harvesting of furbearer species currently protected would vary between minor and major, negative effects on the furbearer populations. Current regulations do not allow any take of furbearer species, except coyote, and thus are currently below or at maximum abundance. Any allowable harvest would lower current abundance and maintain the populations at minimum, self-sustaining numbers. A comprehensive monitoring program would be in affect to detect moderate impacts to any furbearing species to maintain a minimum, self-sustaining population.

It is unknown how predatory furbearer species would be affected by changes in grazing or changes in prescribed fire frequency. Certain prey species could be affected from these management objectives, but how they affect the predators is unknown.

Alternative D

Under this alternative, harvesting of furbearing species would be possible if populations were considered above acceptable levels (based on native habitat and food resources) or able to maintain a self-sustaining population with regulated harvest. This should result in a negligible effect on the selected furbearing species. A comprehensive monitoring program would be in affect to detect minor impacts to any furbearing species to maintain maximum abundance. Current management practices on the refuge allow only the coyote to be harvested and the other species remain protected.

Conclusion

Under alternative A, few changes would occur in the management of furbearers, and effects would be negligible. Additional benefits for furbearers would occur with the implementation of alternatives B and D, such as the active reintroduction of species not currently found on the refuge or are considered rare (for example, swift fox and river otter). These benefits would be major and long-term for the affected species. Alternative C could promote sustainable harvest of furbearing species that are currently protected, resulting in minor to major, negative effects to the furbearer populations. Harvest of furbearing species under alternative D would be based on acceptable population levels, resulting in negligible effects.

Mitigation

No mitigation would be necessary.

EFFECTS on BISON RESTORATION

Any proposal to move forward with a bison restoration endeavor would be conducted through another public process led by MFWP in which all of the associated issues regarding such a proposal will be thoroughly vetted. Hence, it is beyond the scope of analysis here to exhaustively address or evaluate all of the issues associated with a bison restoration proposal. The important aspect for the purposes of this CCP is to evaluate the environmental consequences pertinent to the refuge, realizing any restoration effort would be part of a separate and larger planning effort involving multiple partners.

Alternative A

Bison restoration was not addressed in the 1986 EIS. Given there are no objectives or strategies for bison restoration and management under this alternative, it is difficult to anticipate what environmental consequences may ensue. Should bison remain absent, progress in restoring ecological processes would remain incomplete. Should bison restoration materialize, ecological systems would move closer to full restoration and their presence would likely result in a host of subsequent effects that are difficult to predict. The range of environmental consequences with, and without bison presence, is more fully explored in the action alternatives.

Alternatives B and D

By itself, development of a collaborative bison restoration and management plan would not have any environmental consequences, but the contents and direction of that management plan would set the stage for subsequent environmental and social effects should a restoration effort be launched that involved the refuge.

Alternatives B emphasize the abundance of targeted species while alternative D emphasizes the diversity of all wildlife species. Bison restoration would bring back what was once a dominant herbivore and keystone species in the refuge landscape. Such a project would be consistent with the wildlife population emphasis of this alternative, a positive move toward restoration of natural ecological processes and would present the opportunity for enhanced wildlife-dependent public uses.

It is anticipated there would be changes in bovid herbivory patterns, and subsequent changes in plant and community responses, with bison allowed to range over relatively large areas compared to current domestic cattle management practices. It is hard to predict what those changes would be as they would be influenced by many as of yet undetermined factors (for example, bison population targets, size and location of areas managed for bison, fire frequency and distribution, topography, and previous land use and management practices). Even if those effects are currently unpredictable, it is reasonable to assume the interaction of bison with the other biotic and abiotic factors that affect natural ecological processes would be improved by the presence of

the dominant herbivore with which these systems evolved.

Alternative C

The environmental consequences on the refuge from a MFWP bison restoration effort would be determined by MFWP management guidelines. As there is currently no proposal being advanced, and those management guidelines have not been drafted, it is difficult to anticipate what the environmental consequences may be, as they would depend on many factors yet to be determined.

Given the public and economic use emphasis of this alternative, there would be an emphasis on promoting compatible public uses of bison (such as viewing and hunting) and minimizing influences of bison on other economic uses of the refuge (such as livestock grazing).

Although the presence of bison would move management toward more naturally functioning ecological processes compared to the absence of bison, such influences would be minimal and management efforts would focus on promoting public and economic uses with less emphasis on promoting restoration of natural ecological processes.

Conclusion

It would be unlikely that bison would be restored under alternative A. Under alternatives B, C, and D, the development of a collaborative bison restoration and management plan would not have any environmental consequences, but the contents and direction of that management plan would set the stage for subsequent environmental and social effects should a restoration effort be launched. Bison restoration would bring back what was once a dominant herbivore and keystone species in the refuge landscape. Such a project would be consistent with the wildlife population emphasis of alternative B and a positive move toward restoration of natural ecological processes under alternative D. It would present the opportunity for enhanced wildlife-dependent public uses.

Mitigation

Mitigation would not be necessary.

EFFECTS on BIRDS

This section addresses the effects on grassland birds, waterfowl, colonial-nesting birds, shorebirds, raptors, owls, and Neotropical migrants stemming from the actions in the CCP and EIS. This includes a discussion of riparian areas, invasive species, fire, grazing, public use and access, special management areas, and monitoring. Sharp-tailed grouse and sage-grouse are also addressed under wildlife resources and threatened and endangered species and species of concern.

© Diane Hargreaves

The long-billed curlew nests in wet and dry uplands.

Riparian Areas

Riparian areas are extremely important for birds because they not only provide cover and food but also serve as a seasonal water source particularly during migration and the brood-rearing stages. High plant species diversity, insect abundance and berries make both riparian and hardwood draw areas extremely attractive to grassland and migratory Neotropical birds. Grazing by domestic livestock or heavy browsing by elk directly impacts birds using riparian and hardwood draw areas by (1) reduction and elimination of vegetation layers (2) reduction and elimination of new replacement shrubs and trees in riparian and hardwood draw areas; and (3) reduction and elimination of seed and fruit production as well as the insects that depend on the green parts of highly palatable plants.

Although the refuge has fenced livestock out of many riparian areas, it has not been possible to fence livestock out of all areas, and in localized areas under all alternatives, there would be a continued loss of shrub layers and overstory recruitment, which is important for birds. The specific effects of the alternatives would correspond with the effects of grazing on riparian habitat: minor to moderate incremental benefits for alternative A, moderate long-term benefits for alternative B, variable for alternative C, and moderate to major long-term benefits for alternative D. In all alternatives, riparian habitats in some localized areas would continue to degrade due to grazing impacts.

Invasive Species

Birds require habitat containing a variety of plant species, variation in horizontal canopy cover, and

complexity in vertical structure. In contrast, invasive exotic infestations are often comprised of one species, mostly uniform in height and structure, and form a canopy coverage that is too dense (American Bird Conservancy 2009). As compared to alternative A, alternatives, B, C, and D would result in minor benefits due to increased efforts and partnerships to control invasive species and benefit bird habitat. The use of herbicides and pesticides to control invasive species could have some negative effects on bird populations, but judicious application would limit those effects (Partners in Flight 2000).

Fire

As with grazing, historically wildfire played a significant role in shaping the grassland ecosystem. Suppression of wildfires along with the changes in native ungulate and prairie dog grazing has changed this delicate balance to the detriment of most birds of the Great Plains (Vickery 2008). As described under uplands in chapter 4, constant fire suppression would likely result in negative long-term effects for many grassland birds that use the refuge.

Under alternatives B and D, the use of a patch-burning and prescriptive grazing scheme would benefit the greatest number of grassland birds by providing a mosaic of diverse habitats. The result would be an increase in diversity in both food and structure (Fuhlendorf et al. 2006) as compared to alternative A, which would benefit fewer species than alternatives B and D due to constant fire suppression. Managing for different levels of fire severity would also influence bird abundance and species. There would be fewer benefits for birds under alternative C, because there would be an emphasis on fire suppression to limit economic losses and would be a slower transition to prescriptive grazing.

USFWS

A sharp-tailed grouse presents his courtship display.

The season of burn is often an important variable for bird mortality during prescribed fires. Burns during nesting season appears to be most detrimental to birds and other small mammals, but this depends on the uniformity and severity of a burn. In forested areas, fire effects depend largely on fire severity (Lyon et al. 2000). Mortality of adult songbirds is usually considered a minor effect, but mortality of nestlings and fledglings does occur. Nest destruction and mortality of young have been reported for several ground-nesting species including sharp-tailed grouse, but long-term effects depend partly on their tendency to renest. In using prescribed fire on the refuge, careful consideration in the timing of fires and the type of habitat would minimize negative effects to bird species.

Grazing

Annual and prescriptive grazing by domestic livestock would occur under all alternatives and could result in short-term and long-term effects for grassland and other Great Plains birds, depending on timing and location (refer to chapter 3, Upland Objectives). Although understanding these effects is extremely complex, there are a number of direct and indirect negative effects associated with grazing (Bock 1993, Shackford 1996). Livestock grazing can result in the trampling of ground nesting bird nests, the removal of necessary cover for birds that require dense mid- to tall grass heights for nesting and winter habitat, and it contributes to a uniform landscape that supports fewer species of birds. Grazing can impact seed and fruit production as well as insect production which are important food sources for migratory and resident prairie birds. Interior fencing used in conjunction with livestock grazing contributes to edge effects, negatively affecting some birds. Annual grazing often exacerbates impacts on birds by eliminating much of the nesting cover available in an area in one grazing season.

The use of prescriptive grazing could benefit grassland birds over the long term provided it be done in concert with an objective of improving habitat for grassland birds. Domestic livestock can be used to mimic native grazers (ungulates and prairie dogs) to provide the variety of habitats and foods needed for all native grassland bird species. A primary advantage of prescriptive grazing is that when combined with fire, a mosaic of habitats would be created (different heights of grasses and more shrubs and forbs) benefitting more bird species.

Areas that remain under an annual grazing regime would likely negatively affect some bird species to a greater degree in the long term. There would continue to be more uniformity of the grasslands and less diversity in structure and plants. Prescriptive grazing targets in alternatives B and D would achieve the desired mosaic effects quicker than under alternative A, benefitting a diversity of bird species. Heavy grazing by elk in some areas could offset positive benefits for birds under alter-

native B. Prescriptive grazing targets in alternative C would result in minor benefits to grassland birds.

Public Use and Access

Individual bird species react differently to the presence of people. Recreational activities such as hunting, fishing, boating, hiking, bird watching, photography, and the use of and creation of roads and camping sites could directly and indirectly impact birds. Some bird species such as the nonnative house sparrow or the native brown-headed cowbird have increased in numbers due to human influences, whereas others such as the piping plover have drastically declined due to their specific needs for undisturbed shoreline habitat. Reactions vary according to breeding status, species size, group size, location within a habitat or current activity (foraging for food, roosting, and nesting) (Hamann et al. 1999).

Under all alternatives, the Service would continue to provide for a variety of wildlife-dependent recreation opportunities. Much of the refuge's visitation occurs in the fall during hunting season, which is past the breeding season for birds. The refuge is open for hunting of upland birds, waterfowl and migratory game birds, and subsequently, some individuals would be negatively affected, but monitoring has shown sage-grouse and sharp-tailed populations to be stable. There would likely be some modest increases in upland birds hunters under alternatives B, C, and D, but overall any incremental impacts on these species would be negligible over the long term.

The Service would improve visitor programs and facilities in alternatives B, C, and D largely through the development of more opportunities for wildlife viewing and other nonconsumptive uses. Although more facilities and programs could lead to increased disturbances for birds, facilities such as viewing blinds can direct and concentrate visitor use and lessen impacts and serve management goals. With careful planning and placement, a blind can prevent birdwatchers from wandering into sensitive habitats while at the same time providing an opportunity to experience birds in an ideal setting (Colorado Division of Wildlife 2007). Refugewide, the minor to moderate increases in visitors and facilities (refer to section 5.6, effects on visitor services) would have negligible effects on birds. There would be additional temporary disturbances such as increased noise, dust, and activity during the construction of new trails, viewing blinds, or the science and or interpretive center at Sand Creek Field Station. Scheduling construction activities to occur outside of the breeding seasons or migrations would minimize negative effects.

Studies have shown that recreational roads and trails interrupt the continuity of grasslands and forests, often creating an edge effect, which influences breeding communities. Not only can trails affect the abundance and distribution of bird species, nest predation is often greater near them (Miller et al. 1998). Graveling an additional 16 miles of road under alternative C (Routes 209 and 838) and 5 miles under alternative D (Route 209) would likely increase traffic along those roads resulting in localized incremental disturbances to birds along those corridors. Closing 106 miles of road in alternative B and 23 miles in alternative D would create larger blocks of relatively undisturbed land, which would benefit birds.

Very little information is known about numbers of boaters on Fort Peck or the Missouri River and or the effect they have on waterfowl or other birds on the refuge. Under any of the alternatives, there would be only incremental increases in boating over 15 years. Similarly, significant numbers of anglers line the shores of Missouri River often during the spring breeding season. Much of this occurs during the paddlefish season in select areas from Rock Creek Boat Ramp west to the Fred Robinson Bridge, attracting large crowds and campers when fish numbers and weather conditions are favorable. In recent years, MFWP has limited the number of paddlefish fishing permits. Although fishing would not change substantially under alternatives B, C, and D, birds would continue to be negatively affected to some degree from these disturbances during the spring (refer to chapter 4 and to fishing in section 5.7 below).

Special Management Areas

Protected areas on the refuge such as the research natural areas and wilderness generally benefit birds by allowing more natural processes to take place with fewer disturbances and edge effects. Alternative B would result in the greatest benefits from wilderness protections, followed by alternatives A, D, and C in descending order. The loss of wilderness protection in alternatives C and D would increase disturbance in those areas as there would likely be fewer restrictions on livestock permittees in managing livestock (refer to wilderness in section 5.8 below and to appendix E).

Monitoring

Although more than 250 species of birds have been documented on the refuge, there is little data available on most of the species recorded. Under all alternatives, short-term surveys and long-term monitoring of all grassland birds would indirectly benefit birds as establishing the taxonomy is the foundational first step in species conservation. Bird monitoring, if done correctly, can quantify the status of bird populations, measure trends or changes in status, reveal effects of natural or human-induced changes, and aid in the development and evaluation of management decisions. The monitoring program for bird populations would vary by alternative and would be tied to the habitat objectives described in chapter 3.

Survey and monitoring efforts would be limited under alternative A largely because of the lack of staff and resources and other management priorities. It would continue to limit the ability of the Service to understand trends in bird numbers or species while factors such as climate change are changing bird population dynamics. Without this information, the Service could negatively affect birds inadvertently over the long term through its management actions. Under alternatives B, C, and D, a baseline inventory would be completed within about 6 years, and a comprehensive monitoring program would be established as part of the overall habitat management program. Alternative D would have the most aggressive schedule for implementing a monitoring program to tie bird monitoring into the objectives for sentinel plant monitoring. Alternative C would have a less aggressive schedule and B would be the intermediate alternative.

Conclusion

The Service would increase its monitoring efforts under alternatives B, C, and D, which would be tied to habitat objectives, benefiting birds over the long term. Annual and prescriptive grazing by domestic livestock would be used in all alternatives and could result in short-term and long-term negative effects. Alternative A would result in minor to moderate long-term impacts, while alternatives B and D would result in minor to moderate long-term benefits from prescriptive grazing, and alternative C would have minor benefits. Effects on riparian habitat would be minor to moderate incremental benefits for alternative A, moderate long-term benefits for alternative B, variable for alternative C, and moderate to major long-term benefits for alternative D. Areas with annual grazing (under any alternative) would likely continue to negatively affect birds in localized areas, resulting in moderate to major impacts in localized areas.

Under alternative A, constant fire suppression would have negative long-term effects for many grassland birds largely due to the lack of diversity in species. Alternatives B and D would implement a patch-burning and prescriptive grazing regime that would benefit the greatest number of birds, although the timing of fires in conjunction with breeding seasons would need to be considered. Alternative C would be similar to alternative A. Birds would also benefit from increased invasive species management under alternatives B, C, and D. The loss of wilderness protection in alternatives C and D would increase disturbance in those areas, as there would likely be fewer restrictions on livestock permittees in managing livestock.

Wildlife-dependent recreation activities could negatively affect birds in localized areas under all alternatives, but overall incremental impacts would be minimal with careful planning.

Overall, alternative A would result in negligible effects (as habitat impacts would offset benefits), while alternatives B and D would have moderate to major long-term benefits. Alternative C would have minor long-term benefits. In all alternatives, areas with annual grazing would continue to have moderate to major localized impacts.

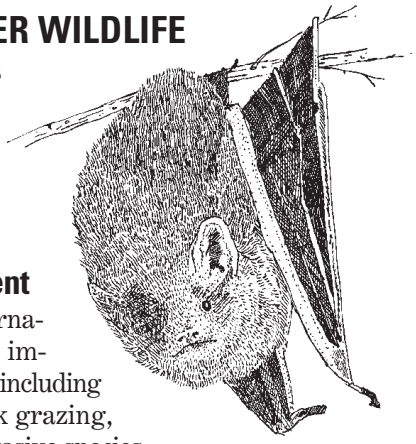
Mitigation

The application and timing of prescribed fire would need to be considered in reducing mortality particularly during breeding seasons.

Careful planning in locating and building visitor facilities would minimize disturbances particularly during critical breeding periods. In addition, undertaking a study to fully assess the effects of boating and fishing along the Missouri River would enable the Service to identify ways to work with partners and reduce disturbances to birds.

EFFECTS ON OTHER WILDLIFE

Other wildlife includes amphibians, reptiles, fish, and small mammals such as bats and other small rodents.



Red Bat
© Cindie Brunner

Habitat Management

Efforts under all alternatives to maintain and improve upland habitats, including prescriptive livestock grazing, prescribed fire, and invasive species management will generally benefit species that depend on those habitats for portions of their life cycle. While prescribed fire, prescriptive livestock grazing, or other management techniques may result in short-term impacts to individual animals or localized areas (due to trampling or the elimination of vegetative cover), the long-term benefits of these measures to amphibian and reptile populations would outweigh the impacts. Overall, these benefits would be moderate to major under alternative D, followed by alternatives B (moderate) and C (minor). Alternative A would result in minor incremental impacts to upland habitats and their value for amphibians and reptiles.

In a similar fashion, efforts to protect and restore riparian habitat areas (including exclosure fence construction and other livestock management efforts) would greatly benefit amphibian, reptile, and fish species, most of which depend on riparian habitats for survival (Pilliod and Wind 2008). Under alternative A, these benefits would be minor though some localized areas would continue to decline, resulting in

moderate long-term impacts to riparian-dependent species. Benefits to these species and their habitat would be moderate under alternatives B and D, and would vary under alternative C depending on the management emphasis in certain locations.

Invasive Species

Pesticides used to control invasive plants cause negative effects to amphibians and reptiles (Maxell and Hokit 1999). Under all alternatives, the invasive species program would be carried out through an approved step-down plan. All personnel who use chemicals would be trained in the proper application of where, when, and how to apply them which would minimize negative effects to amphibians and reptiles.

Water Impoundments

While water impoundments have contributed to the degradation of native riparian habitats, existing impoundments provide open water habitat for many reptiles and amphibians and some fish species that is otherwise scarce on the refuge. Indirect effects of new development of water impoundments may result in the creation or loss of key breeding, foraging and overwintering habitats for amphibians and reptiles (Maxell and Hokit 1999) and fish. Recreational use of water impoundments brings people and pets into direct contact with native wildlife, which can have negative effects. Additionally, predators and game fish use these areas and can have a negative effect on amphibians and reptiles (Maxell and Hokit 1999). Increased use by waterfowl can lead to increased predation on amphibians and reptiles and is associated with decreased water quality, and in some cases, decreased habitat for amphibians and reptiles.

Alternative A would not change management of water impoundments, and therefore would not affect amphibian, reptile, and fish species that depend on them. Efforts under alternative C to evaluate existing impoundments for rehabilitation, removal, or new pond development would likely result in negligible to minor benefits to species that use those areas. The removal of many water impoundments in alternatives B and D would result in moderate short-term localized impacts to some amphibian, reptile, and fish populations. However, this open water habitat need would likely be served over the long term by the restoration of native riparian systems, resulting in moderate long-term benefits to species that use lentic wetlands.

Roads and Access

Indirect effects from roads on riparian areas include impacts to wildlife that use riparian areas. Large numbers of reptiles, amphibians, birds, and small mammals are killed on roads. Some reptiles and amphibians undergo mass migrations to and from breeding habitats and may be killed while crossing roads. Northern leopard frogs exposed to loud noises (120 decibels) become immobilized, possibly leading to increased mortality while crossing roads. Vehicle noise may prevent amphibians from hearing and moving toward breeding areas leading to negative effects. Contaminated runoff from roads and increased sedimentation from road construction could enter riparian areas, negatively affecting amphibians and fish. The density of roads is negatively associated with the probability that amphibians would occupy a pond (Maxell and Hokit 1999).

Pesticides used to control invasive plants cause negative effects on amphibians and reptiles (Maxell and Hokit 1999).

Alternative A

There would be no changes from the current status or management practices for other wildlife species under this alternative. All small mammal species would be protected from harvesting, resulting in maximum abundance if not already obtained.

Maintaining upland habitat, restoring riparian habitat, continuing an active fire management program, and progressively moving towards a prescriptive livestock-grazing program would benefit small mammals. For small mammal species that are currently below maximum population levels, there could be major positive benefits because of not hunting and by promoting range expansion. However, selection of this alternative would have a negligible effect on remaining populations that are currently at viable, self-sustaining levels.

The use of prescribed fire would have mixed results on small mammal communities. Short-term, negative effects would result from fire due to reduction of residual cover as well as a temporary reduction in forage availability. Species that require larger patches of residual cover would be negatively affected; however, the effect would be short-term as fire-return intervals mimic historical levels. Overall, an increase in prescriptive fire in areas that were historically suppressed would result in a long-term, positive effect for small mammal communities.

This alternative would also result in positive effects to raptors and other predatory species that rely on small mammals for survival.

Alternatives B and D

Specific objectives and strategies targeted towards reptiles, amphibians, and fish would contribute to the long-term benefits for these species. The completion of inventory plans or baseline surveys for high priority areas would benefit these species by improving the ability of the Service to monitor and evaluate the success of habitat objectives.

In addition to the effects of alternative A, management actions in alternatives B and D would continue to have long-term, negligible to minor benefits

to the small mammal community. Active removal of continued, season-long grazing would increase many small mammal species found in upland and riparian habitats. Season-long grazing has shown to decrease small mammal diversity and relative abundance by limiting residual cover and forage availability for granivorous species (Giuliano and Homyack 2004, Chapman and Ribic 2002). Prescriptive grazing techniques could have short-term, moderate impacts on small mammal communities. However, small mammal communities would be expected to recover after short-term grazing prescriptions.

Continued research and monitoring would provide additional data on nongame species with limited distributions or specific habitat requirements (for example, bat rookery or roosting sites). Once identified, adaptive management practices could provide additional protection for high-priority species and habitat requirements.

Alternative C

As in alternatives B and D, alternative C has specific objectives and strategies for amphibians, reptiles, and fish. Alternative C would further emphasize the restoration of native reptile, amphibian, and fish that provide recreational and wildlife-viewing opportunities, which would benefit the populations that are being restored.

Small mammal communities would be negatively affected under this alternative. Continued fire suppression in native prairie habitats would negatively affect small mammal communities by allowing the invasion of exotic species, increasing the encroachment of woody plants, and increasing heavy accumulations of litter (Cid et al. 1991, Larson et al. 2001, Howe 1994, Samson and Knopf 1994). Although some small mammal species that require large amounts of residual cover or greater habitat structure (woody vegetation) would be positively affected (for example, western harvest mouse); the small mammal community composition would be expected to diminish over time by the reduction of native plant species.

Similar to alternative B, prescriptive grazing techniques should have short-term, moderate impacts to small mammal communities. However, small mammal communities would be expected to recover after short-term grazing prescriptions. Under this alternative, a management objective of more grasses and less forbs and shrubs, would negatively affect small mammal communities by eliminating the amount forage available for certain species. Particularly, species that forage on forbs and shrubs would be negatively affected and a reduction in range would be expected.

Overall effects of alternative C would be negligible to minor over the long-term.

Conclusion

Baseline information on amphibian, reptile, and fish diversity and abundance is limited. Effects to amphibians, reptiles, and fish would be based mostly on changes to the habitat on which they depend, including uplands, riparian areas, and water impoundments. Amphibians and reptiles occupy a range of habitat types on the refuge, and serve as key indicators for the environmental health of the ecosystem. Nineteen species of amphibians and reptiles have been identified on the refuge, while numerous fish species have been identified in both large rivers and small streams during various sampling surveys.

There would be no changes from the current status or management practices for small mammal species under alternative A. Alternatives B and D would continue to have long-term, negligible to minor benefits to the small mammal community. While prescriptive grazing techniques could have short-term, moderate impacts, small mammal communities would be expected to recover after short-term grazing prescriptions. Some small mammal communities would be negatively affected under alternative C from continued fire suppression in native prairie habitats by allowing the invasion of exotic species, increasing the encroachment of woody plants, and increasing heavy accumulations of litter.

Efforts under all alternatives to maintain and improve upland habitats, including prescriptive livestock grazing, prescribed fire, and invasive species management would generally benefit species that depend on those habitats for portions of their life cycle. The short-term impacts of habitat management actions would be outweighed by the long-term benefits. Overall, these benefits would be moderate to major under alternative D, followed by alternatives B (moderate) and C (minor). Alternative A would result in minor incremental impacts to upland habitats and their value for amphibians and reptiles.

Alternative A would not change management of water impoundments, and therefore would not affect amphibian, reptile, and fish species that depend on them. Efforts under alternative C to evaluate existing impoundments for rehabilitation, removal, or new pond development would likely result in negligible to minor benefits to species that use those areas. The removal of many water impoundments in alternatives B and D would result in moderate short-term localized impacts to some amphibian, reptile, and fish populations, followed by long-term benefits.

The use of pesticides to control invasive weeds could harm amphibians and reptiles, but the effects could be minimized through proper training in the application of chemicals. Under any alternative some reptiles and amphibians are likely to be negatively affected from the large network of roads on the ref-

uge. Road closures in alternatives B and D could benefit amphibians and reptiles in localized areas.

Mitigation

Whenever possible, the Service would avoid spraying pesticides in sensitive riparian habitats. However, invasive species such as saltcedar are found along the riparian habitat, and the harm by the lack of treatment could have a greater long-term impact on amphibians and reptiles. Developing and implementing a step-down plan for invasive species management, together with the rigorous training of personnel in the use of any chemicals could limit impacts on amphibians, reptiles, and native fish species (refer to chapter 3). The implementation of an inventory and monitoring program on the refuge would be a first step in identifying the most sensitive areas, particularly for species of concern such as the northern leopard frog. Alternatives to spraying could be necessary in these areas.

EFFECTS on THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN

Threatened or endangered species at the refuge are black-footed ferret, piping plover, least tern, and pallid sturgeon. Species of concern are black-tailed prairie dog, swift fox, mountain plover, northern leopard frog, sicklefin chub, sturgeon chub, and greater sage-grouse. The grizzly bear (threatened) and gray wolf (endangered), although not currently found on the refuge, are included in the discussion.

All Alternatives

The Service manages threatened and endangered species as trust species and is responsible for assisting in the recovery of these species that occur within the Refuge System. Hence, everything proposed as objectives in chapter 3 for all of the alternatives would attempt to have beneficial effects for threatened and endangered species or at worst, be neutral. Similar consideration and expected effects apply to species of concern.

Hunting is currently permitted under all of the alternatives for greater sage-grouse on the refuge in accordance with State regulations. The Service determined in March 2010 that greater sage-grouse was "warranted but precluded" for listing under the Endangered Species Act. That determination places it on the candidate list. That status does not offer any protection from take, but does raise the level of concern and public scrutiny, places them in the queue for eventual listing and requires an annual status review.

The refuge is not planning to conduct any specific actions related to pallid sturgeon, sicklefin chubs or sturgeon chubs so no effects on those species are expected to result from the proposed actions under any of the alternatives. Least terns and piping plovers are relatively rare on the refuge. Negligible to minor positive benefits are expected under all of the alternatives while working with USACE on invasive plant control and shoreline habitat management to promote attractiveness and nesting success of these shorebirds.

USFWS

Black-footed ferrets were "rediscovered" in Wyoming in 1981.

Should the grizzly bear or gray wolf recolonize on the refuge, the Service would follow the recovery plans for these species. In addition, the Service would develop management plans in cooperation with MFWP, which would be a proactive approach for dealing with the conflicts that would occur.

Alternative A

Black-footed ferrets were "rediscovered" in Wyoming in 1981, and the 1986 the refuge EIS called for maintaining viable black-tailed prairie dog colonies suitable for ferret reintroduction when animals became available. Ferret reintroductions began in 1994 (refer to chapter 4) and about a dozen animals remained at the UL Bend refuge by the end of 2009. In response to sylvatic plague-caused prairie dog die-offs, the Service and partners have taken measures, including translocation and pulicide (agent to kill fleas) applications, to repopulate colonies and to prevent plague outbreaks in prairie dog populations.

Overall, efforts contributing to the conservation of black-tailed prairie dogs and associated species would continue to benefit these species. Maintaining and expanding prairie dog colonies have contributed to habitat and wildlife diversity, natural processes and ecological health. Continuation of these efforts under alternative A would result in minor, incremental benefits to prairie dogs, black-footed ferrets, and other associated species over the long term.

Gray wolf management was not addressed in the 1986 EIS. Given there are no objectives or strategies for wolf management under this alternative, it is difficult to anticipate what environmental consequences may ensue. Should wolves continue to be absent, progress in restoring ecological processes would remain incomplete. Should wolves become established, ecological systems would move closer to full restoration and their presence would likely result in a host of subsequent effects. Some of these potential effects may include altered big game population dynamics, behaviors and habitat use, changes in habitats, changes in public hunting programs, and livestock depredations. The range of environmental consequences with, and without wolf presence, is more fully explored in the action alternatives.

Alternative A does not include specific management objectives for other threatened and endangered species and species of concern. While the lack of specific management guidance could be detrimental to these other species, any such effects would be negligible due to the Service's requirement to manage for special status species on the refuge.

Alternative B

Consistent with the theme of alternative B, resources would be directed toward maintaining, and enhancing where appropriate, population levels of all threatened and endangered species and species of concern to the maximum extent possible and practicable. Such actions would all contribute to achieving biological integrity and managing for biological diversity. Working collaboratively with the many involved partners is a theme within the specific objectives for each of the special status species listed in chapter 3. If successful, an environmental consequence of that approach will be improvement of habitats and wildlife populations at a scale larger than the refuge.

Several of the objectives in alternative B include various monitoring efforts to assess population status and trends of special status species. None of those activities is anticipated to have any significant environmental consequences or effects on special status species.

The Service would follow the Northern Rockies Recovery Plan for the gray wolf. By itself, development of a refuge-specific gray wolf management plan would not have any environmental consequences, but the contents and direction of that management plan would set the stage for subsequent effects should wolves recolonize the Missouri River Breaks. An important aspect of developing a refuge-specific wolf management plan is that it is scheduled to be completed before anticipated wolf recolonization and would afford the opportunity for ordered and coordinated development with the public and other agencies before a crisis-management situation should a plan not be in place before wolf population establishment. It is likely there would be a high degree of conflict and controversy for how wolves would be managed during the interim while the plan was developed.

Alternative B emphasizes the abundance of target species. The philosophy of the plan under this alternative would be toward promoting wolf abundance (within ecological constraints) and providing for recreational viewing opportunities. Wolf presence would add one more native wildlife species that would add diversity and move ecological processes toward more naturally functioning systems. Wolves would provide predation pressure on ungulates that would likely influence their population dynamics, behavior, and habitat use. Changes in how native ungulates use the landscape would likely result in effects on vegetation and habitat dynamics. Those changes are expected to be complex interrelationships among many factors and cannot be predicted at this time, other than to expect an ecological system that includes wolves is closer to restoration of natural processes than a system where wolves are absent.

There would likely be livestock depredation issues should wolves recolonize the Missouri River Breaks. Management responses to livestock depredations under this alternative would be most protective of wolves and public hunting of wolves on the refuge would not be permitted. As a result, wolf populations

would likely be greater than under management that uses approaches that are more aggressive and would probably result in greater influences on native ungulates and related population and habitat responses.

Transitioning to prescriptive grazing would occur most rapidly under this alternative and would benefit many species of wildlife. Reductions in livestock grazing could benefit species like sage-grouse and provide optimum residual cover for nesting. Similarly, more intensive grazing could be directed to some areas to promote prairie dog expansion and increase habitat for mountain plovers and other prairie-related species of concern.

Managing fire by protecting or preventing sagebrush areas from burning would be a moderate to major benefit for sage-grouse. Similarly, fire could be used to remove sagebrush in some areas and promote prairie dog expansion that could also result in benefits associated species. In general, all of the management actions that promote native vegetation and healthy, functioning riparian systems will benefit native fauna. Actions aimed at reducing invasive species will also benefit native flora, fauna, and naturally functioning systems.

Overall, alternative B is anticipated to result in moderate to major long-term benefits for threatened and endangered species and species of concern on the refuge.

Alternative C

Most of the threatened and endangered species and species of concern management objectives for alternative C are the same as alternative B. Therefore, the effects are anticipated to be the same as those described under alternative B (moderate to major long-term benefits), with the following exceptions.

Under alternative C, an ecological system with at least some gray wolves present would be closer to restoring natural processes than a system where they were absent, but the ecological effects and resulting changes in aspects of native ungulate ecology and habitat effects would be less than under alternatives B or D.

Efforts to work with USACE to maintain suitable shoreline nesting habitats, if successful, would moderately benefit least tern and piping plover populations over the long term. Likewise, efforts to maintain at least 50 percent of sage-grouse habitat would contribute some habitat to help support sage-grouse population on and surrounding the refuge, but would be less effective than maintaining 100 percent of the habitat as proposed under alternative B.

The emphasis under alternative C to provide more opportunities for public viewing would likely result in more disturbance impacts on wildlife from people. As those opportunities are developed, care will be taken to minimize such disturbance. Over the long term, the extent of those effects would likely be negligible to minor.

Transitioning to prescriptive grazing would occur most slowly under this alternative and fewer benefits for species like sage-grouse would be expected. Similarly, management actions designed to improve habitat conditions are least aggressive and occur over longer timeframes so effects on threatened and endangered species and species of special concern would be least pronounced under this alternative. Fires would be aggressively suppressed under this alternative and that approach would probably benefit sage-grouse in most situations. However, opportunities to use the appropriate management response to benefit threatened and endangered species and species of concern and other wildlife may be missed.

Alternative D

The threatened and endangered species and species of concern management objectives, as well as their benefits, would be the same as alternative B. Maintenance, restoration and enhancement of special status species is essential to restoration of natural ecological processes, the theme of this alternative.

Alternative D would have added emphasis on research to document and better understand how wolves influence natural ecological processes.

Habitat management actions such as patch burning in sagebrush habitats could help promote prairie dog expansion that would in turn benefit species associated with prairie dog colonies. In contrast, fires in sagebrush habitats, either prescribed or wildfire, could have major negative effects on sage-grouse. In general, all of the management actions that promote native vegetation and healthy, functioning riparian systems will benefit native fauna. Actions aimed at reducing invasive species will also benefit native flora, fauna, and naturally functioning systems.

Conclusion

Alternative A does not include specific management objectives for other threatened and endangered species and species of concern. While the lack of specific management guidance could be detrimental to these other species, any such effects would be negligible. Under alternatives B, C, and D, resources would be directed toward maintaining, and enhancing where appropriate, population levels of all threatened and endangered species and species of concern to the maximum extent possible and practicable, resulting in moderate to major benefits over the long term.

With no objectives and strategies established for gray wolf management under alternative A, it would be difficult to predict any consequences should they colonize the refuge. Under alternatives B, C, and D, the development of a refuge-specific wolf management plan would not have any environmental con-

sequences, but the contents and direction of that management plan would set the stage for subsequent effects should wolves recolonize the Missouri River Breaks. Completion of a management plan under alternatives B and D would likely be more effective, because it would be completed before wolf population establishment. The completion of a plan in alternative C after wolves were established would be more contentious and potentially less effective.

Mitigation

Mitigation of livestock impacts would need to be addressed in any wolf management plan.

CUMULATIVE IMPACTS on BIOLOGICAL RESOURCES

None of the proposed alternatives would result in cumulative effects on shoreline habitat, wolf management, furbearers, small mammals, fish, reptiles, and amphibians.

While direct and indirect effects of the Enhancement Act of 2000 (conveyance of cabin sites) are outside the scope of this analysis, cumulative effects are discussed. Implementation of the Enhancement Act of 2000 would potentially result in the addition of between 10,000 and 40,000 acres of upland and riparian habitat to the refuge. Under any refuge management alternative, the addition of these lands to the refuge, which would include large tracts of unbroken native prairie sagebrush steppe habitat, and riparian areas, would result in minor cumulative benefits to upland and riparian habitat, and the wildlife species that depend on those areas, by removing inholdings, reducing existing habitat fragmentation, and improving potential management (FWS 2005).

Implementation of the Fort Peck Dam/Fort Peck Lake Master Plan may result in cumulative benefits on several biological resources on the refuge. Efforts to improve and maintain tern and plover habitat on the lakeshore, would result in minor cumulative benefits to those species when combined with the benefits of the refuge management objectives that are common to all alternatives. Reestablishing cottonwood bottomland in the Nelson Dredge area, may result in cumulative benefits to river bottom restoration efforts throughout the Fort Peck and refuge region by providing another opportunity to learn from successful or unsuccessful practices. The overall cumulative benefit to bottomlands on the refuge would be negligible to minor.

MFWP has developed management plans for various big game species that include population objectives for the refuge. Most of the refuge management objectives for big game are consistent with MFWP's objectives, with the exception of mule deer management and herd composition targets in alternatives B and D. While this difference in management plan objectives/philosophy exists, it would be speculative to suggest that such a conflict in management plans would result in cumulative effects on mule deer or any other big game species. Under all alternatives, the Service would continue to work with MFWP to manage big game populations on the refuge.

The American Prairie Foundation has created an 87,000-acre reserve on public and private lands adjacent to the refuge. The Nature Conservancy manages the 63,000-acre Matador Ranch near the northwest edge of the refuge. The continued management of American Prairie Foundation and The Nature Conservancy lands for conservation purposes would provide general cumulative benefits to big game species, grassland birds, and listed species and species of concern, including black-footed ferret and sage-grouse by either providing habitat or by buffering habitat and populations on the refuge. These cumulative benefits would be minor to moderate under any alternative, depending on the species, its habitat needs, and metapopulation dynamics. The restoration of bison on American Prairie Foundation lands could provide moderate cumulative benefits to bison restoration planning or implementation on the refuge, by providing a local example of bison management with additional opportunities for cooperation. These moderate cumulative benefits would be limited to alternatives B, C, and D, contingent on the pursuit of bison restoration plans on the refuge.

The efforts by the Ranchers Stewardship Alliance to promote ecological, social, and economic conditions that will sustain the biodiversity and integrity of America's northern, mixed-grass prairie would result in general cumulative benefits for grassland-dependent species.

Efforts by the World Wildlife Fund and the National Wildlife Federation to reduce grazing conflict with ground-nesting birds by buying and retiring refuge grazing rights would result in cumulative benefits to those species and other grassland-dependent species (including sage-grouse and black-footed ferret). Under alternatives A and C, the cumulative benefits of these efforts would offset the long-term effects of annual grazing. Under alternatives B and D, the cumulative benefits would complement refuge management efforts to expand prescriptive grazing, though the specific effects would vary by location.

The continued closing of access roads into the refuge by adjacent private landowners has been an ongoing issue. If this practice continues as recent evidence suggests, it could lead to additional increases in elk populations. Although there could be cumulative effects in all alternatives, the greatest effect would be under alternative B where the emphasis is on maximizing populations. This would benefit elk populations because of reducing disturbance and

increasing security, particularly when combined with the Service's plans to close 106 miles of road. It could also lead to negative effects on vegetation from too many elk in some areas because of the lack of adequate harvest.

The construction of the proposed Keystone XL Pipeline Project would result in localized adverse impacts to biological resources within the pipeline corridor. None of the refuge management alternatives, when combined with the effects of the pipeline, are anticipated to result in cumulative effects to biological resources.

5.6 Environmental Consequences for Visitor Services

Visitors to the refuge have the potential to be affected by opportunities, their experiences, and the setting where the use occurs (Manfredo 2002). Service policy emphasizes the need to provide for quality opportunities when providing for wildlife-dependent recreational activities. Wildlife-dependent recreation programs are evaluated based on the goal of providing for quality programs that would include the following elements: safety and compliance with applicable laws, minimizes conflicts with wildlife and habitat goals, or other public uses, promotes accessibility for all; promotes resource stewardship, and provides for reliable and reasonable opportunities to experience wildlife (FWS 2006c). This section addresses the priority public uses and the activities and facilities that support those uses and how visitors would be affected by the actions in chapter 3. Table 26 compares visitation, miles of road, and level of facility development between the alternatives.

EFFECTS on HUNTING

This section discusses the effect of habitat management, number of hunters, reintroductions, predator management, hunting opportunities, access, and commercial outfitting would have on the hunting program. Information about effects resulting from harvest objectives is discussed for big game under wildlife in section 5.6 above.

Alternative A

Over the long term, there would be little change from current hunting opportunities on the refuge. Big game, upland birds, waterfowl, and migratory game birds would be open to hunting, and there would be limited coyote hunting opportunities. If the bighorn sheep population continued to expand, it would benefit hunters seeking this experience. Most

Table 26. Comparison of access, visitation, and facilities between the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Visitation Aspect	*Alternative A*	*Alternative B*	*Alternative C*	*Alternative D*
Miles of open refuge roads	670	564	670	647
Miles of all-weather access on refuge roads	60	60	76	65
Fishing visits	60,000*	60,000	60,000	60,000
Hunting visits	103,900	100,000	118,500	108,000
Participation visits in nonconsumptive activities (wildlife observation, photography, interpretation)	40,000	44,000	48,000–68,000	46,000–50,000
All nonconsumptive visits (includes office and other visits)	87,100	93,000	117,585	95,800
Increase in environmental education programs	Limited (with a few informal programs)	5% increase (with formal programs, 5+/- yearly)	10% increase (with formal programs, 8+/- yearly)	10% increase (with formal programs, 8+/- yearly)
Number of visitor facilities	Limited (tour route, visitor center, hunting blind, signage)	5%–10% more than A	10%–15% more than A	10% more than A
Total visitation	250,000	253,000	296,085	263,810

**These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.*

hunting seasons for species open on the refuge would coincide with season and harvest quotas established by the State, although in some instances, the refuge would promulgate special regulations to provide for more restrictive harvest of a specific game species when necessitated by a refuge-specific goal or objective for that species.

Over the long term, hunting would remain near current levels of about 103,900 hunters annually (refer to table 26). Current resource management programs on the refuge would result in a positive trend in habitat for game species of wildlife which in turn would likely result in increasing opportunities for hunting and hunter success over time, but it would have a negligible effect on the numbers of hunters on the refuge. Nationwide, the trend in hunting has been decreasing (FWS 2008f). Although hunting on the refuge would likely remain stable, it would not likely grow without a significant effort to increase hunter numbers.

Access would remain as it is today (refer to table 26 and access below), with a mix of hunting areas open to motorized vehicle access and areas where roadless hunting opportunities exist with little or no influence by mechanized equipment. Some hunters believe little or no direct road access into some areas of the refuge limits their ability to harvest big game, especially cow elk. Others suggest minimal road access is a treasured value to get away from the "road hunters," seek solitude and enjoy a quality experience not available elsewhere.

The annual number of permits for commercial hunting (outfitters) would be limited to eleven. Some individuals could feel commercial outfitters would negatively affect their opportunities or experience, particularly where they compete for the same space and resource, but overall it would have a negligible effect on most hunters. As outfitters retire, the refuge would continue the practice of holding those permits and not issuing new permits until a new visitor services plan is completed.

Alternative B

Alternative B would affect hunting in several ways. The resource management programs on the refuge would shift to a blending of both natural processes such as fire and grazing (by wild and domestic) ungulates and artificial processes such as planting food and cover crops and construction of water development projects to benefit fish and wildlife. Game wildlife species would be managed according to mutually agreed to population objectives with the State, taking into consideration tolerance of adjacent landowners and land managers as well as ensuring no negative effects to refuge habitats or other nongame wildlife species. Populations would be managed at levels considered natural in terms of densities and natural age classifications. As a result, there could be some unique opportunities for hunting bull elk or mule deer in the 8-year class, which would benefit some hunters.

The numbers of hunters would remain near existing levels. With an emphasis in maximizing wildlife numbers, it might be necessary to limit harvest rates, at least temporarily; therefore, the number of hunters would be expect to decline slightly to 100,000, but the effect would be negligible overall.

This alternative also encompasses several wildlife reintroductions including Rocky Mountain bighorn sheep where the habitat would support it and there is a social acceptance for such reintroductions. Sheep hunting is an important and highly sought after opportunity on the refuge and would benefit hunters seeking this opportunity.

This alternative would lead the refuge to consider additional hunting opportunities for mobility-impaired hunters as well as for young hunters that may or may not exist on other areas. This would result in a positive benefit in the overall hunting experience for some users and increase the diversity of the current hunter user group.

With road closures and access agreements with neighboring entities, access would be managed to benefit and increase wildlife populations and in some instances be managed to promote harvest opportunities. The refuge would promote nonmotorized access to some portions of the refuge but also provide for additional motorized access in other areas where currently there are strategies that are more restrictive. This could mean allowing game retrieval with motorized vehicles on seasonally closed roads. This would be considered an improvement by those interested in broader use of motorized vehicles but also a negative change by those advocates of roadless hunting opportunities as many seasonally closed roads essentially bisect a larger block of roadless refuge hunting areas.

Specific consideration is given in this alternative to the monitoring and analysis of all terrain vehicles and motorized watercraft as they relate to both wildlife use and visitor experience. This could potentially result in regulating these motorized uses in a manner to ensure that they are not negatively affecting wildlife or visitors if it is determined that they are doing so. This alternative would also lead the refuge to improve areas for visitor use and access such as improving camping areas, boat ramps, and all-weather roads that lead to these types of facilities. This would be a long-term benefit to visitors that desire these facilities. However, it could have a negative effect on wildlife populations, distribution and hunter success in areas that are near to these areas due to increased visitation to specific sites. This alternative also notes that following a review of proposed

wilderness units it could recommend increasing proposed wilderness acres by 25,037 acres (refer to wilderness below). This may result in improved game populations of specific species and a corresponding increase in opportunity for this type of hunting experience and improved hunter success.

Under this alternative outfitting/guiding for hunting would be evaluated to ensure there are no conflicts with other hunters on the refuge. Outfitters would still be required to submit annual report with the number of clients, number of days hunted and game species sought and harvested. The number of outfitting permits for hunting would be adjusted during the life of the CCP to meet wildlife and/or habitat objectives. The refuge would work to reduce conflicts between guides, clients, and the public.

Overall, the implementation of alternative B would result in negligible to minor benefits to hunting opportunities and experiences.

Alternative C

This alternative would maximize wildlife-dependent public uses and economic uses while protecting wildlife populations and habitat to the extent possible, striking a balance between livestock grazing and wildlife utilization of habitat. There would be a considerable emphasis placed on the refuge's hunting program with maximization of opportunity and harvest attempted while at the same time providing for diverse opportunities and healthy wildlife populations and habitats. These efforts would benefit hunting opportunities on the refuge. Some of the artificial processes discussed under alternative B would also be included in this alternative such as food plots and water developments.

Compared to alternative A, the number of hunters would be a minor increase of 14,600 (14 percent) hunters to about 118,500 hunters over the long term.

The wildlife reintroductions also discussed in alternative B would be included in this alternative. As it relates to hunting, bighorn sheep reintroductions are most notable with the positive benefits to hunters. This alternative also addresses the potential inclusion of mountain lion hunting with the associated benefits and negative effects also noted in alternative B.

Increases in hunting opportunities noted in alternative B as it relates to mobility-impaired hunters and young hunters are included in this alternative to even a greater degree. In addition, some "niche hunting" opportunities would also be considered such as traditional or primitive weapon hunts or specific predator hunts.

With a greater emphasis placed on maximizing hunter opportunity and visitation, public use facilities and access would be managed accordingly. This would mean improved access to boat ramps and improving camping facilities, more restrooms and parking facilities. There would be some emphasis placed on nonmotorized access hunting but also provisions to allow motorized access on seasonally closed roads for game retrieval. There would also be consideration for designation of bicycle use in areas currently not open to such use. There would also be consideration given to designated horse camping with some facilities development to accommodated increasing interest in this type of hunting visitor. The overall benefits of these improvements are for the visiting public and would be positive for those interested in this type of experience. There could be negative effects to wildlife habitat and wildlife distribution in specific sites where increased visitor impacts would occur.

This alternative includes removal from consideration of approximately 35,881 acres of proposed wilderness that is currently under consideration for future designation. This would be viewed as a positive by some proponents of increased motorized vehicle access and a negative by those advocating for current or new roadless type management of the refuge.

This alternative encourages the refuge to develop and expand commercial activities that would be consistent with the wildlife purpose. In this alternative, additional outfitter permits would be issued as long as they are consistent with refuge policy and procedures for issuing permits, along with anticipated time and space restraints, would reduce conflicts with the public and between guides. Additional outfitting/guide permits would be issued for pack and retrieval services to facilitate the harvest of big game species in roadless areas. This would result in minor economic gain for outfitter/guides and could result in a small increase in the number of visitors to the refuge. The extent of these impacts is unknown due to incomplete data on the interest by the public for retrieval services in proposed wilderness units and guided wildlife-viewing activities.

Overall, alternative C would result in minor to moderate benefits to hunting opportunities and experiences.

Alternative D

This alternative is based on an ecological processes emphasis where various approaches would be used to restore the natural function of plant communities and wildlife interactions with habitat, the role of fire, water and other influences (refer to objectives and strategies in chapter 3). Wildlife populations and the subsequent opportunities provided to the public through a hunting program would be driven primarily by how these activities would fit into the role of the broader ecological processes. This could mean short-term loss of opportunity if it is beneficial to the overall system to maintain or reduce specific game populations. It could result in a long-term benefit to hunting

programs if, when restoration is achieved, the system supports larger and more diverse game populations.

Over the long term there would be a modest increase of about 4,100, to about 108,000, in the number of hunters as compared to alternative A due to focus on providing for high quality experiences, additional opportunities to hunt bighorn sheep, more young people hunting, and more mobility-impaired hunters. Overall, this would be negligible increase.

As compared to alternative A, this alternative would consider additional reintroductions of wildlife including Rocky Mountain bighorn sheep. This alternative would base the implementation of these reintroductions on the appropriateness of how they would benefit the landscape from an ecological function perspective. The short- and long-term benefits of this initiative were discussed in previous alternatives. In the long term, this would benefit hunters seeking this opportunity.

A mountain lion hunting season would be considered in this alternative. This would be viewed as a positive action by those holding an interest in this type of hunting opportunity on the refuge, as well as the State of Montana's desire to see the refuge participate in this type of hunting, which is currently managed by them on existing hunting units immediately outside the refuge. Those opposed to seeing the refuge open to top predator hunting would view this hunting opportunity negatively.

Alternative D considers the opening of various furbearer seasons not currently permitted on the refuge. This would include species such as fox, coyote, raccoon, and badger. This hunting opportunity for would only be considered in a more limited basis and would be allowed only when the natural role of predators in the system would not be altered through a hunting strategy. This could result in a short-term reduction in this type of hunting opportunity, but potentially a long-term gain as more diverse predator component may become part of a restored system and associated hunting opportunities could be considered if sustainable viable predator populations existed on the refuge.

The overall hunting program on the refuge would be based on hunting quality rather than hunting quantity. Diverse age and sex ratios for game species would be managed for where possible. This could be benefit to those hunters that desire the opportunity to experience game in relatively good abundance and the opportunity to see older age class animals where the opportunity for this is limited in other areas open to public hunting. This approach could also limit participation and reduce hunter numbers at times when it may be necessary to reduce or limit harvest, which could be viewed as a negative aspect to this type of hunting program.

Access under this alternative would be managed according to what best provides for improving wildlife habitat and overall functioning of the refuge as an ecological system. The road system would be dynamic and managed with seasonal and permanent closures as well as open roads that contribute positively to improving function and health from an ecological perspective. Where possible, roads would be managed to improve harvest when necessary. This approach would have the positive and negative effects as outlined in previous alternatives as it relates to hunter access, participation, and success. The effects of all terrain vehicles and motorized watercraft would be the same as alternative B.

Proposed wilderness units would be evaluated and if determined to still meet the wilderness criteria, consideration would be given to expanding the boundary and area of some existing proposed wilderness units and removing wilderness protection in three areas for a net loss of about 8,185 acres. As discussed under alternatives B and C, there would be negative and positive effects on the refuge's overall hunting program including from the viewpoint of hunters.

Outfitting and guiding under this alternative would be managed similarly to alternative B.

Overall, alternative D would result in minor to moderate benefits to hunting opportunities and experiences, depending on the type of experience that individual hunters prefer.

Conclusion

The actions in the alternatives would have negligible to minor benefits on hunting opportunities across the refuge for big game, upland birds, waterfowl, and migratory game birds. The reasons for these benefits vary by alternative, and are largely dependent on the preferences and values of individual hunters.

In the long term, there would be negligible to minor differences in the number of hunters using the refuge annually with a slight decrease of about 3,900 hunters in alternative B as compared to alternative A, a minor increase of about 14,600 hunters in alternative C and a slight increase of about 4,100 hunters in alternative D. Hunters would continue to enjoy a wide variety of access for hunting in all alternatives, although there would be some distinct differences in the amount of road access and proposed wilderness acreage, which would positively benefit or negatively affect hunters depending on their point of view.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on FISHING

Because fishing is a popular activity that occurs on the refuge, fishing pressure, access to fishing areas, and opportunities are evaluated.

All Alternatives

Under all alternatives, the State of Montana (MFWP) would continue to have primary responsibility for all fisheries management within the refuge, which is consistent with Service policy on fishing (FWS 2008f). This includes regulating harvest, egg collecting efforts, and stocking activities. Similarly, The USACE manages the permitting requirements for any commercial fishing activities (including recreational tournaments). The Service would have little control over harvest opportunities for individual anglers. Patterns of fishing pressure have historically followed reservoir levels, with periods of high water levels tending to result in increased fishing pressure and vice versa. This pattern would remain in place under all alternatives. As a result, the numbers of fishing visits attributed to the refuge would likely remain the same under all alternatives (about 60,000 annually; the USACE attributes nearly 160,000 fishing visits to lake and recreation areas).

The Service would work with USACE to extend boat ramps to the water's edge as the lake recedes and identify roads that provide direct access to the lake including ATV access (refer to access below), which would provide long-term benefits for fisherman desiring better access to the lake.

Alternatives A, B, and D

Alternatives A, B, and D would not result in noticeable changes to fishing pressure or opportunities on the waters within the refuge. Existing use patterns would likely continue due the isolated nature of the reservoir.

Alternative C

Alternative C would likely result in expanded fishing opportunities, since the Service would be placing a higher priority on improving existing lake and river access sites and possibly creating additional access sites. However, water level management would not change, so the high and low use patterns would persist, and the overall number of fishing visits would remain at current levels. New or expanded boat access would require considerable road improvements (refer to access in chapter 3). The USACE would need to be a partner in any new boat ramp development. Improvements in access would provide moderate benefits for anglers in the long term.

Conclusion

Under alternatives A, B, and D, there would be few noticeable changes in fishing pressure or opportunities on the waters of the refuge, resulting in negligible effects. In alternative C, the Service would expand opportunities by improving boat access including better boat ramp development, but overall, there would not be significant changes in the number of fishermen regardless of the alternative due to existing use patterns and isolated nature of the reservoir. Alternative C would have negligible benefits.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on WILDLIFE OBSERVATION and PHOTOGRAPHY

This section addresses effects on users and the quality of the wildlife observation and photography program including opportunities and facilities. Like other forms of wildlife-dependent recreation, Service policy (FWS 2008f) encourages refuges to provide quality opportunities for observing and photographing wildlife.

Brett Billings/USFWS

Refuge staff help visitors identify wildlife species.

All Alternatives

The refuge would provide the public with many opportunities to observe and photograph wildlife. Commercial photographers would be required to have a special use permit, which would enable the refuge to control the number of permits issues and minimize impacts to wildlife or other users. For example, the Service would not authorize off-road travel or access into the elk-viewing area. Given the few permits that would be issued for commercial photographers, there would be negligible conflicts with other user groups or refuge resources. Since the Service would be able to use any images or footage produced by a commercial photographer in brochures and other information, the public would benefit from the high quality imagery.

Alternative A

The current trend of increases in wildlife observation and photography visits would likely continue despite few changes in facilities or programs (refer to chapters 3 and 4), but in the long term, with only negligible improvements in the overall program or facilities

and the remoteness of the refuge, visitation would remain stagnant. Ongoing habitat improvements and land acquisition would improve the quality of opportunities for these uses in some areas providing some minor benefits. However, this alternative would not meet the demand for facilities related to observation and photography (trails, tour routes, overlooks, blinds) as gauged by inquiries, past visitation trends, and growing tourism visits to the refuge area.

During peak seasons, visitors would be concentrated in some popular areas like the Elk Viewing Area. Dust, crowds, and inadequate parking facilities (refer to interpretation in chapter 4) would negatively affect some users. There would not be a staff person dedicated to the visitor service's program to develop a comprehensive visitor program that could address conflicts and improve the overall program. Although the refuge would remain a great place to view wildlife, over the long term, the Service would not meet its goal of providing a quality wildlife observation and photography program for a wider audience.

Alternative B

An increased emphasis on habitat improvements and land acquisition would improve the quality of wildlife observation and photography in some areas. The Service would hire one outdoor recreation planner and a visitor service plan would be developed within 5 years of plan implementation. Having a staff member assigned to the visitor service's program would result in improved programming and facility development that could address some conflicts in popular areas. The modest increases in viewing facilities and programs (5 percent over alternative A) would improve the quality of the overall program in the long term, and visitation would be anticipated to grow by about 5–10 percent above alternative A. Improvements in the overall program could be somewhat offset as most of the staff would be directed to more important fish and wildlife-related work. Overall, it would only partially enable the Service to provide a quality wildlife observation and photography program on the refuge.

The reintroduction of bighorn sheep on the south side of the river could provide additional wildlife-viewing opportunities for some visitors. Because this CCP and EIS is addressing the potential of wolves colonizing in Missouri River Breaks at some point and the interest by many in bison restoration, if wolves colonized the refuge or bison were reestablished in cooperation with MFWP (refer to wolves and bison restoration under wildlife in chapter 3) under alternatives B and D, additional wildlife-viewing opportunities could be provided.

Alternative C

With an emphasis on maximizing public use opportunities, wildlife observation and photography visits would increase by 20–50 percent due to habitat improvements, accelerated land acquisition, and a 10-percent increase in related facilities such as trails, tour routes, overlooks, and blinds. Two additional staff would focus on providing public use programs and facility development, which could enhance the quality and quantity of observation and photography opportunities by a moderate amount. Increased facilities and visitation would result in some minor disturbances to wildlife, although this would result in negligible effects on wildlife-viewing opportunities given the size of the refuge. The development of a visitor services plan and travel management plan would minimize intrusion into important wildlife locations and habitat through better planning and facility programming. Any increased use in popular areas like the elk-viewing area without any improvements to offset conflicts would negatively affect some users. This alternative would likely result in long-term positive public and political support, which could positively affect projects and funding for improving the quality of fish and wildlife habitat.

Similar to alternative B, reintroduction of bighorn sheep on the south side of the river would provide additional wildlife-viewing opportunities. Because this CCP and EIS is addressing the potential of wolves colonizing in Missouri River Breaks at some point and the interest by many in bison restoration, it is likely, if wolves immigrated to the refuge or bison were reestablished in cooperation with MFWP and others visitation would increase (refer to wolves and bison restoration under wildlife in chapter 3).

Alternative D

With an emphasis on integrating the wildlife management and public use focus, under this alternative, wildlife observation and photography visits are estimated to increase by a minor to moderate amount of 15–25 percent more in the long term. Similar to alternative C, two additional staff would be focused on providing a comprehensive program that incorporated better planning and facility development. Similar to alternative B, when combined with an emphasis on improving habitat conditions and land acquisition, quality opportunities to see and photograph wildlife would increase by a moderate amount. As with alternatives A and B, any increased use in popular areas without any improvements to offset existing conflicts would negatively affect some users.

Conclusion

Under existing conditions, visitation levels would remain flat in alternative A. Although the refuge would provide many opportunities to view and photograph wildlife, without a dedicated staff person to oversee the public use program or any additional facilities to attract visitors seeking nonconsumptive activities, there would be little growth in visi-

tation. Alternative B would add an outdoor recreation planner, and combined with habitat improvements and modest increases in facilities and programs, the number of visitors coming to the refuge would increase by negligible to minor amount (5–10 percent). Alternatives C and D would add two outdoor recreation planners although the programming would look considerably different. Alternative C would seek to increase a wide-range of opportunities that would also provide economic benefit for the adjacent communities. Visitation would increase moderately by 20–50 percent over existing levels with improved facilities and programs. Alternative D would also seek to improve facilities and programs but there would be a higher emphasis placed on quality over quantity and habitat management. Visitation would increase by a minor to moderate of 15–25 percent amount. Any increased use in popular areas without addressing issues such as parking, dust, and crowding would negatively affect some users.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on ENVIRONMENTAL EDUCATION

National wildlife refuges that are open to the public should strive to provide some level of environmental education. Environmental education programs should be based on guidelines specified in the Service's Environmental Education Policy (FWS 2008f). The guidelines stress that environmental education programs should connect people's lives to the natural world around them, advance environmental and scientific literacy through an interdisciplinary approach to learning, strengthen the Refuge System by fostering public knowledge about environmental conservation, allow for participants to experience wildlife, wildlife habitat, and cultural resources, and instill a sense of stewardship for conservation. This section primarily addresses opportunities for environmental education programs between the alternatives.

Alternative A

The Service would provide environmental education programs on an opportunistic basis but in large part the Service would miss opportunities to educate the public about the values of the refuge and the Refuge System. The Service would not meet the guidance for environmental education in Service policy (FWS 2008f) because there would be little or no contact with refuge staff to answer questions and foster public knowledge or interest in the Service's messages.

Alternative B

The addition of an outdoor recreation planner would enable the refuge to develop a visitor services plan that incorporated a modest increase (5 percent) in environmental education programming, compared to existing conditions. Specific curriculum-based programming would allow staff to train teachers to deliver programs independently and additional teacher workshops would further expand educational capabilities. In the short term, there would be few changes in environmental education opportunities, but once the staff position was hired and the step-down was implemented, in the long term, it would result minor benefits for visitors, which ultimately would be aimed at garnishing greater support for future refuge and Refuge System programs.

Alternative C

Two outdoor recreation planners, as well as increased use of volunteers and partnerships, would enable the refuge to increase environmental education programs by about 10–15 percent as compared to alternative A. In the long term, creating refuge-specific curricula could moderately enhance awareness of the refuge's wildlife and habitat resources. Providing teacher workshops would allow staff to train teachers to deliver programs independently, further expanding educational capabilities. The addition of a education and interpretive center at Sand Creek Field Station would enable the Service to advance its goals for environmental education for both children and adults. This alternative could have long-term benefits in terms of public and political support that could positively affect projects and funding.

Alternative D

Similar to alternative C, there would be an addition of two outdoor recreation planners to the staff. There would be a minor increase of 10 percent in environmental education programming as compared to alternative A. The emphasis would be on providing quality programming over quantity that met the guidelines specified in Service policy. Specific curriculum-based programming would allow staff to train teachers to deliver programs independently and additional teacher workshops would further expand educational capabilities. Students would gain an improved understanding of refuge's natural history, wildlife and ecology as well as the mission and importance of the Refuge System. Similar to alternative C, the addition of a science and interpretive center at Sand Creek Field Station would enable the Service to advance the Service's goals for environmental education for both children and adults, although the messages and programming would differ to some degree. In the long term, it would provide a moderate benefit in terms of generating greater support for future refuge and Refuge System programs.

Conclusion

Under existing conditions, very limited environmental education would be offered at the refuge. Under alternative B, the Service would hire one staff person and begin to offer some additional programming and teacher-led workshops, resulting in negligible benefits. Two staff positions would be filled in alternatives C and D, which would enable the Service to provide more programming. In addition, an interpretive center at Sand Creek Field Station or combination interpretive and science center would enable the Service to advance its goals for environmental education, resulting in minor benefits.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on INTERPRETATION

The guiding principles for the Refuge System's interpretive programs involve developing opportunities, facilities and programs where visitors can develop an understanding and appreciation for America's natural and cultural resources through safe, informative, enjoyable, and accessible activities that ultimately lead to a sense of stewardship about the refuge's resources (FWS 2008f).

All Alternatives

Under all alternatives, visitors would continue to enjoy the refuge's interpretive facilities from the auto tour route, elk-viewing area, an accessible hunting blind, the Fort Peck Interpretive Center, and other contact stations (refer to interpretation in chapter 4), Interpretive signs, exhibits, materials, brochures, and informational kiosks would continue to provide visitors an opportunity to enjoy and learn about the refuge.

Alternatives A and B

As compared to alternative A, under alternative B, there would be modest improvements in the number and quality of interpretative facilities and programs. In addition to hiring an outdoor recreation planner, there would be a 5-percent increase in the number of facilities and programs, but overall this would result in negligible benefits furthering the Refuge Systems principles for interpretation.

Alternatives C and D

Alternative C would have the greatest improvements in interpretive facilities (5–15 percent) and alternative D would be intermediate at about 10 percent. A small visitor center located at Sand Creek Field Station under alternative C and a combination science and interpretive center under alternative D would enable the refuge to provide more quality information where the most popular activities occur like elk viewing during the fall. Under alternatives C and D, the hiring of two outdoor recreation planners would enable the refuge to improve programming, facilities, signage, and exhibits as compared to alternative A by a moderate amount.

USFWS

Conclusion

Similar to wildlife observation, photography and environmental education, under existing conditions, there would be limited interpretive facilities and programs available under alternative A. By hiring one staff person in alternative B and two persons in alternatives C and D, the Service could increase programs and develop additional facilities (10 percent more in alternative D and 15 percent more in alternative C. A small interpretive center in alternatives C and D would enable the refuge to provide quality interpretive programs across the refuge.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on OUTREACH

Effective outreach depends on open and continuing communication and collaboration between the refuge and its many publics. It involves determining and understanding the issues, identifying audiences, listening to interested groups and the public, creating messages, selecting the most effective delivery techniques, and evaluating effectiveness (FWS 2008f).

Under alternative A, the Service would occasionally participate in State and local events, make presentations, recruit some volunteers to support staff efforts, seek grants in partnership with others, and use the internet to keep the public informed about the refuge's programs and activities.

Under alternative B, the Service would increase its outreach efforts resulting in a negligible, 5-percent targeted increase in requests for information

about the refuge. Additionally, there would be a modest increase in efforts to give presentations or host open houses annually. Alternative C would result in the greatest improvement in outreach efforts resulting in a 15-percent, or minor, targeted increase in requests for information by the public. Alternative D would be intermediate with a 10-percent, or minor, targeted increase.

As compared to alternative A, alternatives B, C, and D, the Service would develop a friends group although the timing would vary in the implementation the group.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on ACCESS

This section addresses how access to the refuge is affected under each alternative. Refer to the rationales in chapter 3 under access for an explanation of how and why access would change.

All Alternatives

Visitors to the refuge would continue to have many opportunities for accessing the refuge ranging from the wide network of roads, river access, and designated landing areas on Fort Peck Reservoir for planes. Licensed motor vehicles would be allowed on refuge roads (refer to access under section 4.5 in chapter 4), along with other types of users like boaters, bicyclists, snowmobilers, cross-country skiers, and others. There would continue to be an extensive network of roads although there would be some minor differences between the alternatives (refer to table 26 above; also see figures 7–10 alternative maps in chapter 3).

The Wilderness Society (2009) modeled the accessibility of the refuge by foot from a road for each alternative, assigning values for the time it takes to travel across different vegetation classes while accounting for the steepness of the slope. As shown in figures 45 and 46, within an hour of walking from a road, regardless of the alternative selected, between 90 and 100 percent of the refuge would be accessible for average hikers. Even with reductions in the miles of road under alternative B (106 miles) and D (23 miles), it would result in negligible to minor differences in the amount time it would take to access the majority of the refuge within 30 minutes of a road. Figures 45 and 46 show various travel times across the refuge.

The Service has little information on the number of boat users across the refuge, but none of the alternatives would negatively affect boat users. Bicyclists could continue to access the refuge from any numbered open road or seasonally closed road.

Alternative A

Under alternative A the current road system on the refuge would remain in place (about 670 miles of road). Current refuge data indicates about 62 percent of the refuge is within 1 mile of an open road, and 82 percent is within 1 mile of motorized access. Minor modifications to the current road system would take place over the life of the plan. Where a private landowner has closed access to the refuge, the Service would work with the counties and others to provide access to the refuge. This would be an ongoing challenge as private lands within and immediately adjacent to the refuge restrict access to public land. In addition, safety concerns and maintenance could require that some roads be rerouted or closed to provide for public safety. Under this alternative, the impacts on vehicular access are negligible. Figure 47 displays areas of the refuge accessible by foot within certain amounts of time; almost all of the refuge is accessible by foot within 90 minutes, and most of the refuge is accessible by foot within 30 minutes. This assumes that access occurs from within the refuge and not from outside the refuge where an extensive road network provides access to many boundary areas.

Alternative B

Under alternative B approximately 106 miles of road would be closed to improve habitat for wildlife and/or better define true public access. In some situations, roads would be closed that are inaccessible to the public because of private land ownership within or outside the refuge. Although a primary reason for road closures would be for wildlife benefit, roads also would be closed to eliminate exclusive use in areas where access to the refuge has been closed by private landowners. This alternative would close roads that are not available to the entire public and would eliminate exclusive use of some roads on the refuge. Road closures in this alternative would have a moderate positive benefit for wildlife populations (more security), especially big game. It would result in minor negative effects on road access with 8 percent fewer roads as compared with alternative A.

Alternative C

The refuge road system under alternative C would be very similar to the current road system that exists under alternative A. Several roads (Routes 209 and 108) would be improved (all-weather access), which would provide minor benefits for accessibility in those areas.

Alternative D

About 23 miles of road would be seasonally closed or permanently closed on the refuge. Route 209 would be improved to all weather access. In addition, those roads that currently do not provide vehicle access to

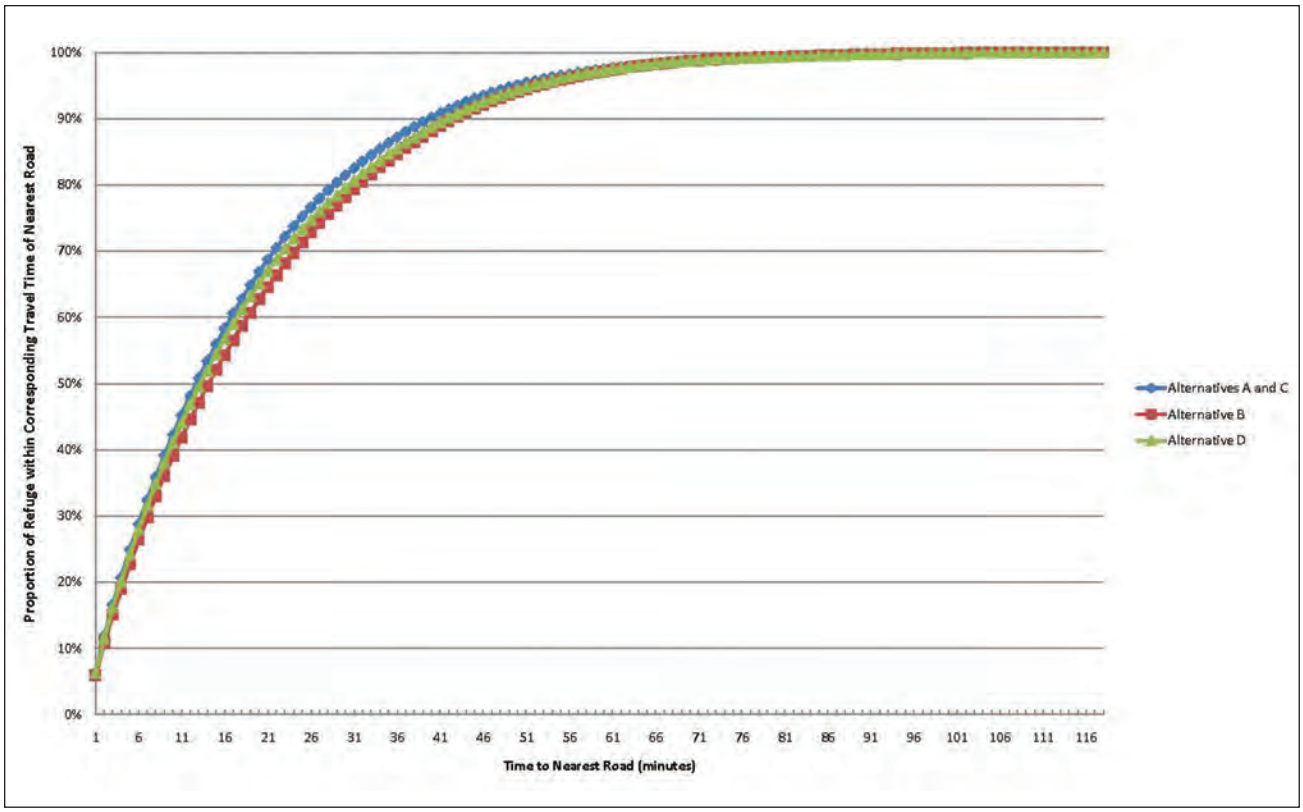


Figure 45. Graph of the proportion of the Charles M. Russell and UL Bend refuges within the corresponding travel time of the nearest road, by CCP alternative. Source: The Wilderness Society (2009).

the public would be closed to eliminate exclusive use. Effects on access would be negligible (about 5 percent).

Conclusion

Visitors to the refuge would continue to access the refuge through a variety of means and opportunities. Alternatives A and C would have the most miles of road open for travel at 670 miles. Alternative B would result in 106 miles of closed road and alternative D would close about 23 miles of road. Under all alternatives, nearly 80 percent of the refuge would be accessible within 30 minutes of walking time and 90 percent or more would be accessible within an hour of walking. Alternative C would have the most all-weather access with 76 miles of road, and alternative D would have about 65 miles as compared to alternatives A and B with about 60 miles. The overall effect on refuge access would be minor impacts from alternative B, minor benefits from alternative C negligible effects from alternative D.

Mitigation

No mitigation would be required.

EFFECTS on RECREATION SITES

None of the Service's actions would affect USACE's management of its developed recreation areas. The Service would continue to manage the primitive recreation sites (refer to chapter 4) under all alternatives.

EFFECTS on COMMERCIAL RECREATION

This section evaluates the effects of wildlife-outfitting and guiding and commercial fishing.

Alternative A

Wildlife outfitting/guiding activities would continue at the current permitted level of 11 outfitters operating on the refuge. Outfitters would still be required to submit annual report with the number of clients, number of days hunted and game species sought and harvested. As outfitters retire, the refuge would continue the practice of holding those permits and not issuing new permits until a new visitor services plan is completed. There would continue to be some conflict with the public in some areas as guides and clients compete for the same space and resource. Commercial fishing and fishing tournaments are managed by MFWP and the USACE on Fort Peck Lake. Since USACE has primary jurisdiction on recreational activities on Fort Peck Lake, the Service would continue to support MFWP and USACE in managing those activities.

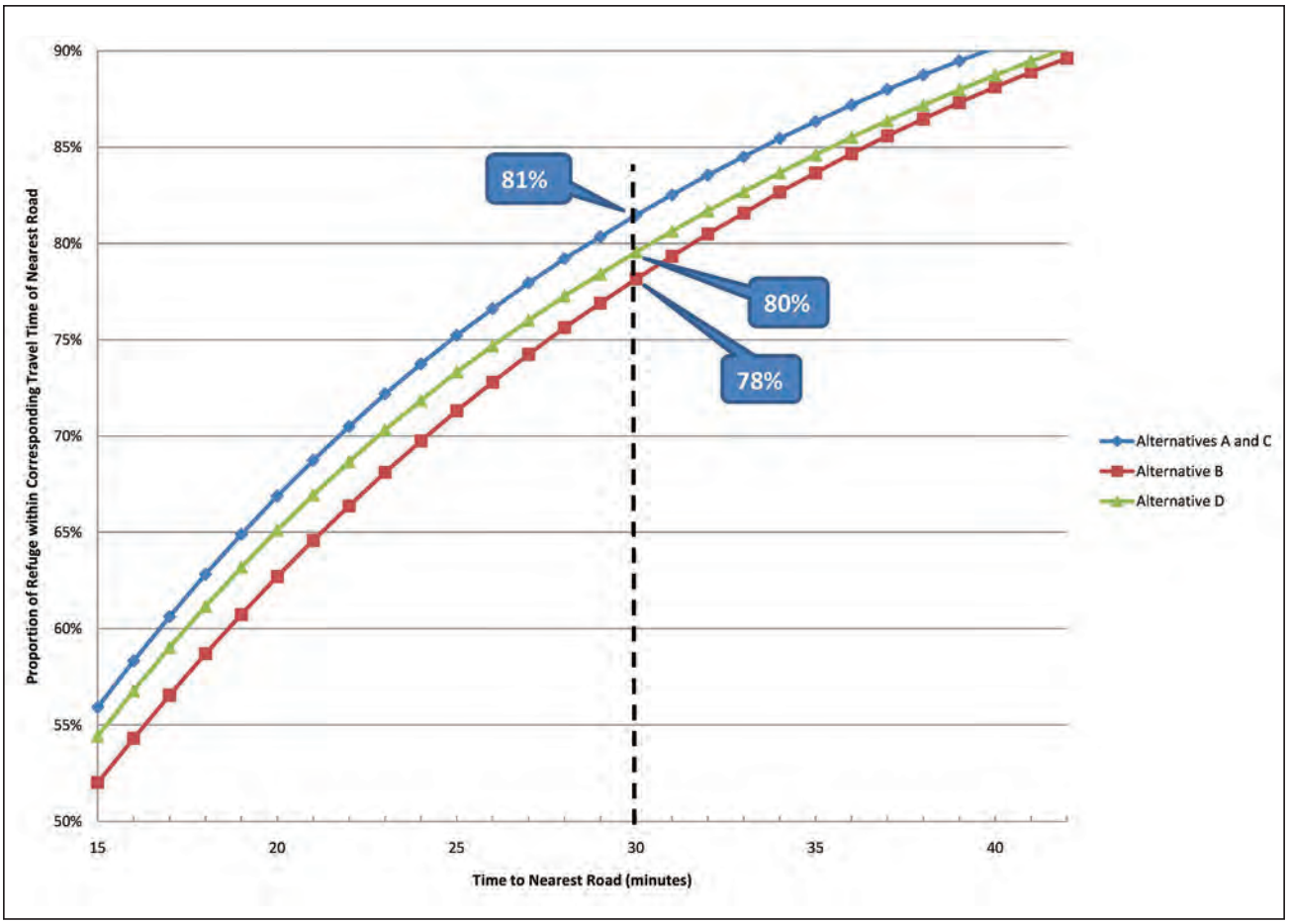


Figure 46. Graph of the proportion of the Charles M. Russell and UL Bend refuges to the nearest road at 30 minutes.
Source: The Wilderness Society (2009).

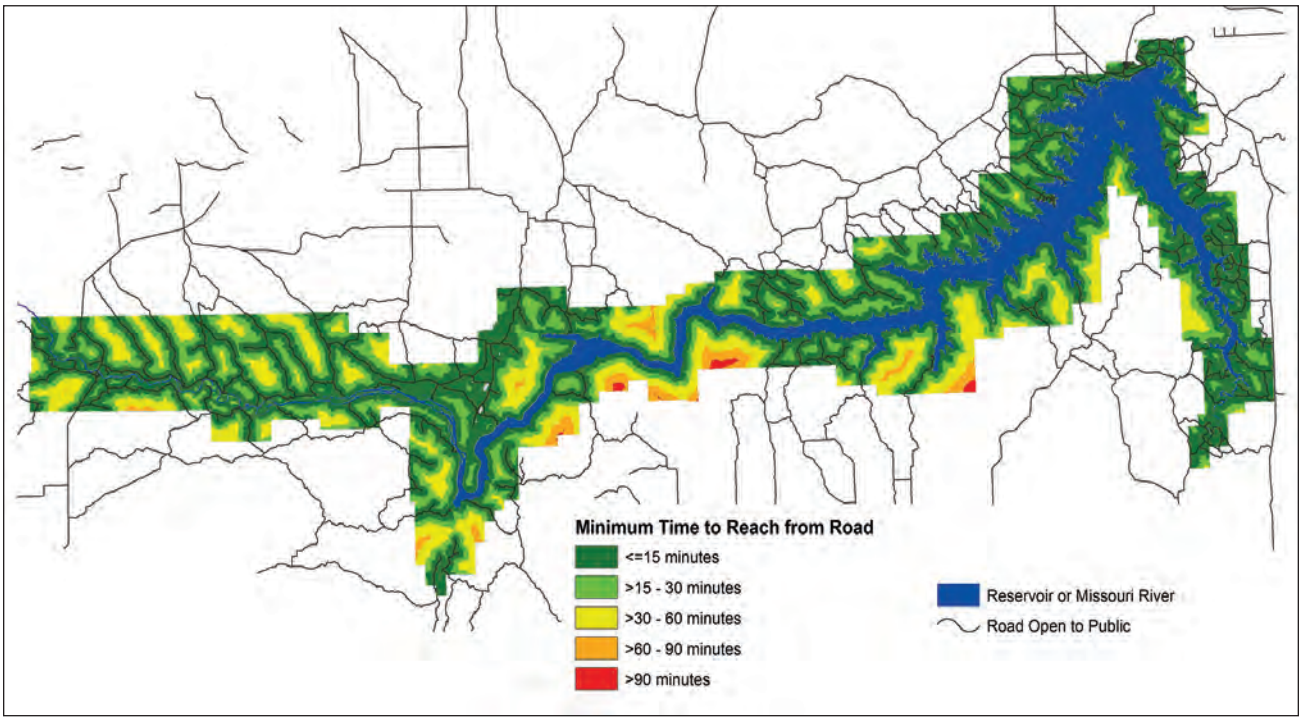


Figure 47. Map of accessibility by foot to the Charles M. Russell and UL Bend refuges under CCP alternative A.
Source: The Wilderness Society (2009)

Alternatives B and D

Under alternatives B and D outfitting/guiding for hunting would be evaluated to ensure there are no conflicts with other hunters on the refuge. Outfitters would still be required to submit annual report. The number of outfitting permits for hunting would be adjusted during the life of the CCP to meet wildlife and/or habitat objectives. The Service would evaluate permitting outfitting/guide services for wildlife viewing, resulting in minor economic gain for outfitter/guides and a small increase in the number of visitors to the refuge. The extent of these effects is unknown due to incomplete data on the interest by the public for guided wildlife-viewing activities. Conflicts between guides, clients, and the public would be minimized. For commercial fishing and commercial-fishing tournaments, the refuge would work with MFWP and USACE to ensure these activities are consistent with Service policy.

Alternative C

Same as alternatives B and D except additional permits would be issued as long as they are that consistent with refuge policy and procedures for issuing permits, along with anticipated time and space restraints, would reduce conflicts with the public and between guides. Additional outfitting/guide permits would be issued for pack and retrieval services to facilitate the harvest of cow elk in proposed wilderness units and to promote wildlife viewing, resulting in minor economic gain for outfitters/guides and a small increase in refuge visitors.

Conclusion

Under existing conditions, outfitting permits would remain at about 11 outfitters operating on the refuge. Alternatives B and D would evaluate the program to ensure there were no substantial conflicts with other hunters. The number of hunters could be adjusted to meet wildlife and habitat objectives if necessary. Under alternative C, additional permits could be issued provided they were consistent with refuge policies and procedures and there were no substantial conflicts with other hunters. There could be additional permits issued for pack and retrieval services to facilitate harvest in wilderness or to promote wildlife viewing.

Mitigation

No mitigation measures would be necessary under any alternative.

CUMULATIVE IMPACTS on VISITOR SERVICES

The Fort Peck Dam/Fort Peck Lake Master Plan describes proposed upgrades and expansions of recreational facilities at existing sites. Proposed upgrades include expanded camping facilities, improved sewage treatment, improved boat ramps, improved day use facilities, and increased interpretive facilities. Implementation of the proposed master plan would directly benefit recreational uses on Fort Peck Lake and at existing facilities. Since many of these areas are used by refuge visitors, implementation of the master plan would also result in minor to moderate cumulative benefits to recreational access and experiences and commercial uses on the refuge (under any refuge management alternative).

The direct and indirect effects of the Enhancement Act of 2000 (conveyance of cabin sites) are outside the scope of this analysis. Implementation of the Enhancement Act of 2000 would not result in any cumulative effects on refuge recreation areas.

As part of the Upper Missouri River Breaks National Monument Resource Management Plan, the BLM will limit special use permits commercial recreational use on the Missouri River and related lands (BLM 2008). This may adversely affect some users in the short term, but would likely result in long-term benefits due to a predictable and equitable permit system that maintains the quality of the resource. Under any refuge management alternative, this may result in minor to moderate short-term cumulative impacts and long-term cumulative benefits on commercial river access on the refuge.

Implementation of the Upper Missouri River Breaks National Monument Resource Management Plan includes management actions to improve recreational access and experiences along the Missouri River (BLM 2008). Under any refuge management alternative, these actions may result in minor cumulative benefits to recreational river access opportunities on the refuge.

5.7 Environmental Consequences for Special Areas

This section addresses the effects on land areas with special land designations, including wilderness. Refer to specific topics under visual resources and soundscapes for additional information.

EFFECTS on SPECIAL MANAGEMENT AREAS

None of the alternatives would change the special management areas including the Upper Missouri Breaks Wild and Scenic River, research natural areas, national natural landmarks, and the Lewis and Clark Historic Trail (refer to section 4.4 in chapter 4).

EFFECTS on WILDERNESS

This section evaluates the effects of changes in wilderness protection across the four alternatives. The acreage of proposed wilderness protection on the refuge and the opportunities to experience wilderness as defined in the Service's wilderness stewardship policy (FWS 2008d) are evaluated. For complete information about the Service's review on wilderness and for a breakout of each wilderness unit, refer to appendix E and the alternative maps (figures 7–10) in chapter 3. The specific effects from habitat management or other activities in wilderness are addressed under the specific resource topic being affected such as visual resources, vegetation, wildlife, access, and others and is not addressed here.

Several studies have been completed showing the potential irreversible effects of recreation on valuable wilderness. A publication put out by the Wilderness Society and the USDA Forest Service, Keeping It Wild: A Citizen Guide to Wilderness Management (1992), is a summary from the Wilderness Act and subsequent legislation. It notes that wilderness should provide for human use while preserving the wilderness character, providing outstanding opportunities for solitude or a primitive and unconfined recreational experience. In addition, recreation should favor wilderness-dependent activities when managing wilderness use. Other non-wilderness-dependent recreation activities taking place in wilderness can be enjoyed elsewhere.

In this analysis, the refuge is examining what proposed wilderness units should remain wilderness because the areas meet the criteria in the Wilderness Act, and the units where other wildlife-dependent recreational activities can be accommodated. In some of the existing proposed areas, the Service has a legal responsibility to allow access to State and private inholdings, and some of these lands are being considered for removal from wilderness protection. While the habitat within those areas is still valuable for wildlife, nonetheless, under existing conditions, it has been fragmented.

Table 27 summarizes the amount of wilderness that would be protected under each alternative. The narratives that follow describe the effects of the various levels of protection.

All Alternatives

There would be no effects to the 20,819 acres of designated wilderness in UL Bend Wilderness. It would continue to protect important habitat and wildlife values including the black-footed ferret (endangered) and other species of concern such as the greater sage-grouse. It would offer outstanding opportunities for solitude and primitive and unconfined recreation. No motorized vehicles would be allowed.

Game carts would not be allowed in UL Bend Wilderness, but they would be allowed in all proposed wilderness units. In proposed wilderness units where livestock grazing still occurred, some wilder-

Table 27. Wilderness protection under the CCP alternatives for the Charles M. Russell and UL Bend refuges.

	Alternative A	*Alternative B*	*Alternative C*	*Alternative D*
Acres in UL Bend Wilderness[1]	20,819	20,819	20,819	20,819
Acres of current proposed wilderness[2]	155,288	155,288	155,288	155,288
Increase in acres	0	+25,037	0	+18,559
Decrease in acres	0	0	–35,881	–26,744
Acres in proposed wilderness alternatives	155,288	180,324	119,407	147,103
Acres of total wilderness protection (designated and proposed)	176,107	201,143	140,226	167,922
% Change in wilderness protection	0	+14	–20	–5
% of refuge with wilderness protection[3]	16	18	13	15

[1] *Based on the legal acreage .*

[2] *The actual proposed wilderness acreage sent forth to Congress was 155,288 acres, but with advances in technology, current GIS acreages may differ slightly.*

[3] *Based on the 1.1 million-acre refuge boundary.*

ness users could be negatively affected by the visual impact of livestock grazing (refer to visual resources in section 5.4 above and see figure 16 in chapter 4).

Alternative A

Under alternative A, the acreage of proposed wilderness would remain at 155,288 acres as proposed in 1974 (note: current GIS calculations estimate the acreage as 158,619 acres, which is within the accepted 2-percent differential margin). Within the refuge boundary, about 16 percent of the refuge would be protected as wilderness. Overall, maintaining the current size and location for proposed wilderness units would have negligible effects on wildlife-dependent recreation opportunities or other wilderness values. Recreationists looking for solitude and primitive recreation would be able to find multiple opportunities across the refuge as well as for those who want better access with their recreational experience (refer to access in section 5.7 above). A higher level of land protection would continue for all 15 proposed wilderness units protecting the characteristics that make them primitive and allowing natural processes to operate freely, sustaining the ecological processes that create the interconnected web of life in wilderness. (The Wilderness Society 1992).

Alternative B

Under alternative B, there would be a net gain of 25,037 acres of protected wilderness land. This would result in a 14-percent increase in wilderness lands across the refuge (refer to table 27). Nineteen percent of the refuge would be protected as wilderness as compared to 16 percent in alternative A. By adding acreage to several of the current proposed wilderness units, the refuge would increase protection of natural ecosystems and allow natural processes to operate freely. Road closures surrounding wilderness will total about 13 miles. Most of the closures are short spur roads. The reduction in disturbance to wildlife within those areas would have a minor benefit, allowing wildlife to forage and migrate between

USFWS

UL Bend Wilderness protects habitat for the greater sage-grouse, a species of concern on the refuge.

forage sites with less possibility of disturbances and hindrance due to roads. In a few localized areas, the closures could make it more difficult to manage big game through hunting, but given the overall accessibility of the refuge, the impact would be negligible (figures 45, 46, and 47). Although some species tolerate road systems, there are other species, particularly large carnivores, that are usually absent in landscapes with high road densities (Noss 1991). Overall, the proposed wilderness changes in alternative B would have minor benefits on wilderness and values on the refuge.

Alternative C

There would be a net loss of 35,881 acres of proposed wilderness through the elimination of four wilderness units and a decrease in acreage of one currently proposed wilderness unit. A 20-percent decrease in wilderness protection (refer to table 27) would have a minor to moderate negative effect on wilderness as a resource and its inherent values. Removing wilderness protection would allow for some additional wildlife-dependent recreation opportunities, better access, and fewer restrictions on livestock owners. Increased opportunities and access also have the potential to disturb wildlife. The level of disturbance would vary depending on the extent, longevity, and intensity of the activity (Cole 1996). In those areas where the protection of wilderness is removed, it could allow for easier access and eliminate issues over the use of game carts.

One area being considered for elimination is the East Hell Creek proposed wilderness unit. It contains 14,744 acres, a private inholding, a State section, and a network of refuge roads that by law are required to remain open to allow for access to both. While this area of the refuge contains valuable habitat, due to the encumbrance of inholdings and roads, the habitat is fragmented and some of the wilderness values are limited. Within the vicinity of wilderness, some formerly seasonally closed could be opened, allowing for additional access to the refuge. However, no new roads would be proposed in the draft CCP and EIS. While the additional access will have a minor impact on wildlife and habitat, it would allow for increased use of the refuge and provide for additional recreation such as hunting and game retrieval. Overall, the proposed wilderness changes in alternative C would have minor impacts on wilderness and values on the refuge.

Alternative D

Under alternative D, there would be a net loss of 8,185 acres of proposed wilderness. About 18,559 additional acres would be protected in six proposed wilderness units, and 26,744 acres would be eliminated in three areas. With a 5-percent loss of designated and proposed wilderness acres as compared to alternative A, it would result in minor negative effects for wilderness protection values and negligible effects refugewide. There would be 6 miles of road closures associated with the additional proposed wilderness acres. These road closures would allow wildlife to migrate between forage sites with fewer disturbances. With the potential increase in recreational activities and reduced restrictions on access within those areas, there is the potential for additional wildlife and habitat disturbance and destruction.

Wilderness areas are intended to be large enough to allow landscape-scale ecological processes to occur naturally, providing a standard of healthy, intact, relatively unmodified land (Noss 1991). By consolidating proposed wilderness units within alternative D, it allows for the protection of larger landscapes and the ecological processes associated with these landscapes, while allowing more liberal land use to those areas encumbered by roads and private inholdings. Those areas removed from proposed wilderness (such as East Hell Creek mentioned above), still contain valuable habitat, however from a management standpoint it should not longer contain wilderness protection due to its proximity to roads and inholdings. The consolidation of proposed wilderness units is seen as an overall benefit to the habitat by allowing larger areas natural process to operate freely keeping the land as wild and natural as possible.

Overall, the proposed wilderness changes in alternative B, including the consolidation of proposed wilderness units, would have minor benefits on wilderness and values on the refuge.

Conclusion

Under all alternatives, 20,819 acres of designated wilderness in UL Bend Wilderness would remain protected as identified in the Wilderness Act of 1964. No motorized vehicles would be allowed. Game carts would not be allowed in UL Bend Wilderness, but until a minimum tool analysis was completed, they would be allowed in all proposed wilderness units. Increases in proposed wilderness would provide additional protection of those natural ecosystems and allow natural processes to operate freely.

Under alternative A, the proposed wilderness acreage would remain at 155,288 acres as proposed in 1974. Within the refuge boundary, about 16 percent of the refuge would be protected as wilderness. In alternative B, there would be a net gain of 25,037 acres of proposed wilderness, resulting in a 14-percent change refugewide. Alternative C would see a net loss of 35,881 proposed wilderness acres (20 percent less), while alternative D have a net loss of 8,185 acres (5 percent less). The effects on total designated and proposed wilderness acres, and the values that they provide, would be minor benefits in alternative B,

minor impacts in alternative C, and minor benefits in alternative D. The effects of reduced total wilderness acres in alternative D would be offset by the improved arrangement of wilderness to be more efficient and effective.

Mitigation

No mitigation measures would be necessary under any alternative.

CUMULATIVE IMPACTS on SPECIAL AREAS

The BLM has three wilderness study areas that are contiguous with existing designated wilderness on the refuge. The existing configuration and management of these areas to preserve wilderness values provides moderate cumulative benefits to the management and integrity of wilderness on the refuge by expanding the total size of wilderness areas. These moderate cumulative benefits would be the same under alternatives A, B, and D, and would be slightly less in alternative C (figure 9), which would remove wilderness protections from one of the units that abuts BLM wilderness study areas (east of Forchette Creek Recreation Area).

None of the alternatives would result in cumulative impacts on other special land designations.

5.8 Environmental Consequences for Cultural and Historical Resources

Many of the refuge's prehistoric and historic resources have not been surveyed. Formal investigations have been sporadic and there is still a lot the Service does not know regarding these resources (refer to section 4.6 in Chapter 4–Affected Environment).

EFFECTS COMMON to ALL ALTERNATIVES

Activities outlined in each alternative have the potential to negatively affect cultural resources, either by direct disturbance during construction of habitat projects and facilities related to public use or administration and operations, or indirectly by exposing cultural and historic artifacts during management actions such as habitat restoration or prescribed burning. The presence of cultural resources including historic properties would not prevent a Federal undertaking or project, but any undertaking would be subject to Section 106 of the National Historic Preservation Act, or other laws protecting cultural resources (refer to Appendix D–Key Legislation and Policy). Many negative effects to cultural resources would be identified and options for minimizing impacts would be discussed prior to any implementation of the project. The Service would provide the Regional Historic Preservation Officer a description and location of all projects, activities, routine maintenance, and operations that could negatively affect ground and structures, details on requests for allowable uses, and the options being considered. The region 6 archaeologist would analyze these undertakings for their potential to affect historic properties and enter into consultation with the State Historic Preservation Officer and other parties as appropriate. As necessary, the refuge would notify the public and local government officials. The Service would protect all known gravesites. Any collection of plant or other materials for tribal ceremonial purposes would be conducted under a special use permit.

EFFECTS of ALTERNATIVES B, C, and D

As compared to alternative A, under alternatives B, C, and D, the Service would increase protection and preservation of cultural resources found on the refuge primarily through better planning and additional survey work. Development of a step-down plan early in the implementation of the CCP would benefit cultural resources, particularly if it were integrated early with habitat management plans. Additional survey work would enable the refuge to identify areas with a high or moderate likelihood of historic properties, and actions could be taken to limit negative effects on cultural resources.

Visitors who are interested in the refuge's historical past would benefit from an increased emphasis on interpretation of the refuge's cultural resources and the efforts to preserve its rich past.

CONCLUSION

The Service would continue to follow all cultural resources laws for any project work on the refuge. Under alternatives B, C, and D, the Service would increase protection efforts largely through better planning, survey work, and law enforcements. Tribes would be allowed to collect and use plants and other resources for ceremonial purposes under a special use permits. These efforts would result in negligible to minor benefits to cultural resources.

MITIGATION

For cultural resources, any mitigation measures would be addressed with the State Historic Preservation Officer.

CUMULATIVE IMPACTS on CULTURAL and HISTORICAL RESOURCES

None of the alternatives would result in cumulative impacts on cultural and historical resources.

5.9 Environmental Consequences for Paleontological Resources

The primary effects would be on Hell Creek and Bug Creek.

EFFECTS COMMON to ALL ALTERNATIVES

Paleontological resources would be protected on the refuge in accordance with the Paleontological Resources Protection Act of 2009. However, the digging of fossils, even when done under a special use permit would result in direct, negative, and long-term effects from the excavation of these resources from their original context. In keeping with the provisions of the Protection Act, the excavation of these important fossils by credible research facilities would contribute to the knowledge and interpretation of the fossil history of the area. The refuge would continue to issue permits to the Museum of the Rockies or others to collect paleontological resources. Recreational digging would be prohibited. The landmarks at Hell Creek and Bug Creek would be conserved.

EFFECTS of ALTERNATIVES B, C, and D

As required by the Protection Act, the Service would work with Montana State University to develop a step-down plan to protect paleontological resources and facilitate uniform permitting for research for credible research. Increased law enforcement, educational, and interpretive exhibits would ensure protection of these resources while providing opportunities for the public to enjoy and learn about these resources. These measures would result in minor benefits to paleontological resources.

CONCLUSION

Under all of the action alternatives, the continued adherence to the Paleontological Resources Protection Act of 2009, along with the completion of a step-down plan and increased management, interpretation, and law enforcement would result in minor benefits to paleontological resources on the refuge over the long-term.

MITIGATION

No mitigation measures would be necessary under any alternative.

CUMULATIVE IMPACTS on PALEONTOLOGICAL RESOURCES

None of the alternatives would result in cumulative impacts on paleontological resources.

USFWS

5.10 Environmental Consequences for the Socioeconomic Environment

The Service contracted with the USGS through the Policy and Science Assistance Branch of the Biological Resources Division, Fort Collins Science Center for the economic impact analysis for this CCP and EIS. It is important to note that the economic value of a refuge encompasses more than just the effects of the regional economy. Refuges also provide substantial nonmarket values (values for items not exchanged in established markets) such as maintaining endangered species, preserving wetlands, educating future generations, and adding stability to the ecosystem (Carver and Caudill 2007). However, quantifying these types of nonmarket values is beyond the scope of this study.

The methods used to conduct a regional economic impact analysis are described below. An analysis of the management objectives and strategies found in chapter 3 that could affect stakeholders and residents and the local economy is then presented. The refuge management activities of economic concern in this analysis follow:

- Refuge purchases of goods and services within the local community.
- Refuge personnel salary spending.
- Grazing operations.
- Spending in the local community by refuge visitors.
- Revenues generated from Refuge Revenue Sharing program.

METHOD for the REGIONAL ECONOMIC IMPACT ANALYSIS

Economic input-output models are commonly used to determine how economic sectors will and will not be affected by demographic, economic, and policy changes. The economic impacts of the management alternatives for the refuge were estimated using IMPLAN (Impact Analysis for Planning), a regional input-output modeling system developed by the USDA Forest Service. IMPLAN is a computerized database and modeling system that provides a regional input-output analysis of economic activity in terms of 10 industrial groups involving more than 400 economic sectors (Olson and Lindall 1999). The IMPLAN model draws on data collected by the Minnesota IMPLAN Group from multiple Federal and State sources including the Bureau of Economic Analysis, Bureau of Labor Statistics, and the U.S. Census Bureau (Olson and Lindall 1999). The year 2007 IMPLAN county level data profiles for McCone, Garfield, Fergus, Phillips, Petroleum, and Valley were used in this study. The IMPLAN county level employment data estimates were found to be comparable to the US Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System data for the year 2007.

Because of the way industries interact in an economy, a change in the activity of one industry affects activity levels in several other industries. For example, if more visitors come to an area, local businesses will purchase extra labor and supplies to meet the increase in demand for additional services. The income and employment resulting from visitor purchases from local businesses represent the direct effects of visitor spending within the economy. Direct effects measure the net amount of spending that stays in the local economy after the first round of spending; the amount that does not stay in the local economy is termed a leakage (Carver and Caudill 2007). To increase supplies to local businesses, input suppliers must also increase their purchases of inputs from other industries. The income and employment resulting from these secondary purchases by input suppliers are the indirect effects of visitor spending within the economy. Employees of the directly affected businesses and input suppliers use their incomes to purchase goods and services. The resulting increased economic activity from new employee income is the induced effect of visitor spending. The indirect and induced effects are known as the secondary effects of visitor spending. "Multipliers" (or "response coefficients") capture the size of the secondary effects, usually as a ratio of total effects to direct effects (Stynes 1998). The sums of the direct and secondary effects describe the total economic impact of visitor spending in the local economy.

For each alternative, regional economic effects from the IMPLAN model are reported for the following categories:

- Local output represents the change in local sales or revenue.
- Employment represents the change in number of jobs generated in the region from a change in regional output. IMPLAN estimates for employment include both full- and part-time workers, which are measured in total jobs.
- Labor income includes employee wages and salaries, including income of sole proprietors and payroll benefits.

The CCP provides long-range guidance and management direction to achieve refuge purposes over a 15-year timeframe. The economic impacts reported in this report are on an annual basis in 2007 dollars. Large management changes often take several years

to achieve. The estimates reported for alternatives B, C, and D represent the final economic effects after all changes in management have been implemented.

ECONOMIC IMPACTS of ALTERNATIVE A

The economic impacts from revenue-sharing payments, refuge administration, public use activities, and other refuge management activities associated with livestock grazing are analyzed.

Revenue Sharing

Forty percent of the acreage within the refuge boundary is under the primary jurisdiction of the Service. The majority of the acreage (51 percent) falls under the primary jurisdiction of the USACE, with the Service having secondary jurisdiction in those areas. The Montana DNRC and private landowners own the remaining acreages. Under provisions of the Refuge Revenue Sharing Act, local counties receive an annual payment for lands that have been purchased by full fee-simple acquisition by the Service. Table 28 shows the Service fee acquisition acreage in each surrounding county.

Table 28. Full fee-simple acquisition acreage and refuge revenue-sharing payments for the Charles M. Russell and UL Bend refuges (fiscal year 2008).

County	*Full Fee-simple Acquisition (acres)*	*Refuge Revenue-sharing Payment ($)*
Fergus	2,512	2,626
Garfield	5,952	6,819
McCone	2,784	1,325
Petroleum	2,981	2,360
Phillips	12,715	17,347
Valley	6,455	4,652
Totals	24,935	25,684

Refuge revenue-sharing payments are based on the greater of 75 cents per acre or 0.75 percent of the fair market value of lands acquired by the Service. The exact amount of the annual payment depends on Congressional appropriations, which in recent years have tended to be less than the amount to fully fund the authorized level of payments. In 2008, the six-county area surrounding the refuge received refuge revenue-sharing payments totaling $25,684 (refer to table 28). Table 29 shows the resulting economic impacts of refuge revenue-sharing payments under alternative A. Accounting for both the direct and secondary effects, refuge revenue-sharing payments for alternative A generate total annual economic impacts of $32.6 thousand in local output, $7 thousand in labor income, and less than one third of a job in the local impact area.

Refuge Administration

The spending by refuge employees and work-related purchases are identified.

Employees' Personal Purchases. Refuge employees reside and spend their salaries on daily living expenses in communities near the refuge thereby generating impacts within the local economy. Household consumption expenditures consist of payments by individuals/households to industries for goods and services used for personal consumption. The IMPLAN modeling system contains household consumption spending profiles that account for average household spending patterns by income level. These profiles also capture average annual savings and allow for leakage of household spending to outside the region. The current approved refuge staff consists of 28 permanent and 21 seasonal employees for alternative A, as shown in table 6 in chapter 3.

Based on fiscal year 2008 salary charts, it was estimated that annual salaries for alternative A would total over $2.3 million. Table 30 shows the economic impacts associated with spending of salaries in local area by refuge employees under alternative A. For alternative A, salary spending by refuge personnel would directly account for $1.5 million in local output, 11 jobs, and $277.2 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional $375.2 thousand in local output, four jobs, and $98.9 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative A would generate total economic impacts of $1.9 million in local output, 15 jobs, and $376.1 thousand in labor income.

Table 29. Annual economic impacts from refuge revenue-sharing payments by the Charles M. Russell and UL Bend refuges for CCP alternative A (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	25.5	5.0	0
Secondary effects	7.1	2.0	0
Total Economic Impact	32.6	7.0	0

Table 30. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative A (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	1,502.1	277.2	11
Secondary effects	375.2	98.9	4
Total Economic Impact	1,877.3	376.1	15

Work-related Purchases. A wide variety of supplies and services are purchased for refuge operations and maintenance activities. Refuge purchases made in the six-county area, contribute to the local economic impacts associated with the refuge. According to refuge records, approximately 40 percent of the annual nonsalary budget expenditures are spent on goods and services purchased in the six-county area. Major local expenditures include supplies and services related to building maintenance and construction; auto repairs, parts, and fuel; and utilities. Average annual nonsalary expenditures for alternative A are anticipated to be $1.45 million. Table 31 shows the economic impacts associated with work-related expenditures in the six-county area. For alternative A, work-related expenditures would directly account for almost $597 thousand in local output, two jobs, and $59 thousand in labor income in the local economy. Accounting for both the direct and secondary effects, work-related purchases for alternative A would generate total economic impacts of $670.8 thousand in local output, three jobs, and $79.8 thousand in labor income.

Public Use and Access

The impact from expenditures by refuge visitors is evaluated.

Refuge Visitors' Expenditures in the Local Economy. Spending associated with recreational visits to national wildlife refuges generates significant economic activity. The Service report "Banking on Nature: The Economic Benefits of National Wildlife Refuges Visitation to Local Communities" estimated the impact of national wildlife refuges on their local economies (Carver and Caudill 2007). According to the report, more than 34.8 million visits were made to national wildlife refuges in fiscal year 2006, which generated $1.7 billion of sales in regional economies. Accounting for both the direct and secondary effects, spending by national wildlife visitors generated nearly 27,000 jobs, and over $542.8 million in employment income (Carver and Caudill 2007). Approximately 82 percent of total expenditures were from nonconsumptive activities, 12 percent from fishing, and 6 percent from hunting (Carver and Caudill 2007).

The refuge offers a wide variety of year-round accessible recreational opportunities including big game hunting, upland game hunting, fishing, migratory game bird and waterfowl hunting, and nonconsumptive wildlife-viewing, education and photography opportunities. Information on State and regional trends and associated economic impacts of these recreational activities were presented in the previous section. This section focuses on the local economic impacts associated with refuge visitation. Annual refuge visitation estimates are based on several refuge statistic sources including: visitors entering the visitor center or other offices, traffic counters, hunting permits, and general observation by refuge personnel. Annual refuge visitation estimates are on a per visit basis. Table 32 summarizes estimated refuge visitation by type of visitor activity for alternative A.

To determine the local economic impacts of visitor spending, only spending by persons living outside the local six-county area are included in the analysis. The rational for excluding local visitor spending is twofold. First, money flowing into the local area from visitors living outside the local area (hereafter referred to as nonlocal visitors) is considered new money injected into the local economy. Second, if residents of the local six-county area visit the refuge more or less due to the management changes, they will correspondingly change their spending of their money elsewhere in the six-county area, resulting in no net change to the

Table 31. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative A (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	596.8	58.8	2
Secondary effects	74.0	21.0	1
Total Economic Impact	670.8	79.8	3

Table 32. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative A.

Visitor Activity	*Number of Visits*	*Percentage of Nonlocal Visits*	*Number of Nonlocal Visits*	*Number of Hours Spent at the Refuge per Visit*	*Number of Nonlocal Visitor Days*[2]
Consumptive Use					
Fishing	60,000[1]	50	30,000	8	30,000
Big game hunting	90,000	70	63,000	8	63,000
Waterfowl and migratory bird hunting	2,900	70	2,030	8	2,030
Upland game hunting	10,000	75	7,500	8	7,500
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	87,100	70	60,970	4	30,485
Totals	250,000	—	163,500	—	133,015

[1] *These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.*
[2] *One visitor day = 8 hours.*

local economy. These are standard assumptions made in most regional economic analyses at the local level. Refuge visitation statistics and hunting permits were used to determine the percentage of nonlocal refuge visitors. Table 33 shows the estimated percentage of nonlocal refuge visits for alternative A.

A visitor usually buys a wide range of goods and services while visiting an area. Major expenditure categories include lodging, restaurants, supplies, groceries, and recreational equipment rental. In this analysis we use the average daily visitor spending profiles from the Banking on Nature report (Carver and Caudill 2007) that were derived from the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. The survey reports trip-related spending of State residents and nonresidents for several different wildlife-associated recreational activities. For each recreation activity, spending is reported in the categories of lodging, food and drink, transportation, and other expenses. Carver and Caudill (2007) calculated the average per-person per-day expenditures by recreation activity for each region of the Service. Residents were defined as living within 30 miles of the refuge and nonresidents as living outside the 30-mile radius (Carver and Caudill 2007). For this analysis, nonlocal visitors match the nonresident spending profile definition. Therefore, the spending profile for nonresidents for the Service's region 6 (where the refuge is located) was used. Nonresident average daily spending profiles for big game hunting ($190.38 per day), small game hunting ($156.87 per day), migratory bird hunting ($67.62 per day), and freshwater fishing ($112.02 per day) were used to estimate nonlocal visitor spending for refuge hunting and fishing-related activities. The average daily nonresident spending profile for nonconsumptive wildlife recreation (observing, feeding, or photographing fish and wildlife) was used for nonconsumptive wildlife-viewing activities ($140.46 per day).

The visitor spending profiles are estimated on an average per day (8 hours) basis. Because some visitors only spend short amounts of time on the refuge, counting each refuge visit as a full visitor day would overestimate the economic impact of refuge visitation. To properly account for spending, the annual number of nonlocal refuge visits was converted to visitor days. Refuge personnel estimate that nonlocal hunters and anglers spend a full visitor day (8 hours) on the refuge. Nonlocal visitors that view wildlife on nature trails or participate in other wildlife observation activities typically spend 4 hours (one-half of a visitor day) on the refuge. Table 32 above shows the number of nonlocal visitor days by recreation activity for alternative A.

Total spending by nonlocal refuge visitors was determined by multiplying the average nonlocal visitor daily spending by the number of nonlocal visitor days. Table 33 above summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive (wildlife viewing) visitation for alternative A. Nonlocal refuge visitors would spend over $20.9 million in six-county area annually. This spending would directly account for $14.6 million in local output, 204 jobs,

Table 33. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative A (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	8,913.9	2,606.0	123
Wildlife viewing	3,337.6	975.4	51
Subtotal	14,619.2	4,227.8	204
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	3,519.7	946.6	36
Wildlife viewing	1,438.0	379.2	15
Subtotal	5,875.3	1,570.3	60
Total Effects			
Fishing	3,285.3	890.9	39
Hunting	12,433.6	3,552.6	159
Wildlife viewing	4,775.6	1,354.6	66
TOTAL Economic Impact	20,494.5	5,798.1	264

and $4.2 million in labor income in the local economy. The secondary or multiplier effects would generate an additional $5.9 million in local output, 60 jobs, and $1.6 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative A would generate total economic impacts of $20.5 million in local output, 264 jobs and $5.8 million in labor income.

Livestock Grazing

Service records indicate there were 42 cattle permits on the refuge in 2008 (refer to table 34). During 2008, approximately 24,000 AUMs were permitted; however, only 18,872 AUMs were actually used. Garfield County had the largest number of permits and AUMs (38.1 percent and 36.2 percent respectively). Both McCone and Phillips Counties had 19 percent of the permits, but Phillips accounted for 25.7 percent of total refuge AUMs while McCone only accounted for 14.4 percent. Valley County had 11.9 percent of total permits, and accounted 19.2 percent of total refuge AUMs. Both Fergus and Petroleum received less than 10 percent of total permits (9.5 percent and 2.4 percent respectively), while accounting for only 1.9 percent and 2.5 percent of total refuge AUMs.

Table 34. Grazing permits and AUMs for the Charles M. Russell and UL Bend refuges (2008).

County	*Number of Permits*	*Number of AUMs*
Fergus	4	359
Garfield	16	6,839
Petroleum	1	468
Phillips	8	4,849
McCone	8	2,726
Valley	5	3,631
Total	42	18,872

While total AUMs supplied by the refuge have decreased from 2001 to 2008, revenues received from refuge grazing permits have risen due to increases in refuge grazing fees from $9.50 per AUM in 2001 to $17.20 per AUM in 2008.

Table 35 summarizes the estimated economic impact of one AUM of refuge grazing to the six-county area economy if the refuge grazing is considered in isolation. This analysis, conducted by Dr. David Taylor (agricultural economist at the University of Wyoming), was estimated from a modified 2007 IMPLAN model of the six-county area. These estimates are based on the 1999–2008 average value of production for cow/calf operations in the northern Great Plains region of the United States (Economic Research Service 2009), which includes the refuge area, and a 2006 University of Idaho cow/calf budget (a specific budget for the six-county area was not available, the Idaho budget was determined to be the best match). On a per AUM basis, the average value of production was $41.09. Due to economic linkages between ranching and the rest of the six-county area economy, the total output from the production associated with one AUM of grazing was estimated to be $79.52. This represents the total economic activity that occurs within the region from production from one AUM of livestock grazing. Because of this eco-

Table 35. Economic impact of grazing on the Charles M. Russell and UL Bend refuges (2007$).

Impact Aspect	*Value Per AUM*	*Total for AUMs Permitted (24,000) at the Refuge*	*Total for AUMs of Actual Use (18,872) at the Refuge*
Value of production	$41.09	$986,160	$775,450
Total economic impact (output)	$79.52	$1,908,480	$1,500,620
Total labor earnings	$18.17	$436,080	$342,993
Total employment	0.000741 job	18 jobs	14 jobs
Average earnings per job	$24,532.00	$24,532	$24,532

Source: David Taylor, University of Wyoming (2009).

nomic activity, it is estimated that $18.17 of labor income are generated throughout the local economy and .000741 jobs are supported per AUM of livestock grazing. The .000741 jobs represent about one job for every 1,350 AUMS of livestock grazing. Average earnings per job for this employment are $24,532 per year.

For alternative A, the current level of permitted refuge grazing (24,000 AUMs) would generate $986.2 thousand of production in six-county area annually. This production would account for $1.9 million in total economic output, $436 thousand in labor earnings, and 18 jobs in the local economy (refer to table 35). The current level of AUMs actually used on the refuge (18,872 AUMs) would generate $775.5 thousand of production in six-county area annually. This production would account for $1.5 million in total economic output, $343 thousand in labor earnings, and 14 jobs in the local economy (refer to table 35).

Summary of Economic Impacts for Alternative A

Table 36 summarizes the direct and total economic impacts of refuge management activities for alternative A in the six-county area. Under alternative A, refuge management activities directly related to all refuge operations generate an estimated $16.7 million in local output, 217 jobs and $4.6 million in labor income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of $23.1 million in local output, 282 jobs, and $6.3 million in labor income. In addition, grazing on refuge lands generates $1.5 million in total output, 14 jobs, and $343 thousand in labor income in the six-county area economy. The economic impacts associated with grazing were not included in the summary of refuge management activities for alternative A (refer to table 36). Grazing would be on a prescriptive basis for all other alternatives where the specific number of AUMs are unknown; therefore, grazing impacts were not analyzed.

In 2007, total labor income was estimated at $466.4 million and total employment was estimated at 17,945 jobs for the six-county area (Minnesota IMPLAN Group 2007). Excluding grazing operations, total economic impacts associated with refuge operations under alternative A represents 1.3 percent of total income and 1.6 percent of total employment in the overall six-county area economy. Total

Table 36. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative A (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,098.9	336.0	13
Total effects	2,548.1	455.9	18
Public Use			
Direct effects	14,619.2	4,227.8	204
Total effects	20,748.6	5,798.1	260
Aggregate Impacts			
Direct effects	16,743.6	4,568.8	217
Total effects	23,075.2	6,261.0	282

Note: Economic impacts associated with grazing are not included.

economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, Fort Peck, Jordan, and Malta where most of the refuge's public use-related economic activity occurs.

ECONOMIC IMPACTS of ALTERNATIVE B

The economic impacts under alternative B from revenue sharing, refuge administration, public use activities, and other management activities are analyzed.

Revenue Sharing

The effects would be the same as for alternative A.

Refuge Administration

The impact from staff purchases and work-related purchases are evaluated.

Employees' Personal Purchases. Proposed staff for alternative B includes all approved staff positions (refer to table 6 in chapter 3) plus five additional positions. The new positions are an outdoor recreation planner, law enforcement officer, refuge operations specialist, range technician, and a technician. Table 37 shows the economic impacts associated with spending of salaries in the six-county area by refuge employees under alternative B. For alternative B, salary spending by refuge personnel would directly account for $1.7 million in local output, 13 jobs, and $306.7 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional $415.1 thousand in local output, four jobs, and $109.8 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative B would generate total economic impacts of $2.1 million in local output, 17 jobs, and $416.5 thousand in labor income. Due to the increased personnel levels for alternative B, the associated economic effects of staff salary spending would generate $199.6 thousand more in local output, two more jobs, and $40.4 thousand more in labor income than alternative A.

Work-related Purchases. Nonsalary expenditures for alternative B are anticipated to increase in proportion with the salary increase for the new staff positions for a total annual nonsalary budget of $1.61 million (an 11-percent increase compared to alternative A). Table 38 shows the economic impacts associated with work-related expenditures in the six-county area for alternative B. These estimates assume 40 percent of the nonsalary budget will be spent on goods and services purchased in the six-county area (same as current and alternative A). Work-related expenditures under alternative B would directly account for $660.3 thousand in local output, two jobs, and $65.1 thousand in labor income in the local economy. Accounting for both the direct and secondary effects, work-related purchases for alternative B would generate a total economic impact of $742.2 thousand in local output, three jobs, and $88.4 thousand in labor income. Due to the increased nonsalary expenditures for alternative B, the associated economic effects of work-related purchases would generate $71.3 thousand more in local output and $8.6 thousand more in labor income than alternative A.

Public Use and Access

Visitor expenditures are evaluated.

Refuge Visitors' Expenditures in the Local Economy. Changes in refuge management activities can affect recreational opportunities offered and visitation levels. Table 39 shows the estimated visitation levels

Table 37. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative B (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	1,661.8	306.7	13
Secondary effects	415.1	109.8	4
Total Economic Impact	2,076.9	416.5	17

Table 38. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative B (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	660.3	65.1	2
Secondary effects	81.9	23.3	1
Total Economic Impact	742.2	88.4	3

Table 39. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative B.

Visitor Activity	*Number of Visits*	*Percentage of Nonlocal Visits*	*Number of Nonlocal Visits*	*Number of Hours Spent at the Refuge per Visit*	*Number of Nonlocal Visitor Days*[2]
Consumptive Use					
Fishing	60,000[1]	50	30,000	8	30,000
Big game hunting	85,000	70	59,500	8	59,500
Waterfowl and migratory bird hunting	3,000	70	2,100	8	2,100
Upland game hunting	12,000	75	9,000	8	9,000
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	93,000	70	65,100	4	32,550
Totals	253,000	—	165,700	—	133,150

[1] *These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.*
[2] *One visitor day = 8 hours.*

associated with each visitor activity for alternative B. Under alternative B, annual visitation is anticipated to increase for waterfowl hunting (3 percent), upland game hunting (20 percent), and nonconsumptive use activities (7 percent) compared to alternative A (refer to table 33 under alternative A above). No change is anticipated for fishing activities while big game hunting is anticipated to decrease by 6 percent compared to alternative A.

Table 40 summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive visitation for alternative B. Nonlocal refuge visitors would spend over $20.8 million in the six-county area annually. This spending would directly account for $14.6 million in local output, 203 jobs, and $4.2 million in labor income in the local economy. The secondary or multiplier effects would generate an additional $5.9 million in local output, 60 jobs, and $1.6 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative B would generate total economic impacts of $20.4 million in local output, 263 jobs, and $5.8 million in labor income. Even though visitation increased slightly (135 total nonlocal visitor days) compared to alternative A, the increase in waterfowl hunting (70 visitor days with an average spending of $67.62 per day), upland game hunting (1,500 visitor days with an average spending of $156.87 per day), and nonconsumptive use activities (2,065 visitor days with an average spending of $140.46 per day) does not offset the decrease in big game hunters (3,500 visitor days with an average spending of $190.39 per day). Therefore, for alternative B, the associated economic effects of refuge visitation would be less than alternative A by $54.9 thousand in local output, one job, and $12.5 thousand in labor income.

Livestock Grazing

For alternative B, refuge management will move towards a prescriptive grazing regime to meet specific wildlife and/or habitat goals and objectives. Within 4–7 years, a prescriptive grazing plan would be developed for 50–75 percent of the refuge. As a result, the level of grazing could be reduced or increased for short periods.

As shown in table 23 in chapter 4, the refuge supplies less than 1 percent of total AUMs in the six-county area. Therefore, changes to refuge grazing levels would not be significant for the six-county economy but could impact individual ranches with refuge grazing permits. The refuge grazing impacts in table 35 under alternative A assume that the only affect on the ranching operation from refuge grazing is the direct production associated with the refuge AUMs. Although most ranches are typically only partially dependent on Federal land grazing for forage, this forage source can be a critical part of their livestock operation due to the rigidity of seasonal forage availability (Taylor et al. 2008). Therefore, potential reductions in income and net ranch returns can be greater than just the direct economic loss from reduc-

Table 40. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative B (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	8,641.8	2,529.0	119
Wildlife viewing	3,563.7	1,041.5	54
Subtotal	14,573.2	4,216.9	203
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	3,413.4	919.3	35
Wildlife viewing	1,535.4	404.9	16
Subtotal	5,866.4	1,568.7	60
Total Effects			
Fishing	3,285.3	890.9	39
Hunting	12,055.2	3,448.3	154
Wildlife viewing	5,099.1	1,446.4	70
TOTAL Economic Impact	20,439.6	5,785.6	263

tions in Federal grazing AUMs (Rowe and Bartlett 2001, Taylor et al. 2008, Van Tassell and Richardson 1998). The level of an increased impact above the direct production associated with refuge AUMs would depend on a number of factors including the individual ranch's level of dependency on refuge grazing, the magnitude of the proposed change in grazing, the financial solvency of the ranch, and the availability of alternative sources of forage (Taylor et al. 2008).

Summary of Economic Impacts for Alternative B

Table 41 summarizes the direct and total economic impacts of refuge management activities for alternative B in the six-county area. Excluding grazing operations, refuge management activities directly related to refuge operations would generate an estimated $16.9 million in local output, 218 jobs and $4.6 million in labor income in the local economy under

Table 41. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative B (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,322.1	371.8	15
Total effects	2,819.1	504.9	20
Public Use			
Direct effects	14,573.2	4,216.9	203
Total effects	20,439.6	5,785.6	263
Aggregate Impacts			
Direct effects	16,920.8	4,593.7	218
Total effects	23,291.3	6,297.5	283

Note: Economic impacts associated with grazing are not included.

alternative B. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of $23.3 million in local output, 283 jobs and $6.3 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative B represents 1.4 percent of total income and 1.6 percent of total employment in the overall six-county area economy. Total economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, Fort Peck, Jordan, and Malta where most of the refuge public use-related economic activity occurs.

Table 42 summarizes the change in economic effects associated with refuge operations under alternative B as compared to alternative A. Due to increases in refuge administration and decreases in big game hunting, alternative B would generate $216.0 thousand more in local output, $36.4 thousand more in labor income and one more job as compared to alternative A.

ECONOMIC IMPACTS of ALTERNATIVE C

The economic impacts under alternative C as a result of revenue sharing, refuge administration, public use activities, and other management activities are evaluated.

Revenue Sharing

The effects would be the same as for alternative A.

Refuge Administration

The purchases by staff in the communities or other work-related purchases are evaluated.

Employees' Personal Purchases. Proposed staff for alternative C includes all current staff positions (refer to table 6 in chapter 3) plus seven additional positions. The new positions are: two outdoor recreation planners; two maintenance workers, law enforcement officer; station manager (UL Bend National Wildlife Refuge), and a range technician. Table 43 shows the economic impacts associated with spending of salaries in the six-county area by refuge employees under alternative C. For alternative C, salary spending by refuge personnel would directly account for $1.7 million in local output, 13 jobs, and $321.5 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional $435.1 thousand in local output, four jobs, and $114.7 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative C would generate total economic impacts of $2.2 million in local output, 17 jobs, and $436.2 thousand in

Table 42. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative B compared with CCP alternative A (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Refuge Revenue Sharing			
Direct effects	0	0	0
Total effects	0	0	0
Refuge Administration			
Direct effects	+223.2	+35.8	+2
Total effects	+270.9	+48.9	+2
Public Use			
Direct effects	–46.0	–10.9	–1
Total effects	–309.0	–12.5	+3
Aggregate Impacts			
Direct effects	+177.2	+24.9	+1
Total effects	+216.0	+36.4	+1

Table 43. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative C (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	1,742.0	321.5	13
Secondary effects	435.1	114.7	4
Total Economic Impact	2,177.1	436.2	17

labor income. Due to the increased personnel levels for alternative C, the associated economic effects of staff salary spending would generate $300 thousand more in local output, two more jobs, and $60.1 thousand more in labor income than alternative A.

Work-related Purchases. Nonsalary expenditures for alternative C are anticipated to increase in proportion with the salary increase for the new staff positions for a total annual nonsalary budget of $1.68 million (16-percent increase compared to alternative A). Table 44 shows the economic impacts associated with work-related expenditures in the six-county area for alternative C. These estimates assume 40 percent of the nonsalary budget will be spent on goods and services purchased in the six-county area (same as current and alternative A). Work-related expenditures under alternative C would directly account for $692.2 thousand in local output, two jobs, and $68.2 thousand in labor income in the local economy. Accounting for both the direct and secondary effects, work-related purchases for alternative B would generate a total economic impact of $778.0 thousand in local output, three jobs and $92.6 thousand in labor income. Due to the increased nonsalary expenditures for alternative B, the associated economic effects of work-related purchases would generate $107.2 thousand more in local output and $12.8 thousand more in labor income than alternative A.

Public Use and Access

The impact from visitor expenditures is evaluated.

Refuge Visitors' Expenditures in the Local Economy. In Table 45, the estimated visitation levels associated with each visitor activity are shown for alternative C. Under alternative C, visitation increases are anticipated for all activities expect fishing as compared to alternative A (refer to table 32).

Table 46 summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive visitation for alterna-

Table 44. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative C (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	692.2	68.2	2
Secondary effects	85.8	24.4	1
Total Economic Impact	778.0	92.6	3

Table 45. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative C.

Visitor Activity	*Number of Visits*	*Percentage of Nonlocal Visits*	*Number of Nonlocal Visits*	*Number of Hours Spent at the Refuge per Visit*	*Number of Nonlocal Visitor Days*[2]
Consumptive Use					
Fishing	60,000[1]	50	30,000	8	30,000
Big game hunting	100,000	70	70,000	8	70,000
Waterfowl and migratory bird hunting	3,500	70	2,450	8	2,450
Upland game hunting	15,000	75	11,250	8	11,250
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	117,585	70	82,310	4	41,155
Totals	296,085	—	196,010	—	154,855

[1] *These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.*

[2] *One visitor day = 8 hours.*

Table 46. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative C (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	10,240.0	2,990.2	141
Wildlife viewing	4,505.8	1,316.8	69
Subtotal	17,113.5	4,953.4	240
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	4,045.0	1,087.5	41
Wildlife viewing	1,941.3	511.9	20
Subtotal	6,903.9	1,843.9	70
Total Effects			
Fishing	3,285.3	890.9	39
Hunting	14,285.0	4,077.7	182
Wildlife viewing	6,447.1	1,828.7	89
TOTAL Economic Impact	24,017.4	6,797.3	310

tive C. Nonlocal refuge visitors would spend almost $23.4 million in the six-county area annually. This spending would directly account for $17.1 million in local output, 240 jobs, and $5 million in labor income in the local economy. The secondary or multiplier effects would generate an additional $6.9 million in local output, 70 jobs, and $1.8 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative C would generate total economic impacts of $24 million in local output, 310 jobs and $6.8 million in labor income. Due to the increased visitation levels (except for fishing) under alternative C, the associated economic effects of visitor spending would generate $3.5 million more in local output, 46 more jobs, and $999.2 thousand more in labor income than alternative A.

Livestock Grazing

For alternative C, refuge management will gradually move towards a prescriptive grazing regime on those units that are fenced or are currently not assigned a permit holder. As with alternative B prescriptive grazing will be initiated to meet specific wildlife and/or habitat objectives. As a result, the level of grazing will remain consistent from year-to-year with some fluctuations due to units being prescriptive grazed to meet goals and objectives.

As shown in table 23 in chapter 4, the refuge supplies less than 1 percent of total AUMs in the six-county area. Therefore, changes to refuge grazing levels would not be significant for the six-county economy but could impact individual ranches with refuge grazing permits. The refuge grazing impacts in table 35 under alternative A assume that the only affect on the ranching operation from refuge grazing is the direct production associated with the refuge AUMs. Although most ranches are typically only partially dependent on Federal land grazing for forage, this forage source can be a critical part of their livestock operation due to the rigidity of seasonal forage availability (Taylor et al. 2008). Therefore, potential reductions in income and net ranch returns can be greater than just the direct economic loss from reductions in Federal grazing AUMs (Van Tassell and Richardson 1998, Rowe and Bartlett 2001, Taylor et al. 2008). The level of an increased impact above the direct production associated with refuge AUMs would depend on a number of factors including the individual ranch's level of dependency on refuge grazing, the magnitude of the proposed change in grazing, the financial solvency of the ranch, and the availability of alternative sources of forage (Taylor et al. 2008).

Summary of Economic Impacts for Alternative C

Table 47 summarizes the direct and total economic impacts of all refuge management activities for alternative C in the six-county area. Under alternative C, refuge management activities directly related to all refuge operations generate an estimated $19.6 million in local output, 255 jobs, and $5.4 million in labor income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of $27 million in local output, 330 jobs, and $7.3 million in labor income. Excluding grazing operations, total economic impacts

Table 47. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative C (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,434.2	389.7	15
Total effects	2,955.1	528.8	20
Public Use			
Direct effects	17,113.5	4,953.4	240
Total effects	24,017.4	6,797.3	310
Aggregate Impacts			
Direct effects	19,573.2	5,348.1	255
Total effects	27,005.1	7,333.1	330

Note: Economic impacts associated with grazing are not included.

associated with refuge operations under alternative C would represent 1.6 percent of total income and 1.8 percent of total employment in the overall six-county area economy. Total economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, Fort Peck, Jordan, and Malta where most of the refuge public use-related economic activity occurs.

Table 48 summarizes the change in economic effects associated with refuge operations under alternative C as compared to alternative A. Due to increases in refuge administration and visitation, alternative C would generate $3.9 million more in local output, 48 additional jobs and $1 million more in labor income as compared to alternative A.

ECONOMIC IMPACTS of ALTERNATIVE D

The economic impacts under alternative D from revenue sharing, refuge administration, public use activities, and other management activities are evaluated.

Revenue Sharing

The effects would be the same as for alternative A.

Refuge Administration

The purchases by staff in the communities or other work-related purchases are evaluated.

Employees' Personal Purchases. Proposed staff for alternative D includes all current staff positions (refer to table 6 in chapter 3) plus seven additional positions. The new positions are two outdoor recreation planners; maintenance worker; law enforcement officer; station manager (UL Bend National Wildlife Refuge), range technician, and a technician. Table 49 shows the economic impacts associated with spending of salaries in the six-county area by refuge employees under alternative D. For alternative D, salary spending by refuge personnel would directly account for $1.7 million in local output, 13 jobs, and $321 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional $434.4 thousand in local output, four jobs, and $114.5 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative C would generate total economic impacts of $2.2 million in local output, 17 jobs, and $435.5 thousand in labor income. Due to the increased personnel levels for alternative D, the associated economic effects of staff salary spending would generate $296 thousand more in local output, two more jobs, and $59 thousand more in labor income than alternative A.

Work-related Purchases. Nonsalary expenditures for alternative D are anticipated to increase in proportion with the salary increase for the new staff positions, a 16-percent increase (same as alternative C) compared to alternative A. Therefore, the impacts would be the same as for alternative C, as shown in table 44 above.

Public Use and Access

The impact from visitor expenditures is evaluated.

Refuge Visitors' Expenditures in the Local Economy. In table 50, the estimated visitation levels associated with each visitor activity are shown for alternative D. Under alternative D, slight increases in visitation are anticipated for all activities except fishing and upland game hunting as compared to alternative A (refer to table 30 above).

Table 48. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative C compared with CCP alternative A (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Refuge Revenue Sharing			
Direct effects	0	0	0
Total effects	0	0	0
Refuge Administration			
Direct effects	+335.3	+53.7	+2
Total effects	+407.0	+72.8	+2
Public Use			
Direct effects	+2,494.3	+725.6	+36
Total effects	+3,268.8	+999.2	+50
Aggregate Impacts			
Direct effects	+2,829.6	+779.3	+38
Total effects	+3,929.9	+1,072.0	+48

Table 49. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative D (2007$).

Type of Impact	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct effects	1,739.2	321.0	13
Secondary effects	434.4	114.5	4
Total Economic Impact	2,173.6	435.5	17

Table 50. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative D.

Visitor Activity	*Number of Visits*	*Percentage of Nonlocal Visits*	*Number of Nonlocal Visits*	*Number of Hours Spent at the Refuge per Visit*	*Number of Nonlocal Visitor Days*[2]
Consumptive Use					
Fishing	60,000[1]	50	30,000	8	30,000
Big game hunting	95,000	70	66,500	8	66,500
Waterfowl and migratory bird hunting	3,000	70	2,100	8	2,100
Upland game hunting	10,000	75	7,500	8	7,500
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	95,810	70	67,067	4	33,534
Totals	263,810	—	173,167	—	139,634

[1] *These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.*

[2] *One visitor day = 8 hours.*

Table 51 summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive visitation for alternative D. Nonlocal refuge visitors would spend almost $21.8 million in the six-county area annually. This spending would directly account for $15.8 million in local output, 221 jobs, and $4.6 million in labor income in the local economy. The secondary or multiplier effects would generate an additional $6.4 million in local output, 65 jobs, and $1.7 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative D would generate total economic impacts of $22.2 million in local output, 287 jobs, and $6.3 million in labor income. Due to the increased visitation levels (except for fishing and upland game hunting) under alternative D, the associated economic effects of visitor spending would generate $1.7 million more in local output, 23 more jobs, and $497.5 thousand more in labor income than alternative A.

Livestock Grazing

For alternative D, refuge management will gradually move towards a prescriptive grazing regime to promote ecological resilience, promote biological diversity, integrity, and heterogeneity across the landscape. Prescriptive grazing will be implemented across 50–75 percent of the refuge within 6–9 years. As a result, the level of grazing could probably be reduced from the current level but could possibly increase for short periods.

As shown in table 23 in chapter 4, the refuge supplies less than 1 percent of total AUMs in the six-county area. Therefore, changes to refuge grazing levels would not be significant for the six-county economy but could affect individual ranches with refuge grazing permits. The refuge grazing impacts in table 35 under alternative A assume that the only affect on the ranching operation from refuge grazing is the direct production associated with the refuge AUMs. Although most ranches are typically only partially dependent on Federal land grazing for forage, this forage source can be a critical part of their livestock operation due to the rigidity of seasonal forage availability (Taylor et al. 2008). Therefore, potential reductions in income and net ranch returns can be greater than just the direct economic loss from reductions in Federal grazing AUMs (Van Tassell and Richardson 1998, Rowe and Bartlett 2001, Taylor et al. 2008). The level of an increased impact above the direct production associated with refuge AUMs would depend on a number of factors including the individual ranch's level of dependency on refuge grazing, the magnitude of the proposed change in grazing, the financial solvency of the ranch, and the availability of alternative sources of forage (Taylor et al. 2008).

Summary of Economic Impacts for Alternative D

Table 52 summarizes the direct and total economic impacts of all refuge management activities for alternative D in the six-county area. Excluding grazing, refuge management activities directly related to all refuge operations generate an estimated $18.3 million in local output, 236 jobs and $5 million in labor income in the local economy under alternative D.

Table 51. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative D (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	9,803.9	2,872.0	135
Wildlife viewing	3,671.4	1,073.0	56
Subtotal	15,843.0	4,591.4	221
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	3,870.5	1,042.6	40
Wildlife viewing	1,581.8	417.1	16
Subtotal	6,369.9	1,704.2	65
Total Effects			
Fishing	3,285.3	890.9	40
Hunting	13,674.4	3,914.6	175
Wildlife viewing	5,253.2	1,490.1	72
TOTAL Economic Impact	22,212.9	6,295.6	287

Table 52. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative D (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,431.4	389.2	15
Total effects	2,951.6	528.1	20
Public Use			
Direct effects	15,843.0	4,591.4	221
Total effects	22,212.9	6,295.6	287
Aggregate Impacts			
Direct effects	18,299.9	4,985.6	236
Total effects	25,197.1	6,830.7	307

Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of $25.2 million in local output, 307 jobs and $6.8 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative D would represent 1.5 percent of total income and 1.7 percent of total employment in the overall six-county area economy. Total economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, and Malta where most of the refuge public use-related economic activity occurs.

Table 53 summarizes the change in economic effects associated with refuge operations under alternative D as compared to alternative A. Due to increases in visitation and refuge administration, alternative D would generate $1.6 million more in local output, 19 additional jobs, and $569.6 thousand more in labor income as compared to alternative A.

IMPACTS on LIVESTOCK PERMITTEES

In addition to economic impacts described above, the effects on livestock grazers from changes in annual grazing to prescriptive grazing including fencing changes, stock pond renovations, and changes in wilderness on current livestock permittees were evaluated. For more information on current livestock grazing, refer to chapter 4 and figure 16.

Table 53. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative D compared with CCP alternative A (2007$).

Impact Aspect	*Local Output ($ thousands)*	*Labor Income ($ thousands)*	*Employment (number of full- and part-time jobs)*
Refuge Revenue Sharing			
Direct effects	0	0	0
Total effects	0	0	0
Refuge Administration			
Direct effects	+332.5	+53.2	+2
Total effects	+403.5	+72.1	+2
Public Use			
Direct effects	+1,223.8	+363.6	+17
Total effects	+1,464.3	+497.5	+27
Aggregate Impacts			
Direct effects	+1,556.3	+416.8	+19
Total effects	+2,121.9	+569.6	+25

Alternatives A and C

The alternatives would have varying impacts on current livestock permittees as shown in table 54. Under existing conditions, a minimum of 34 percent of the refuge would be grazed prescriptively, and any change from annual grazing would only occur when grazing units became available through the sale to a third party, or when habitat evaluations are completed and prescriptive grazing is required to meet habitat objectives. Under alternative C, the Service would implement prescriptive grazing on up to 50 percent of the total available grazing lands (this would be about 740,030 acres) within 15 years. The refuge would continue the practice of holding grazing permits as ranches sell their lands to outside parties. Any move to prescriptive grazing would occur mostly on units that would become vacant in the future so the impacts to current permit holders would be minor. Fence removal and stock pond renovations would occur on those units that are managed under prescriptive grazing plan. As compared to alternative A, proposed wilderness units under alternative C would be reduced by 38,114 acres by removing protection on four wilderness units (see figure 9), which would have minor benefits for some permittees due to fewer access restrictions on fence maintenance work and managing livestock on those units. New boundary fence construction would have negligible to minor impacts on a few permittees that would have pastures that are in common with refuge lands.

Alternatives B and D

Under alternatives B and D there would be moderate to major impacts on some livestock permittees as the Service moved to a greater emphasis on prescriptive grazing over annual grazing (refer to table 54). Under alternative B, the Service would move to prescriptive grazing over 50–75 percent of the refuge in 4–7 years, whereas the timeframe under alternative D would occur over 6–9 years. Over 15 years, a total of 331,278 to 555,023 acres would be prescriptively grazed under alternatives B and D for an increase of 16–41 percent as compared to existing conditions (252,706 acres). Compared to existing conditions where only 662,555 acres of the 740,030 acres are being grazed either by annual or prescriptive grazing under alternatives B and D, the acres with no current Federal grazing allotments could be

Table 54. Acres of grazing lands available under the CCP alternatives for the Charles M. Russell and UL Bend refuges.

EXISTING CONDITIONS 2010
Total acres of refuge grazing lands = 740,030[1]
Acres with no grazing allotments = 77,475 (10%)
Acres available for grazing = 662,555 (90%)

Alternative A		*Alternative B*		*Alternative C*		*Alternative D*	
Acres	*% of Total*	*Acres*	*% of Total*	*Acres*	*% of Total*	*Acres*	*% of Total*
Area under Annual Grazing							
409,849	55	165,639–331,278	22–45	331,278–409,849	45–72	165,639–331,128	22–45
Area under Prescriptive Grazing[2]							
252,706	34+	331,278–555,023	50–75	252,706–370,015	Up to 50	331,278–555,023	50–75
Area with No Grazing Allotments							
77,475	10	Variable		Variable		Variable	
Implementation Timeframe							
Unknown[3]		Within 4–7 years		Over 15 years		Within 6–9 years	

[1] *Refer to figure 16 in chapter 4. This acreage accounts for all of the Service's lands available for grazing including those with no current grazing allotment, lands grazed under annual grazing, and lands currently grazed under prescriptive grazing. It does not include private or State inholdings within the refuge boundary.*

[2] *This acreage would depend on amount of acreage with no grazing allotment. If all of the yellow lands remained with no grazing allotment, 662,555 acres would be available for grazing either prescriptively or under annual grazing; if all of the yellow lands were available for grazing in the future, the highest amount available for prescriptive grazing would be 740,030 acres.*

[3] *This assumes no changes in ranch ownership over 15 years.*

prescriptively grazed in the future. Steer operations typically have more flexibility in their operations and could adapt easier to a prescriptive program. Working with existing permittees to develop habitat management plans with a prescriptive grazing component so they can make arrangements in their operations for future grazing needs on the refuge could reduce impacts to some permittees.

Additionally, there would be moderate direct impacts on permittees when the Service removed 25–50 percent of the interior fences; however, there would be a minor economic benefit when the Service issued contracts for this work. There could be moderate to major impacts on permittees when the Service renovated stock ponds to restore natural hydrological conditions of riparian areas down slope. There would be minor to moderate negative impacts due to the closing of 106 miles of road and increasing wilderness acreage in six units by 25,037 acres under alternative B. Under alternative D, the closing of 23 miles of road would result in negligible to minor impacts on livestock owners. There would be a minor benefit with the proposed reduction of three proposed wilderness units (see figure 10) for some permittees due to fewer access restrictions for fence maintenance work or managing livestock on those units.

IMPACTS on STATE GRAZING LANDS

Under all alternatives, the Service would extend agreements that are already in place for aggressive fire suppression activities on DNRC lands. Over time, the use of prescribed fire in Alternatives B and D and to lesser extent in C would reduce heavy fuels, thus reducing the risk for severe wildfires spreading across State lands, but implementation of any alternative would not eliminate the risk for wildfire all together. Implementation of a prescriptive grazing program across 50–75 percent of the refuge in alternatives B and D and up to 50 percent in alternative C could negatively impact DNRC in meeting their statutory obligations of generating revenue for local schools. The degree to which this would occur is not known, but under all alternatives, the Service would work with DNRC to develop special use permits that would allow permittees to continue to graze habitat units. If permittees no longer desired to retain their grazing permit, the Service would work with DNRC to assume permits, providing funding exists.

EFFECTS on ENVIRONMENTAL JUSTICE

Within the spirit and intent of Executive Order 12898, Federal actions to address environmental justice in minority populations and low-income populations, no actions being considered in this draft CCP and EIS would disproportionately place any adverse environmental, economic, social, or health effects on minority or low-income populations as compared to the public.

The Service is committed to ensuring that all members of the public have equal access to America's fish and wildlife resources, as well as equal access to information that would enable them to participate meaningfully in activities and policy shaping.

CONCLUSION

Under alternative A, refuge management activities directly related to all refuge operations generate an estimated $16.7 million in local output, 217 jobs and $4.6 million in labor income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of $23.1 million in local output, 282 jobs, and $6.3 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative A represents 1.4 percent of total income and 1.6 percent of total employment in the overall six-county area economy.

The refuge currently supplies less than 1 percent of total AUMs in the six-county region (about 22,581 AUMs in 2008; see table 23 in chapter 4). While moving toward a greater emphasis on prescriptive grazing could negatively impact individual ranchers holding refuge grazing permits, the overall effects to the counties would be negligible to minor. The specific number of AUMs grazed on the refuge would be difficult to predict with any certainty in light of the uncertainties of ranches changing ownership, potential for droughts, grazing fees, and habitat conditions.

Under alternative B, excluding grazing operations, the refuge would generate an estimated $16.9 million in local output, 218 jobs, and $4.6 million in labor income in the local economy, with total economic impacts of $23.3 million in local output, 283 jobs, and $6.3 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative B represents 1.4 percent of total income and 1.6 percent of total employment in the overall six-county area economy. Due to increases in refuge administration and decreases in big game hunting, alternative B would generate $216.0 thousand more in local output, 36.4 thousand more in labor income and one more job as compared to alternative A. The overall economic effect of alternative B would be negligible, compared to existing conditions.

Under alternative C, the refuge would generate an estimated $19.6 million in local output, 255 jobs and $5.4 million in labor income in the local economy, with total economic impacts of $27 million in local output, 330 jobs, and $7.3 million in labor income. Excluding grazing operations, total economic impacts would represent 1.6 percent of total income and 1.8 percent of total employment in the overall six-county area econ-

omy. Due to increases in refuge administration and visitation, alternative C would generate $3.9 million more in local output, 48 additional jobs and $1 million more in labor income as compared to alternative A. The overall economic effect of alternative C would be negligible to minor benefits, compared to existing conditions.

Under alternative D, the refuge would generate an estimated $18.3 million in local output, 236 jobs, and $5 million in labor income in the local economy, with total economic impacts of $25.2 million in local output, 307 jobs, and $6.8 million in labor income. Excluding grazing operations, total economic impacts would represent 1.4 percent of total income and 1.4 percent of total employment in the overall six-county area economy. Due to increases in visitation and refuge administration, alternative D would generate $2.1 million more in local output, 25 additional jobs, and $569.6 thousand more in labor income as compared to alternative A. The overall economic effect of alternative D would be minor benefits, compared to existing conditions.

The alternatives would have varying degrees of impacts to livestock permittees as changes in annual and prescriptive grazing, fencing changes, stock pond renovations, and wilderness units occurred. Under existing conditions, about 34 percent of the refuge would be prescriptively grazed and this would not change unless units became available through the sale to a third party, or when habitat conditions dictated a change. Alternative C would implement prescriptive grazing on 50 percent of the refuge in 15 years, but the refuge would continue the practice of holding grazing permits as ranches sold their lands to outside parties. Fence removal or stock pond renovations would only occur on lands that were converted to prescriptive grazing. The elimination of four wilderness units totaling 35,881 acres in alternative C would benefit some permittees due to fewer access restrictions. Overall, there would only be negligible to minor negative impacts in alternatives A and C.

Alternatives B and D would have greater impacts on livestock permittees, and for some these could be moderate to major, as the Service implemented prescriptive grazing on up 75 percent of the refuge. The schedule would be more aggressive under alternative B than under D. There would be moderate negative impacts on permittees when the Service removed 25–50 percent of the interior fences or renovated stock ponds, although the actual removal of any fencing would bring about a short-term economic benefit as a result of contracting out the work. Alternative B would have the greatest impact on permittees with the closing of 106 miles of road, and an increase in wilderness protection by 25,037 acres, limiting access in some areas. Road closures in alternative D would be minor (23 miles), but some permittees would benefit from the elimination of three wilderness units that reduce access restrictions for fence maintenance or managing livestock. Working with permittees during the development of the HMPs would enable ranchers to make arrangements for future grazing needs.

Implementation of any alternative would not affect existing agreements with DNRC for fire suppression activities nor would it affect access. The greater use of prescribed fire in alternatives B and D and to a lesser extent in alternative C would reduce some of the risk for severe wildfire spreading across State lands. Implementation of a prescriptive grazing program across much of the refuge in alternatives B, D, and to a lesser extent in C could negatively affect DNRC if refuge grazing lands became less attractive to permittees. This could be offset by working with DNRC to assume permits if funding permitted.

MITIGATION

Working closely with ranch permittees and DNRC during the development of the HMPs would enable them to plan in advance for changes in their operations.

CUMULATIVE IMPACTS on the SOCIOECONOMIC ENVIRONMENT

As described in chapter 4, land ownership patterns near the refuge are continuing to see a transition toward nontraditional ownership and management (such as the American Prairie Foundation's 87,000-acre preserve and The Nature Conservancy's 63,000-acre Matador Ranch), along with the purchase of private ranches by absentee owners. The 2009 purchase and retirement of two grazing allotments on the refuge by the National Wildlife Foundation (totaling about 45,000 acres) are consistent with this trend. While the reduction or elimination of grazing on private conservation lands is generally believed to have a negative economic impact on local communities, some individual ranchers have benefitted financially by the opportunity to sell their land or grazing interests to outside entities. The economic impacts of absentee ranch owners are less apparent.

While current economic and demographic trends in the six-county region surrounding the refuge are likely to have negative impacts on local communities, none of the refuge management alternatives would contribute to those impacts. Instead, all of the alternatives would likely result in negligible to minor cumulative benefits to local communities by increasing income, jobs, and (under action alternatives B–D) additional opportunities for recreation and tourism.

Changes in grazing management and stocking rates in alternatives B and D would likely further reduce the availability of grazing land in the region.

However, considering that the refuge currently supplies less than 1 percent of all AUMs in the region, the regional cumulative effect of refuge management actions, when combined with the economic effects of other land management changes, would be negligible.

The real or perceived effect of land use and management chances on the social and traditional values of nearby communities is an important consideration. As described in chapter 4, many residents in the area have had family ties to the land and the agricultural economy for several generations, strive to maintain those economic and social traditions, and feel threatened by land use (particularly grazing) changes both on and off the refuge. Others may see economic opportunities from conservation-oriented property sales or increased recreational activity. It is difficult to quantify these types of impacts, or to identify the differences between perceived or actual impacts. If changes in land ownership patterns and management in the region has a negative impact on social and traditional values, the changes in grazing management under alternatives B and D would result in minor cumulative effects. Alternatives A and C would result in negligible cumulative benefits, by maintaining existing management approaches.

5.11 Irreversible and Irretrievable Resource Commitments

The National Environmental Policy Act requires a discussion of any irreversible or irretrievable commitment of resources that would result from implementing the alternatives. An irreversible commitment of resources means nonrenewable resources are consumed or destroyed. These resources are permanently lost due to plan implementation. In contrast, an irretrievable commitment of resources is the loss of resources or resource production, or use of renewable resources during the 15-year of the plan.

All alternatives would result in an irreversible commitment of soil resources. Topsoil would be removed before a facility construction for the use in revegetation of disturbed areas or the excavation of fossils. Even with the best management practices, some irreversible soil loss due to erosion would occur. Livestock grazing, particularly in riparian areas would continue contributing to soil erosion although the amounts would vary by alternative. The use of prescribed fire would improve plant vigor and health, but there could be some temporary losses of soil. Major wildfires could lead to severe soil erosion. Loss of soil, as well as changes to visual resources due to facility development would be an irretrievable commitment of resources.

The digging of fossil resources would be an irreversible commitment of resources. These resources would no longer be in the ground in their original context, although they would continue to be available to the public for research and educational purposes.

Federal funding for staff and operation would be an irretrievable commitment of resources. These resources would not be available for other Federal programs or projects.

Fossil fuel used by motor vehicles, boats, and equipment, either by the Service or the public would represent an irreversible commitment of resources because their use is lost for future generations. In addition they would result an irretrievable impact on air quality and global climate change.

Like fossil fuel, prescribed fires and wildfires would emit carbon and particulates in the air and would result in irretrievable impact on air quality and global climate change.

5.12 Short-term Uses of the Environment and Maintenance of Long-term Productivity

Historical uses of the refuge including early settlement, agricultural uses, roads and access, livestock grazing and developed recreational areas, have affected the long-term productivity of the refuge's ecological environment. Short-term uses of the refuge associated with implementing the CCP include: the restoration of former agricultural areas; restoration of riparian areas or water impoundments; construction of facilities or boundary fences; removal of fencing; and improving and/or maintaining roads. In implementing the CCP, modifications, and enhancement of the natural environment using prescribed fire, livestock grazing, and hunting to control wildlife populations would contribute to the maintenance and enhancement of long-term productivity of the refuge environment.

5.13 Adherence to Planning Goals

The following sections are descriptions by goal of how and how well each alternative meets that goal for the refuge. Table 55 summarizes this discussion.

Table 55. Ratings for how well the actions in the CCP alternatives meet the goals for the Charles M. Russell and UL Bend refuges.

Goal	*Alternatives—Adherence to Goals**			
	A	B	C	D
Habitat and wildlife management	✚	✷	✷	●
Threatened and endangered species and species of concern	✷	●	✷	●
Research and science	✷	●	✷	●
Fire management	✚	●	✷	●
Public use and education	✷	✷	●	●
Wilderness	●	●	✚	✷
Cultural and paleontological resources	●	●	●	●
Refuge operations and partnerships	✷	●	●	●

**Ratings note that an alternative either satisfies (●) the goal, partially satisfies(✷) the goal, or does not satisfy (✚) the goal.*

HABITAT and WILDLIFE MANAGEMENT

The goal is to conserve, restore, and improve the biological integrity, environmental health, and ecological diversity of the refuge's plant and animal communities of the Missouri River breaks and surrounding prairies to support healthy populations of native plants and wildlife. Working with others, reduce and control the spread of nondesirable, nonnative, invasive plant and aquatic species for the benefit of native communities on and off the refuge.

The most important component of this goal is the first sentence. Alternatives A and C would not restore biological integrity, environmental health or ecological diversity. Alternative C would take some steps toward improving existing conditions but would only minimize damaging effects in some areas. Alternative B would only partially improve biological integrity, environmental health, and ecological diversity primarily because maximizing populations would not necessarily improve biological diversity, integrity, and environmental health. Alternative D would fully meet the biological integrity, health, and diversity goal, plus have an emphasis on improving resiliency. All alternatives would work with others to reduce and control the spread of invasive species, but alternative A would only maintain existing program levels whereas alternatives B, C, and D would work to achieve greater reductions (25–50 percent). Therefore, alternative A does not satisfy this goal.

THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN

The goal is to contribute to the identification, preservation, and recovery of threatened and endangered species and species of concern that occur or have historically occurred in the northern Great Plains.

All alternatives would meet basic requirements of this goal; however, alternative A would only maintain the status quo. There would not be any extra effort to contribute to the preservation of threatened and endangered species, so it only partially satisfies the goal, where as alternatives B, C, and D would protect, conserve, and enhance threatened and endangered species.

RESEARCH and SCIENCE

The goal is to advance the understanding of natural resources, ecological processes, and the effectiveness of management actions in the northern Great Plains through compatible scientific investigations, monitoring, and applied research.

USFWS

A researcher checks a deer for signs of disease.

Alternative A would only maintain existing research programs. Alternative C would not advance the understanding of ecological processes although research would continue under all alternatives. Alternatives B and D would fully meet the goal.

FIRE MANAGEMENT

The goal is to manage wildland fire using a management response that promotes fire's natural role in shaping the landscape while protecting values at risk.

Alternatives A and C would not promote fire's natural role while alternatives B and D would. All alternatives would protect private property.

PUBLIC USE and EDUCATION

The goal is to provide all visitors quality education, recreation, and outreach opportunities that are appropriate and compatible with the purpose and goals of the refuge and the mission of the Refuge System while maintaining the remote and primitive experience unique to Charles M. Russell National Wildlife Refuge.

All alternatives would provide for a variety of hunting and fishing opportunities. Alternative C would focus on more opportunities (quantity) whereas alternative D would focus on providing quality experiences. There would be minor increases in hunting visitors in alternatives C and D and a negligible decrease in alternative B.

Alternative A would not have an outdoor recreation planner and there would very limited environmental education opportunities and few improvements for nonconsumptive wildlife-dependent users. Alternative B would have one outdoor recreation planner, which would enable the refuge to improve programming but would still be limited and would not advance wildlife-dependent public uses or environmental education program to any great degree. Visitation would in essence remain stagnant over 15 years. Alternatives C and D would staff two outdoor recreation planners, which would enable the refuge to provide for more quality wildlife-dependent recreation and environmental education programs and would seek some moderate increases in the number of visitors participating in those programs.

WILDERNESS

The goal is to conserve, improve, and promote the wilderness quality and associated natural processes of designated and proposed wilderness within Charles M. Russell National Wildlife Refuge for all generations.

Alternative A would maintain the status quo and no wilderness would decrease. Alternative B would improve and promote wilderness quality. Alternative C would remove more protected acreage than any other alternative and therefore would not meet the goal. Alternative D would improve and promote wilderness quality in some areas, but would remove some areas from protected status; therefore, it would only partially meet the goal.

CULTURAL and PALEONTOLOGICAL RESOURCES

The goal is to identify, value, and preserve the paleontology and cultural resources of Charles M. Russell National Wildlife Refuge to connect refuge staff, visitors, and the community to the area's prehistoric and historic past.

All alternatives would identify, value, and preserve paleontological and cultural resources.

REFUGE OPERATIONS and PARTNERSHIPS

The goal is to, through effective communication and innovative use of technology and resources, use funding, personnel, partnerships, and volunteer programs for the benefit of natural resources while recognizing the social and economic connection of the refuge to adjacent communities.

All alternatives would maintain existing partnerships. Alternative A would not have a volunteer program nor would the refuge work to increase conservation strategies across the landscape, whereas alternatives B, C, and D would seek to increase partnerships across the conservation landscape and initiate a volunteer and friends program.

5.14 Unavoidable Adverse Effects

Generally most adverse and negative environmental effects associated with implementation of the CCP would be short term and minimal. During construction of additional facilities on the refuge, wildlife would be disturbed and temporarily displaced. Facilities construction also would result in minor, short-term disturbance of soils and erosion. Excavation of paleontological resources would result in short-term disturbance of soils and the removal of fossils from the refuge. The use of prescribed fire would result in short-term losses of vegetation. The long-term effects of implementing the CCP would be beneficial to the biological community and the diversity and productivity of the refuge ecosystem. Moving toward a prescriptive grazing and fire program would enable the refuge to use grazing to meet specific habitat objectives. Restoring former agricultural fields would reduce the growing infestation of invasive species on the refuge. There would be some increases in the level of visitation, particularly in alternatives C and D, but they would be minor to

moderate differences over existing conditions. With proper planning and placement of new facilities, effects on refuge resources would be minimal.

5.15 Conflicts with Federal, State, Tribal, and Local Agencies

Actions considered in this environmental impact statement do not appear to conflict with USACE, BLM or tribal goals, objectives, policies, or plans.

Where USACE has primary jurisdiction and the Service has secondary jurisdiction, a memorandum of understanding provides guidance on how habitat and wildlife resources are managed. None of the actions in this CCP and EIS conflicts with any memorandum of understanding the Service has with USACE. The Service did not analyze issues related to lake levels on Fort Peck, the developed recreation areas, real estate activities related to the cabin sales on the east end of the refuge, or fishing tournaments as these are actions where USACE has primary jurisdiction.

The Service has consulted with Fort Belknap and Fort Peck Tribes in the development of this CCP and EIS. The tribes are interested in collecting and using plants or other resources for ceremonial and traditional purposes. The CCP and EIS does not conflict with this interest as the tribes only need to contact the refuge manager and obtain a special use permit. Although bison are not currently managed on the refuge, many of the tribes consider them as central to their culture. This CCP and EIS has proposed and evaluated an option in alternatives B and D to only consider a reintroduction of bison if the MFWP led the issue and addressed all pertinent concerns of the Service and the public. Any future bison restoration would be a part of a separate planning effort involving multiple partners. Additionally, the tribes also have any interest in conducting ceremonial hunts on the refuge as elk and deer are also central to their culture. Because hunting is regulated by the State of Montana, the tribes would need to work with State on arranging for a ceremonial hunt on the refuge.

As a cooperating agency, the State of Montana has played an important role in the development of this CCP and EIS. None of the actions in this CCP and EIS would close or take away access to State lands within the refuge. The Service would eliminate any end-of-route effects such as parking on State lands.

The Service has coordinated closely with MFWP in the development of this CCP and EIS and has reviewed all State management plans including those for deer, elk, prairie dogs, fish, and many other wildlife species. Nearly all of the objectives for wildlife management are consistent with MFWP's objectives. There are some differences in opinions with MFWP on the management of mule deer populations under alternatives B and D (the proposed action) about herd composition targets. The refuge views sex and age structure as an important consideration in managing the harvest of native ungulates. Although hunting regulations on national wildlife refuges cannot be more liberal than State hunting regulations, they can be more restrictive. In addition, MFWP would like to see the Service reopen a number of refuge roads that have been closed in the past including those within proposed wilderness units. By policy, roads are not allowed in wilderness, and the Service has not considered an option to reopen roads within wilderness. However, in compliance with the Service's planning policy, the refuge has reevaluated all the proposed wilderness units in this CCP and EIS to make sure they meet the qualities set forth in the Wilderness Act. Under alternatives C and D, the Service has analyzed the removal of several wilderness units from the wilderness study.

Although no new roads would be proposed in the CCP and EIS, the removal of wilderness protection in some units could facilitate easier game retrieval.

The six adjacent counties and the Missouri River Council of Conservation Districts have also been cooperating agencies in this planning effort. The counties and Conservation Districts have expressed a number of concerns regarding the Service's actions in this planning process. Foremost, the counties and the conservation districts are opposed to any change that would negatively affect livestock grazers on the refuge (refer to upland objectives in chapter 3 and the discussion on other effects on livestock operations).

The counties are also concerned about a number of issues related to roads and particularly about recognizing rights-of-way under R.S. 2477 or where they believe they have a valid county-petitioned right-of-way.

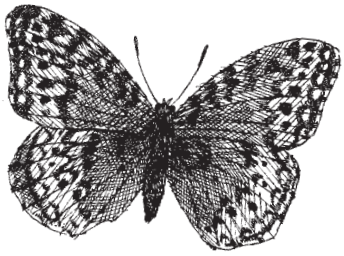
This CCP and EIS does not negate any valid rights of way the counties may have, but determining the legal validity of any right of way is outside the scope of the plan. The roads that are reflected in alternative A reflect the refuge's current guide map.

There are a number of other issues that concern the counties and conservation districts including the use of prescribed fire, wilderness protection, land acquisition, wildlife and habitat management and reintroductions. The Service has fully evaluated several alternative options in the Draft CCP and EIS, which consider all of these concerns.

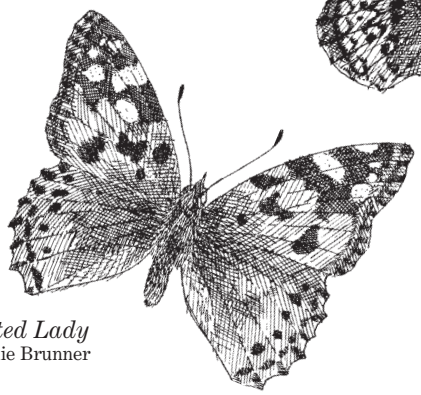
5.16 Comparison of Environmental Consequences

Table 56 summarizes the above environmental consequences—by estimated level of benefit—to compare refuge management under each alternative.

Admiral
© Cindie Brunner



Fritillary
© Cindie Brunner



Painted Lady
© Cindie Brunner

Table 56. Summary of the environmental consequences for actions of the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Alternative A No Action	*Alternative B* Wildlife Populations	*Alternative C* Public and Economic Uses	*Alternative D* Ecological Processes (Proposed Action)
Climate Change			
Habitat management actions would result in benefits; vehicle emissions would result in effects.	→	→	→
Negligible overall effect on global climate change.	→	→	→
Air Quality			
Motorized equipment use would have a negligible effect.	→	→	→
Motorized vehicle use would concentrate emissions during high use periods.	Negligible to minor increases in vehicle emissions due to increased visitation.	→	→
Short-term negligible impacts from prescribed fire; short-term major impacts from large wildfires.	More frequent negligible prescribed fire effects and reduced short-term impacts (moderate) from large wildfires.	Similar to B, except greater effects from large wildfires due to greater biomass.	Same as B.
Visual Resources			
Negligible overall effects from facilities and structures.	→	→	→
Negligible effect based on current road visibility.	Minor benefit due to road closures.	Same as A.	Negligible to minor benefit due to closed roads.
Negligible to moderate benefits from management efforts for invasive species control and river bottom restoration.	→	→	→
Short-term negligible impacts from prescribed fire and wildfire.	Short-term negligible impacts and long-term minor benefits from prescribed fire and wildfire.	Same as A.	Same as B.
Minor impact to some users from livestock grazing.	Moderate benefit to some users due to prescriptive livestock grazing regime.	Negligible impact to some users from livestock grazing.	Same as B.
Soundscapes			
Negligible to minor impacts due to motorized boats, road use, and facility construction.	Same as A, with minor benefits in localized areas due to road closures.	Same as A, with minor to moderate impacts in localized areas due to snowmobile access.	Same as B.
Negligible impact from gunshots.	→	→	→
Soils			
Negligible short-term impacts and long-term benefits from river bottom restoration.	→	→	→

Table 56. Summary of the environmental consequences for actions of the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Alternative A No Action	*Alternative B* Wildlife Populations	*Alternative C* Public and Economic Uses	*Alternative D* Ecological Processes (Proposed Action)
Soils (continued)			
Negligible short-term impacts and long-term benefits from prescribed fire.	Minor short-term impacts and long-term benefits from prescribed fire.	→	→
Moderate to major short-term impacts due to fire suppression and large wildfires.	Minor to moderate short-term impacts due to fire suppression and large wildfires.	→	→
Continued moderate to major impacts from livestock grazing in some areas; long-term improvements where prescriptive grazing is implemented.	Same as A, except improvements from prescriptive grazing would be greater.	Same as A.	Same as B.
Minor overall impacts from public use; moderate to major impacts in localized areas. Negligible short-term impacts due to facility construction.	→	→	→
Negligible impacts to localized areas from research excavations for cultural and paleontological resources.	Same as A.	Greater impacts (negligible to minor) due to increased research opportunities for cultural and paleontological resources.	Same as A.
Water Resources			
Negligible effect on hydrology and water quality.	→	→	→
Vegetation			
Minor short-term impacts to uplands; moderate to major long-term impacts due to continuation of existing management.	Variable effects on uplands depending on target species and management emphasis; overall long-term moderate benefits but some overbrowsing could occur.	Minor long-term benefits for uplands due to improved management, including prescriptive grazing and balanced use by wild and domestic ungulates.	Long-term major benefits for uplands due to emphasis on restoring natural processes using prescribed grazing and fire.
Minor to moderate long-term benefits for river bottoms from restoration to native communities; longer timeframe due to minimal commitment of resources.	Minor to moderate long-term benefits for river bottoms (same as A), except more aggressive approach is more likely to succeed in a shorter timeframe.	Same as B, except cooperative approach would allow restoration to begin more quickly.	Same as B, with a less aggressive approach.
Shorelines primarily under USACE jurisdiction; negligible effects.	→	→	→

Table 56. Summary of the environmental consequences for actions of the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Alternative A No Action	*Alternative B* Wildlife Populations	*Alternative C* Public and Economic Uses	*Alternative D* Ecological Processes (Proposed Action)
Vegetation (continued)			
Minor long-term benefits for riparian areas and wetlands from grazing and habitat management actions. Continued moderate impacts in localized areas from grazing.	Moderate long-term benefits for riparian areas and wetlands due to more extensive prescriptive grazing and water impoundment removal. Continued moderate impacts in localized areas from grazing. (Same as A)	Minor to moderate long-term benefits for riparian areas and wetlands due to more extensive prescriptive grazing and water impoundment rehabilitation. Continued moderate impacts in localized areas from grazing. (Same as A)	Same as B, with moderate to major benefits. Continued moderate impacts in localized areas from grazing. (Same as A)
Wildlife			
Minor benefits for big game from ongoing population management and habitat improvements.	Minor to moderate long-term benefits for big game from management towards natural ecosystem processes and reduced livestock conflicts.	Moderate long-term impacts on big game from management that emphasizes maximum harvests.	Moderate long-term benefits for big game from a balanced approach to population, habitat, and harvest management.
Negligible effects on furbearers and small predators (no changes in management).	Major long-term benefits for furbearers and small predators due to active reintroduction of some species.	Minor to major impacts due to increased harvest of furbearers and small predators.	Negligible impact on furbearers and small predators from harvest opportunities based on acceptable population levels.
Negligible effects on birds. Habitat impacts would generally offset benefits. Moderate to major localized impacts on birds due to grazing.	Moderate to major long-term benefits for birds due to upland and riparian habitat management. Moderate to major localized impacts on birds due to grazing. (Same as A)	Similar to B, with minor long-term benefits. Moderate to major localized impacts on birds due to grazing. (Same as A)	Same as B. Moderate to major localized impacts on birds due to grazing. (Same as A)
Minor incremental impacts on amphibians, reptiles, and fish due to upland and riparian habitat degradation. Negligible effects on small mammals.	Moderate benefits for amphibians, reptiles, and fish due to upland and riparian habitat improvements. Negligible to minor benefits to small mammals from prescriptive grazing and habitat improvements.	Same as B for amphibians, reptiles, and fish, with minor benefits. Negligible to minor impacts on small mammals due to continued fire suppression and loss of native habitat structure.	Same as B for other wildlife, with moderate to major benefits.
Negligible benefits on TES and species of concern (no specific objectives). Direct effects on TES and species of concern from wolf and bison management objectives would be negligible.	Moderate to major long-term benefits due to prescriptive grazing, fire management, and general habitat improvements. Direct effects on TES and species of concern from wolf and bison management objectives would be negligible. (Same as A)	Same as B.	Same as B.

Table 56. Summary of the environmental consequences for actions of the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Alternative A No Action	*Alternative B* Wildlife Populations	*Alternative C* Public and Economic Uses	*Alternative D* Ecological Processes (Proposed Action)
Special Management Areas			
Negligible impact on wilderness. No effects on other special designations.	Minor benefit due to expanded proposed wilderness units (+25,000 acres).	Minor impact for reduced proposed wilderness units (–36,000 acres).	Minor benefit due to consolidated proposed wilderness units (–8,000 acres).
No effects on other special management areas.	→	→	→
Visitor Services			
Negligible effects on hunting. No long-term change from current hunting opportunities.	Negligible to minor benefits including unique and expanded hunting opportunities and improved access management.	Minor to moderate benefits from an expanded emphasis on hunting opportunities and harvest.	Minor to moderate benefits for hunting, depending on individual preferences.
Negligible effects on fishing.	Same as A.	Same as A, plus negligible benefits from expanded boat ramp access.	Same as A.
Negligible effects on wildlife observation and photography. Visitation levels would remain flat. Facilities would not meet demand.	Negligible to minor benefits for wildlife observation and photography with increased staff (1), facilities, and programs to accommodate increased visitation.	Moderate benefits for wildlife observation and photography with increased staff (2), facilities, and programs with an emphasis on economic benefits.	Moderate benefits for wildlife observation and photography with increased staff (2) and a greater emphasis on quality programs.
Negligible effects on environmental education. Very little environmental education would be offered.	Negligible benefits for environmental education with increased staff (1) and programming.	Minor benefits for environmental education with increased staff (2), programs, and facilities.	Same as C, with greater emphasis on quality programs.
Negligible effects for interpretation (limited programs and facilities).	Negligible benefits for interpretation with increased staff (1) and modest improvements in facilities and programs.	Minor benefits for interpretation with increased staff (2), and expanded facilities.	→
Negligible effects for outreach.	Negligible benefits due to increased outreach efforts.	Minor benefits due to increased and targeted outreach efforts.	→
Negligible effects on access. 670 miles of road open to visitors.	Minor impacts on access due to 106 miles of closed road.	Minor benefits for access due to road improvements or game retrieval on some formerly closed roads (outside of wilderness) and consideration of winter access to fishing areas from the south and north side of the Missouri River.	Negligible impact on access due to 23 miles of closed road. Minor benefits for access due to road improvements or game retrieval on some closed roads (outside of wilderness) and a winter access route to an ice fishing area from the south side of the Missouri River.
Negligible effect for commercial recreation. Current level of permits (11) would remain.	Negligible benefits for commercial recreation due to efforts to minimize conflicts.	Minor benefits for commercial recreation due to additional permits and efforts to reduce conflicts.	Same as B.

Table 56. Summary of the environmental consequences for actions of the CCP alternatives for the Charles M. Russell and UL Bend refuges.

Alternative A No Action	*Alternative B* Wildlife Populations	*Alternative C* Public and Economic Uses	*Alternative D* Ecological Processes (Proposed Action)
Cultural and Paleontological Resources			
Negligible effects on cultural resources.	Negligible to minor benefits for cultural resources due to increased resource protection.	→	→
Negligible effects on paleontological resources.	Negligible to minor benefits for paleontological resources due to increased management, interpretation, and law enforcement.	→	→
Socioeconomics			
Negligible impact on regional economics.	Negligible impact on regional economics, generating an additional $216,000 in local output and one more job.	Minor benefits for regional economics, generating $3.9 million in local output and 48 additional jobs.	Minor benefits for regional economics, generating $2.1 million in local output and 25 additional jobs.
Negligible to minor impact on livestock permittees.	Moderate to major impact on livestock permittees due to transition to prescriptive grazing, fence removal, and stock pond removal.	Same as A, with minor impact on some permittees due to boundary fence construction.	Same as B, with a minor benefit to some permittees due to the reduction of proposed wilderness units.
No effect on environmental justice.	→	→	→

Glossary

accessible—Pertaining to physical access to areas and activities for people of different abilities, especially those with physical impairments.

active management—The direct manipulation of habitats or wildlife populations to achieve specific objectives. Actions could include planting food plots, managing water levels, prescribed grazing or fire, or wildlife relocations.

adaptive resource management—The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities; a process that uses feedback from research, monitoring, and evaluation of management actions to support or modify objectives and strategies at all planning levels; a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

Administration Act—National Wildlife Refuge System Administration Act of 1966.

alternative—A reasonable way to solve an identified problem or satisfy the stated need (40 CFR 1500.2); one of several different means of accomplishing refuge purposes and goals and contributing to the Refuge System mission (The Fish and Wildlife Service Manual, 602 FW 1.5).

amphibian—A class of cold-blooded vertebrates including frogs, toads, or salamanders.

annual—A plant that flowers and dies within 1 year of germination.

appropriate management response—The response to a wildfire based on an evaluation of risks to firefighter and public safety, the circumstances under which a fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to be protected.

appropriate use—A proposed or existing uses on national wildlife refuges that meet at least one of the following: is a wildlife-dependent recreational use; contributes to fulfilling refuge purposes, the Refuge System mission, or goals and objectives outline in a CCP; and the refuge manager has evaluated the use and found it to be appropriate.

ATV—All-terrain vehicle.

baseline—A set of critical observations, data, or information used for comparison or a control.

biological control—The use of organisms or viruses to control invasive plants or other pests.

biological diversity, also **biodiversity**—The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (The Fish and Wildlife Service Manual, 052 FW 1.12B). The National Wildlife Refuge System's focus is on indigenous species, biotic communities, and ecological processes.

biological integrity—Biotic composition, structure, and function at genetic, organism, and community levels.

biotic—Pertaining to life or living organisms; caused, produced by, or comprising living organisms.

Bureau of Land Management (BLM)—A Federal agency that was established in 1946 through consolidation of the General Land Office and U.S. Grazing Service. The agency has a multiple-use mandate is responsible for a variety of programs for managing and conserving surface and subsurface mineral estates, mostly in the western United States.

canopy—A layer of foliage, generally the uppermost layer, in a vegetative stand; midlevel or understory vegetation in multilayered stands. Canopy closure (also canopy cover) is an estimate of the amount of overhead vegetative cover.

CCP—See comprehensive conservation plan.

CFR—See Code of Federal Regulations.

cervid—All members of the family Cervidae and hybrids, including deer, elk, moose, caribous, reindeer, and related species.

CFR—See Code of Federal Regulations.

cfs—Cubic feet per second.

Code of Federal Regulations (CFR)—The codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government. Each volume of the CFR is updated once each calendar year.

compatibility determination—See compatible use.

compatible use—A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the director of the U.S. Fish and Wildlife Service, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge (The Fish and Wildlife Service Manual, 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identified stipulations or limits necessary to ensure compatibility.

comprehensive conservation plan (CCP)—A document that describes the desired future conditions of the refuge and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the Refuge System, and to meet other relevant mandates (The Fish and Wildlife Service Manual, 602 FW 1.5).

concern—See issue.

conservation district—Organized in the 1930s as a response to the severe erosion problems, a district is often a political subdivision of a State. Funding comes from assessments levied on real property within the boundaries of the district. It assists citizens in conserving renewable natural resources.

conspecific—An individual belonging to the same species as another.

cool-season grasses—Grasses that begin growth earlier in the season and often become dormant in the summer. These grasses will germinate at lower temperatures. Examples of cool-season grasses at the refuge are western wheatgrass, needle and thread, and green needlegrass.

county road—In general, means any public highway opened,established,constructed,maintained,abandoned in accordance with State law.

cover, also **cover type, canopy cover**—Present vegetation of an area.

cultural resources—The remains of sites, structures, or objects used by people in the past.

depredation—Destruction or consumption of eggs, broods, or individual wildlife due to a predatory animal; damage inflicted on agricultural crops or ornamental plants by wildlife.

drawdown—The act of manipulating water levels in an impoundment to allow for the natural drying-out cycle of a wetland.

EA—See environmental assessment.

ecological resilience—The ability to absorb disturbances, to be changed, and then to reorganize and still have the same identity, that is, retain the same basic structure and ways of functioning. A resilient system is forgiving of external shocks; a disturbance is unlikely to affect the whole. A resilient habitat: (1) sustains many species of plants and animals and a highly variable structural composition; (2) is asymmetric; (3) exemplifies biological integrity, biological diversity, and environmental health; and (4) adapts to climate change.

ecosystem—A dynamic and interrelating complex of plant and animal communities and their associated nonliving environment; a biological community, together with its environment, functioning as a unit. For administrative purposes, the Service has designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries and their sizes and ecological complexity vary.

ecosystem resilience—See ecological resilience.

EIS—Environmental impact statement.

endangered species, Federal—A plant or animal species listed under the Endangered Species Act of 1973, as amended, that is in danger of extinction throughout all or a significant portion of its range.

endangered species, State—A plant or animal species in danger of becoming extinct or extirpated in a particular State within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

endemic species—Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

environmental assessment—A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action and alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

environmental health—Composition, structure, and functioning of soil, water, air, and other abiotic features.

EPA—Environmental Protection Agency.

extinction—The complete disappearance of a species from the earth; no longer existing.

extirpation—The extinction of a population; complete eradication of a species within a specified area.

fauna—All the vertebrate and invertebrate animals of an area.

Federal trust resource—A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States as a result of Federal acts and treaties. Examples are species listed under the Endangered Species Act, migratory birds protected by international treaties, and native plant or wildlife species found on a national wildlife refuge.

Federal trust species—All species where the Federal Government has primary jurisdiction including federally endangered or threatened species, migratory birds, anadromous fish, and certain marine mammals.

fire refugia—Those places within the landscape that due to size, soils, or topography do not burn as often, as intensely, or at all with frequent light ground fire. In landscapes with frequent fire return intervals, respect for fire refugia is essential for protection of fire intolerant plant species.

flora—All the plant species of an area.

FMP—Fire management plan.

forb—A broad-leaved, herbaceous plant; a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue but dies down at the end of the growing season.

fragmentation—The alteration of a large block of habitat that creates isolated patches of the original habitat that are interspersed with a variety of other habitat types; the process of reducing the size and connectivity of habitat patches, making movement of individuals or genetic information between parcels difficult or impossible.

"friends group"—Any formal organization whose mission is to support the goals and purposes of its associated refuge and the National Wildlife Refuge Association overall; "friends" organizations and cooperative and interpretive associations.

FTE—A full-time equivalent; one or more job positions with tours of duty that, when combined, equate to one person employed for the standard Government work-year.

FWS—See U.S. Fish and Wildlife Service.

geocaching—A high-technology scavenger hunt in which objects are hidden at secret outdoor locations for participants to find using Global Positioning System positions posted on the Internet.

geographic information system (GIS)—A computer system capable of storing and manipulating spatial data; a set of computer hardware and software for analyzing and displaying spatially referenced features (such as points, lines and polygons) with nongeographic attributes such as species and age.

GIS—See geographic information system.

goal—Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (The Fish and Wildlife Service Manual, 620 FW 1.5).

grassland tract—A contiguous area of grassland without fragmentation.

CFR—See Code of Federal Regulations.

Global Positioning System (GPS)—A navigational system involving satellites that a allows a user with a receiver to determine precise coordinates for their location on the earth's surface.

GS—General Schedule (pay rate schedule for certain Federal positions).

habitat—Suite of existing environmental conditions required by an organism for survival and reproduction; the place where an organism typically lives and grows.

habitat disturbance—Significant alteration of habitat structure or composition; may be natural (for example, wildfire) or human-caused events (for example, timber harvest and disking).

habitat management plan (HMP)—A step-down plan to a comprehensive conservation plan that identifies in detail how the objectives and strategies for upland, riparian, river bottoms, and the shoreline will be carried out.

habitat type, also **vegetation type, cover type**—A land classification system based on the concept of distinct plant associations.

HDP—See height density plot.

height density plot (HDP)—methods used to record the height of visual obstruction of plant cover. A measuring pole is observed at points along a line transect from a set distance and angle. It provides information on the adequacy of nesting cover for sharp-tailed grouse.

herbivory—Grazing of grass and other plants by any animal.

heterogeneity—diversity or dissimilar species within a landscape

HMP—See habitat management plan.

HUA—Hydrologic unit area.

huntable—A species that can be hunted on the refuge in accordance with Federal and State regulations.

impoundment—A body of water created by collection and confinement within a series of levees or dikes, creating separate management units although not always independent of one another.

Improvement Act—National Wildlife Refuge System Improvement Act of 1997.

indigenous—Originating or occurring naturally in a particular place.

inholding—Non-Service land owned by private, other agency, or other group landowners that is within the boundary of a national wildlife refuge.

integrated pest management—Methods of managing undesirable species such as invasive plants; education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods.

introduced species—A species present in an area due to intentional or unintentional escape, release, dissemination, or placement into an ecosystem as a result of human activity.

invasive plant, also **noxious weed**—A species that is nonnative to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

invertebrates—An animal that lacks an internal skeleton or backbone such as insects, butterflies, and aquatic species like snails.

inviolate sanctuary—A place of refuge or protection where animals and birds may not be hunted.

issue—Any unsettled matter that requires a management decision; for example, a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (The Fish and Wildlife Service Manual, 602 FW 1.5).

lentic—Still water wetlands. These wetlands occur in basins and lack a defined channel and floodplain. Examples include perennial, intermittent bodies of water like lakes, reservoirs, stock ponds.

long-distance animal movement—The ability of a wildlife species to move greater distances in search of forage without fences.

lotic—Flowing water wetlands are associated with rivers, streams and drainage ways. These riparian wetlands contain a defined channel and floodplain.

management alternative—See alternative.

migration—Regular extensive, seasonal movements of birds between their breeding regions and their wintering regions; to pass usually periodically from one region or climate to another for feeding or breeding.

migratory birds—Birds which follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

mission—Succinct statement of purpose and/or reason for being.

mitigation—Measure designed to counteract an environmental impact or to make an impact less severe.

mixed-grass prairie—A transition zone between the tall-grass prairie and the short-grass prairie dominated by grasses of medium height that are approximately 2–4 feet tall. Soils are not as rich as the tall-grass prairie and moisture levels are less.

monitoring—The process of collecting information to track changes of selected parameters over time.

national wildlife refuge—A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include coordination areas; a complete listing of all units of the Refuge System is in the current "Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service."

National Wildlife Refuge System (Refuge System)—Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife including species threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas.

National Wildlife Refuge System Improvement Act of 1997 (Improvement Act)—Sets the mission and the administrative policy for all refuges in the National Wildlife Refuge System; defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation); establishes a formal process for determining appropriateness and compatibility; establish the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; requires a comprehensive conservation plan for each refuge by the year 2012. This act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

native species—A species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

Neotropical migrant—A bird species that breeds north of the United States and Mexican border and winters primarily south of this border.

nest success—The percentage of nests that successfully hatch one or more eggs of the total number of nests initiated in an area.

nongovernmental organization—Any group that is not comprised of Federal, State, tribal, county, city, town, local, or other governmental entities.

noxious weed, also **invasive plant**—Any living stage (including seeds and reproductive parts) of a parasitic or other plant of a kind that is of foreign origin (new to or not widely prevalent in the United States) and can directly or indirectly injure crops, other useful plants, livestock, poultry, other interests of agriculture, including irrigation, navigation, fish and wildlife resources, or public health. According to the Federal Noxious Weed Act (Public Law 93-639), a noxious weed (such as invasive plant) is one that causes disease or has adverse effects on humans or the human environment and, therefore, is detrimental to the agriculture and commerce of the United States and to public health.

NRCS—Natural Resources Conservation Service of the U.S. Department of Agriculture.

NWR—National wildlife refuge.

objective—An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work; derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific and should be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively (The Fish and Wildlife Service Manual, 602 FW 1.5).

passive management—This management approach allows for natural processes such as fire, grazing, and flooding to occur with little human assistance or funding, which conserves limited funds while increasing the likelihood of self-sustaining communities.

patch—An area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

patch burning—The use of prescribed fire each year in a different location or patch within a larger unfenced landscape. With an ecology-driven purpose, patch burning has high potential to increase biodiversity and wildlife habitat. This management practice creates a mosaic of heavily grazed and lightly grazed areas that provide a diverse vegetative structure and increase diversity in the same grazing unit.

perennial—Lasting or active through the year or through many years; a plant species that has a life span of more than 2 years.

plant community—An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soil, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community, such as ponderosa pine or bunchgrass.

prescribed fire—Any fire ignited by management actions to meet specific objectives. These objectives could be hazardous fuels reduction, habitat or wildlife oriented, or other objectives in the prescribed fire burn plan.

prescriptive grazing—To designate or order the use as a remedy through a written direction to achieve a desired outcome.

priority public use—One of six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority if found to be compatible with a refuge's purposes. This includes hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

properly functioning condition—Qualitative method for assessing the condition of riparian-wetland areas. It describes both the assessment and the conditions of the wetland area. It evaluates how well the physical processes are functioning through use of a checklist.

proposed action—The alternative proposed to best achieve the purpose, vision, and goals of a refuge (contributes to the Refuge System mission, addresses the significant issues, and is consistent with principles of sound fish and wildlife management).

public—Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

public domain—Lands that were not under private or State ownership during the 18th and 19th centuries in the United States, as the country was expanding. These lands were obtained from the 13 colonies, Native American tribes, or purchases from other counties. The domain was controlled by the Federal Government and sold to States or private interests through the General Land Office which would eventually become the Bureau of Land Management.

public involvement—A process that offers affected and interested individuals and organizations an opportunity to become informed about, and to express their opinions on, Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

purpose of the refuge—The purpose of a refuge is specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing authorization or expanding a refuge, a refuge unit, or a refuge subunit (The Fish and Wildlife Service Manual, 602 FW 1.5).

pyric herbivory—Grazing promoted through fire. The fire-grazing interaction is critical in maintaining heterogeneity (dissimilar species resulting in variety) of grassland ecosystems.

raptor—A carnivorous bird such as a hawk, a falcon, or a vulture that feeds wholly or chiefly on meat taken by hunting or on carrion (dead carcasses).

R.S. 2477—Revised Statute 2477. Section 2477 of the Revised Statutes emerged from Section 8 of the Mining Act of 1866 which provided right of ways for the construction of highways over public lands, not reserved for public uses. It was repealed on October 21, 1976 under the Federal Land Policy and Management Act.

refuge purpose—See purpose of the refuge.

Refuge System—See National Wildlife Refuge System.

refuge use—Any activity on a refuge, except administrative or law enforcement activity, carried out by or under the direction of an authorized Service employee.

resident species—A species inhabiting a given locality throughout the year; nonmigratory species.

resilence—The ability to absorb disturbances, to be changed and then to reorganize and still have the same identity (retain the same basic structure and ways of functioning).

rest—Free from biological, mechanical, or chemical manipulation, in reference to refuge lands.

restoration—Management emphasis designed to move ecosystems to desired conditions and processes, such as healthy upland habitats and aquatic systems.

Riparian and Wetland Research Program—A program through the University of Montana's Department of Forestry that the Service contracted with in 1999–2000 to look at water quality on the refuge.

riparian area or **riparian zone**—An area or habitat that is transitional from terrestrial to aquatic ecosystems including streams, lakes, wet areas, and adjacent plant communities and their associated soils that have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, "riparian" describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes all plant life growing on the land adjoining a stream and directly influenced by the stream.

SAMMS—See Service Asset Maintenance Management System.

scoping—The process of obtaining information from the public for input into the planning process.

seasonally flooded—Surface water is present for extended periods in the growing season, but is absent by the end of the season in most years.

sediment—Material deposited by water, wind, and glaciers.

sentinel plant species—Plant species that vanish first when the ecological processes that occur within an ecosystem are out of balance (refer to appendix F).

Service—See U.S. Fish and Wildlife Service.

Service Asset Maintenance Management System (SAMMS)—A national database which contains the unfunded maintenance needs of each refuge; projects include those required to maintain existing equipment and buildings, correct safety deficiencies for the implementation of approved plans, and meet goals, objectives, and legal mandates.

shorebird—Any of a suborder (Charadrii) of birds such as a plover or a snipe that frequent the seashore or mud flat areas.

spatial—Relating to, occupying, or having the character of space.

special status species—Plants or animals that have been identified through Federal law, State law, or agency policy as requiring special protection of monitoring. Examples include federally listed endangered, threatened, proposed, or candidate species; State-listed endangered, threatened, candidate, or monitor species; Service's species of management concern; or species identified by the Partners in Flight Program as being of extreme or moderately high conservation concern.

special use permit—A permit for special authorization from the refuge manager required for any refuge service, facility, privilege, or product of the soil provided at refuge expense and not usually available to the public through authorizations in Title 50 CFR or other public regulations (Refuge Manual, 5 RM 17.6).

species of concern—Those plant and animal species, while not falling under the definition of special status species, that are of management interest by virtue of being Federal trust species such as migratory birds, important game species, or significant keystone species; species that have documented or apparent populations declines, small or restricted populations, or dependence on restricted or vulnerable habitats.

step-down management plan—A plan that provides the details necessary to implement management strategies identified in the comprehensive conservation plan (The Fish and Wildlife Service Manual, 602 FW 1.5).

strategy—A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (The Fish and Wildlife Service Manual, 602 FW 1.5).

threatened species, Federal—Species listed under the Endangered Species Act of 1973, as amended, that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

threatened species, State—A plant or animal species likely to become endangered in a particular State within the near future if factors contributing to population decline or habitat degradation or loss continue.

travel corridor—A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required for long-term survival or reproduction of its migrants.

trust resource—See Federal trust resource.

trust species—See Federal trust species.

ungulate—A hoofed mammal such as horses, cattle, deer, pronghorn, and bighorn sheep.

U.S. Army Corps of Engineers (USACE)—The Federal agency whose mission is to provide vital public engineering services in peace and war to strengthen the Nation's security, energize the economy, and reduce risks from disasters.

USDA—U.S. Department of Agriculture.

U.S. Fish and Wildlife Service (Service, USFWS, FWS)—The principal Federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. The Service manages the 93-million-acre National Wildlife Refuge System comprised of more than 530 national wildlife refuges

and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological service field stations, the agency enforces Federal wildlife laws, manages migratory bird populations, restores national significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal aid program that distributes millions of dollars in excise taxes on fishing and hunting equipment to State wildlife agencies.

USFWS—See U.S. Fish and Wildlife Service.

U.S. Geological Survey (USGS)—A Federal agency whose mission is to provide reliable scientific information to describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

USGS—See U.S. Geological Survey.

UWA—Unified watershed assessment.

viability—Ability to survive and developing adequately. For a plant, the ability to survive and bear fruits or seeds without being fenced.

vision statement—A concise statement of the desired future condition of the planning unit, based primarily on the Refuge System mission, specific refuge purposes, and other relevant mandates (The Fish and Wildlife Service Manual, 602 FW 1.5).

visual obstruction—Pertaining to the density of a plant community; the height of vegetation that blocks the view of predators and conspecifics to a nest.

waterfowl—A category of birds that includes ducks, geese, and swans.

watershed—The region draining into a river, a river system, or a body of water.

wetland management district—Land that the Refuge System acquires with Federal Duck Stamp funds for restoration and management primarily as prairie wetland habitat critical to waterfowl and other wetland birds.

WG—Wage grade schedule (pay rate schedule for certain Federal positions).

wildfire—Any nonstructure fire that occurs in the wildland including prescribed fire.

wildfire implementation plan—A progressively developed assessment and operational management plan that documents the analysis and describes the response for a wildfire.

wildland fire—Any nonstructure fire that occurs in the wildland including wildfire and prescribed fire.

wildland-urban interface—The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland and vegetative fuels.

wilderness review—The process used to identify and recommend for congressional designation Refuge System lands and waters that merit inclusion in the National Wilderness Preservation System. It is a required element of a CCP and includes three phases: inventory, study, and recommendation.

wilderness study area (WSA)—An area being considered for wilderness designation. These are identified and established through the inventory component of a wilderness review.

wildlife-dependent recreational use—Use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, environmental education, or interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority public uses of the Refuge System.

woodland—Open stands of trees with crowns not usually touching, generally forming 25–60 percent cover.

Appendix A

List of Preparers and Contributors

This document is the result of the extensive, collaborative, and enthusiastic efforts by the members of the planning team, cooperating agencies, and other Service or agency contributors listed below.

U.S. Fish and Wildlife Service Staff on Planning Team

Name	*Agency/Position*	*Education and Experience*	*Contribution*
Laurie Shannon	Planning team leader, region 6, Lakewood, Colorado	B.S. recreation resources management; 27 years	Project coordination, organization, writing and review
Barron Crawford	Project leader, Charles M. Russell National Wildlife Refuge, Lewistown, Montana	B.S. and M.S. wildlife and fisheries science; 18 years	Project oversight, writing and review
Bill Berg	Deputy project leader, Charles M. Russell National Wildlife Refuge	B.S. wildlife management and zoology; 29 years	Writing, review, and Common Sense coordinator
Trina Brennan	Wildlife refuge specialist, Charles M. Russell National Wildlife Refuge	B.S. fisheries and wildlife management; 5 years	Assist in project coordination, organization and writing
Matt Derosier	Sand Creek Field Station manager, Charles M. Russell National Wildlife Refuge	B.S. wildlife management; 21 years	Writing and review
JoAnn Dullum	Wildlife biologist, Charles M. Russell National Wildlife Refuge	B.S. zoology, M.S. wildlife biology; 15 years	Writing and review
Mike Granger	Fire management officer, Charles M. Russell National Wildlife Refuge	B.S., M.S. wildlife biology; 25 years	Writing and review
Paula Gouse	Fort Peck wildlife refuge specialist, Charles M. Russell National Wildlife Refuge	B.S. biology; 13 years	Writing and review
Dan Harrell	Habitat biologist, Charles M. Russell National Wildlife Refuge	B.S. fish and wildlife management; 18 years	Writing and review
Nathan Hawkaluk	Jordan Field Station manager, Charles M. Russell National Wildlife Refuge	B.S. fish and wildlife management; 7 years	Writing and review
Aaron Johnson	Fort Peck Field Station manager, Charles M. Russell National Wildlife Refuge	B.S. wildlife management; 12 years	Writing and review
Neil Kadrmas	Wildlife biologist, Charles M. Russell National Wildlife Refuge	B.S., M.S. wildlife and fisheries science; 5 years	Writing and review
Danielle Kepford	Realty specialist, Charles M. Russell National Wildlife Refuge	B.S. wildlife and fisheries sciences; 10 years	Realty and land acquisition review

U.S. Fish and Wildlife Service Staff on Planning Team

Name	*Agency/Position*	*Education and Experience*	*Contribution*
Randy Matchett	Senior wildlife biologist, Charles M. Russell National Wildlife Refuge	B.S., M.S. wildlife biology; 27 years	Writing and review
Beverly Roedner Skinner	Administration, Charles M. Russell National Wildlife Refuge	B.S., M.S. wildlife management; B.S. agriculture/horticulture; teacher certificate (science for grades 5–12); 20 years	Writing and review
Bob Skinner	Habitat biologist, Charles M. Russell National Wildlife Refuge	B.S. zoology, M.S. wildlife management, Ph.D. wildlife management; 30 years	Writing and review

Cooperating Agency Members

Name	*Agency/Position*	*Education and Experience*	*Contribution**
Rich Adams	BLM HiLine district field manager, Malta, Montana	B.S. range and forest management; 31 years	Planning team member
Gary Benes	BLM district manager, Central Montana, Lewistown, Montana	B.A. geography and history, B.S. natural resource conservation	Planning team member
John Daggett	USACE operations project manager, Fort Peck, Montana	B.S. civil engineering; 20 years at Fort Peck	Planning team member
Lee Iverson	Petroleum County commissioner, Winnett, Montana	B.S. animal husbandry; 12 years	Planning team member
Vicki Marquis	Missouri River Conservation District Council coordinator, Great Falls, Montana	B.A. chemistry; 5 years on council	Planning team member
Darin McMurry	USACE lake manager, Fort Peck, Montana	B.S. wildlife science; 23 years	Planning team member
Chris Pileski**	DNRC, Eastern Land Office, acting area manager, Miles City, Montana	B.S. forestry; 14 years	Planning team member
Lesley Robinson	Phillips County commissioner, Malta, Montana	5 years	Planning team member
Clive Rooney	DNRC, Northeastern Land Office, area manager, Lewistown, Montana	B.A. business administration; 20 years	Planning team member
Tom Stivers	MFWP, wildlife biologist, Lewistown, Montana	B.S. wildlife biology, M.S. fish and wildlife management; 30 years	Planning team member
Mark Sullivan	MFWP, region 6 wildlife program manager, Glasgow, Montana	B.S. biology, M.S. fish and wildlife management; 20 years	Planning team member

**Primary representative of respective agency at meetings: participated on planning team; helped identify issues; provided input on alternatives, objectives, and strategies; reviewed planning documents; and provided information as requested.*

***Replaced Rick Strohmyer.*

Other Service or Agency Contributors

Name	*Agency/Position*	*Contribution*
John Chaffin	Attorney advisor, Department of the Interior, Office of the Solicitor	Legal advisor to the Service
Rick Coleman	Assistant regional director, region 6, Lakewood, Colorado	Refuge System policy guidance
Mark Ely	Region 6, division of refuge planning, GIS specialist, Lakewood, Colorado	GIS map preparation for document
Patti Fielder	Hydrologist, region 6, Lakewood, Colorado	Assistance with writing water resources section
Jackie Fox	Biological science technician, Charles M. Russell National Wildlife Refuge	Assistance with document preparation
Shannon Heath	Outdoor recreation planner, division of visitor education and services, Helena, Montana	Assistance with developing public use objectives and overview of visitor services
Wayne King	Region 6 wildlife biologist, Lakewood, Colorado	Review of region 6 fish and wildlife priorities
Dean Rundle	Region 6, refuge supervisor (Montana, Wyoming, Utah, Colorado), Lakewood, Colorado	Refuge System policy guidance
Michael Spratt	(Retired) chief, division of refuge planning, Lakewood, CO	Planning guidance
Meg Van Ness	Region 6 archaeologist, Lakewood, Colorado	Assistance with cultural resources objectives
Brant Loflin	Archaeologist	Assistance with cultural resources and paleontology information

Other Consultants

Name	*Agency/Position*	*Contribution*
Roxanne Bash	Federal Highways Administration, Western Federal Lands Office, Washington	Assistance with transportation planning
Jessica Clement	Colorado State University, Fort Collins, Colorado	Assistance in facilitation of public use objectives workshop
George Fekaris	Federal Highways Administration, Western Lands Office, Washington	Assistance with transportation planning
Lynne Koontz Ph.D.	Economist, USGS, Fort Collins Science Center, Colorado	Analysis of socioeconomic impacts
Mimi Mather	Shapins-Belt Collins, Boulder, Colorado	Facilitation of planning team and public meetings; assistance with document preparation
Bill Mangle	ERO Resources, natural resources planner, Denver, Colorado	Assistance with analysis and research for reasonably foreseeable activities and cumulative impacts, and other environmental analysis documentation
Natalie Sexton	USGS, Fort Collins Science Center, Colorado	Facilitation and assistance with public use objectives and analysis of socioeconomic impacts
Rick Schroeder	(Retired) USGS, Fort Collins Science Center, Colorado	Assistance with vision and goals; provided input on writing biological objectives

Many other individuals also provided invaluable assistance with the preparation of this CCP. The Service acknowledges the efforts of the following individuals and groups towards the completion of this plan. The diversity, talent, and knowledge contributed dramatically improved the vision and completeness of this document.

- Mark Albers, BLM, field manager, Malta, Montana
- Mary Bloom, BLM, assistant field manager, Miles City, Montana
- Clayton Christensen, Charles M. Russell National Wildlife Refuge
- John Esperance, (retired) region 6, planning branch chief
- Jim Forsythe, Charles M. Russell National Wildlife Refuge
- Jody Jones, Charles M. Russell National Wildlife Refuge
- Kim Greenwood, region 6 tribal liaison
- Glenn Guenther, Charles M. Russell National Wildlife Refuge
- Pat Gunderson, MFWP, Glasgow, Montana
- Brian Haugen, Charles M. Russell National Wildlife Refuge
- Bob King, Charles M. Russell National Wildlife Refuge
- Chris King, Petroleum County commissioner, Winnett, Montana
- Gerry Majerus, BLM, Lewistown, Montana
- Paul Pallas, Charles M. Russell National Wildlife Refuge
- Carl Seilstad, Fergus County commissioner, Lewistown, Montana
- Scott Haight, BLM, assistant field manager, Lewistown, Montana
- Margaret Raper, BLM field manager, Miles City, Montana
- Dale Tribby, BLM, Miles City, Montana
- Asuka Ishizaki, formerly with USGS, Fort Collins Science Center, Colorado
- Dr. John Ritten Ph.D. University of Wyoming; assisted USGS (Fort Collins Science Center, Colorado) in socioeconomic analysis

Appendix B

Public Involvement Summary

Following the guidance found in the National Environmental Policy Act, the Improvement Act, and the Service's planning policy, the planning team has made sure all that all interested groups and the public have had an opportunity to be involved in the planning process. The term "stakeholder" is commonly used to refer to individual citizens; organizations; businesses; Native American tribes; Federal, State, and local governmental agencies; and others who have expressed an interest in the issues and outcomes of the planning process.

B.1 Public Scoping Activities

The formal scoping period began on December 4, 2007, with the publication of a notice of intent in the Federal Register (FR-23467). The notice of intent notified the public of the Service's intent to begin the CCP and EIS process and solicited public comments.

OUTREACH ACTIVITIES

Early in the preplanning phase and before publication of the notice of intent in the Federal Register, the Service outlined a process that would be inclusive of diverse stakeholder interests and would involve a range of activities for keeping the public informed and ensure meaningful public input. This process was summarized in a planning update titled Public Involvement Summary (FWS 2007a) and posted to the project website. The full report titled "Charles M. Russell National Wildlife Refuge Public Involvement Process" was included as an appendix in the scoping report (FWS 2008c), which was posted on the project's website. Throughout scoping, the planning team used various methods to solicit guidance and feedback from interested groups and the public. These methods included a variety of outreach materials, public meetings, cooperating agency meetings, briefings and presentations, as well as personal conversations, letters, email and telephone calls.

Planning Updates

A planning update (Issue 1, January 2008) (FWS 2007a) was mailed to the initial mailing list of 625 people and businesses prior to the first round of public meetings. The planning update, together with the earlier Planning Involvement Summary (FWS 2007a), outlined the planning process, draft vision and goals for the CCP, and dates, times and locations of the public scoping meetings. Refuge staff handed out the updates at various local agency meetings. The planning update distribution list consisted of individuals, agencies, and organizations who had previously expressed an interest in refuge activities. Following the close of the public comment period for scoping, Planning Update, Issue 2, May 2008 (FWS 2007a) was mailed and posted to the planning website. This update summarized the comments and key findings from scoping.

Press Release

A press release announcing the planning process and notifying the public of the schedule and location of the public meetings was sent to nearly 270 media organizations throughout Montana including congressional offices, other Federal and State agency offices, and tribal agencies. A number of news articles featured the planning processed in several newspapers, radio, TV and online publications prior to the meetings. The Service distributed a second press release when one of the meetings (Bozeman) had to be rescheduled due to inclement weather.

Paid Advertisements

The Service placed paid advertisements in nine newspapers to publicize the project and invite the public to the scoping meetings. The advertisements, 3.75 inches × 6 inches, were placed in the Billings Gazette (January 24), Bozeman Daily Chronicle (January 24), Great Falls Tribune (January 24), Circle Banner (January 17), Glasgow Courier, Glendive Ranger Review (January 17), Jordan Tribune (January 25), Lewiston News-Argus (January 16), and Phillips County News (January 16).

Project Website

The Service established a project website <http://www.fws.gov/cmr/planning> in January 2008 (FWS 2007a). From the website, interested groups and the public could learn about meetings, download documents, get their name added to the project mailing list, and provide comments.

Public Scoping Meetings

Approximately 210 people attended one of seven public scoping meetings across Montana from January 29–February 21, 2008 in Great Falls, Fort Peck, Malta, Lewistown, Jordan, Billings, and Bozeman. The planning team listened to many ideas and concerns that

were expressed and answered questions from a variety of interested groups and the public. The initial comment period was scheduled to end on February 4, 2008, but was extended to February 29, 2008.

Following a brief welcome and introduction, Service staff made a 15-minute presentation that outlined the following points:

- Description of the Service and the purpose of the Refuge System
- Key points of the legislation establishing the Charles M. Russell and UL Bend refuges
- CCP and EIS process
- Project schedule

The remainder of the meeting was broken up into two components: (1) a question and answer session; and (2) an opportunity for participants to make official public comments.

SCOPING SUMMARY and UPDATE

During the comment period for scoping, the Service received 23,867 (FWS 2008c) written responses in the form of letters, emails, or from the handout sheet provided at the public meeting. Twenty-three organizations submitted comments.

Following the comment period, the planning team prepared a scoping report summarizing the scoping phase. Copies of the report were provided to the cooperating agencies and posted to the project website. The comments were placed into a spreadsheet and included in the scoping report. Additionally, the team summarized the key activities in a second planning update (Issue 2, January 2008) (FWS 2007a), which was mailed out to the entire mailing list and posted to the project website.

The comments were consolidated into seven significant topics of concern with a number of subtopics. The seven primary topics are: habitat and wildlife, public uses and access wilderness, socioeconomic issues, water resources, adjacent lands and partnerships and cultural values, traditions, and resources. These are addressed in more detail in chapter 1.

B.2 Cooperating Agencies and Tribal Coordination

In accordance with the Service's planning policy (FWS 2000b), the preplanning and scoping process began with formal notification to Native American tribes and other Federal and State agencies with a land management interest and inviting them to participate as cooperating agencies and members of the planning team.

NATIVE AMERICAN TRIBES

The Service sent letters of notification about the planning process including an invitation to participate on the planning team to the following tribes: Arapahoe Business Council, Chippewa Cree Tribe, Crow Tribal Council, Fort Belknap Tribal Council, Fort Peck Tribal Council, and Northern Cheyenne Tribe. In July 2009, the Service reached out again to several of the closest tribes to the refuge, Fort Peck and Fort Belknap and made arrangements for a formal briefing and consultation (July 8-9, 2009).

FEDERAL, STATE, and LOCAL AGENCIES

In addition to notifying the tribes, the Service sent letters about the planning process including an invitation to participate on the planning team to the following agencies: USACE, BLM, MFWP, and DNRC. The Service sent notification letters to the Montana State Historic Preservation Office and to the six counties (Fergus, Petroleum, Garfield, McCone, Phillips, and Valley). In September 2007, Service staff met with representatives from the conservation districts and the counties to inform them of the CCP and EIS process and discuss the project.

As a result, the Service received formal letters requesting cooperating agency status from the six counties, the Garfield County Conservation District, and the Missouri River Conservation District Council. The Service granted the six counties cooperating agency status. Two representatives attended planning team meetings on behalf of all the counties. Additionally, the Service granted the six conservation districts that surround the refuge cooperating agency status, allowing for one representative to attend meetings on behalf of all the conservation districts.

In summary, the cooperating agencies included USACE, BLM, MFWP, DNRC, Fergus, Petroleum, Garfield, McCone, Phillips, and Valley Counties, and the Missouri River Conservation Districts. A memorandum of understanding was signed by all the agencies, and the signed document was posted to the planning website (FWS 2007a).

B.3 Planning Team Meetings

In November 2007, the planning team met with the Federal and State agencies. Following the addition of the counties and Missouri River Conservation Districts as cooperating agencies, in April 2008 the entire planning team met twice. The first meeting occurred April 15 for bringing all the cooperating agencies together, as several agencies had been

added since the first meeting in the fall of 2007. Key topics included developing of the Memorandum of Understanding, discussion of the Scoping Report, the upcoming alternatives development workshop, and a preliminary discussion about alternative scenarios.

A second meeting occurred when the refuge staff met for a three-day alternatives workshop, which included representation from most of the cooperating agencies involved in the project. At this workshop preliminary alternative concepts were further developed. Some agency representatives chose instead to participate in a two-day briefing held June 17-18, 2008 to discuss the concepts that had been further refined and to go out onto the refuge to discuss specific issues. For this meeting, the Service mailed all of the cooperating agencies a copy of the revised draft alternatives table prior to the meeting. The cooperating agencies offered substantial input and feedback on the initial draft alternatives during the June briefing including written comments that were submitted by McCone County. The Service incorporated many of those comments and concerns prior to publishing the entire alternatives chart for the public on the website in early August.

In early January and February 2009, the planning team met twice to develop preliminary objectives and strategies for all the alternatives. In May of 2009, the Service held another planning team meeting, which included all the county commissioners for the purposes of discussing roads and the accuracy of the data the Service had acquired to date.

The Service provided the cooperating agencies with copies of the internal review document in April 2010. Following a 5-week review period, the Service met with the cooperating agencies in June 2010 to discuss the significant issues identified during their review. Before release of the public draft, the Service met again with the cooperating agencies to advise them of any significant changes to the document.

ALTERNATIVES DEVELOPMENT

The Service considers alternatives development as part of an iterative process in the development of the Draft CCP and EIS (FWS 2000b). This phase of the project began in spring 2008, and public input ended in late fall 2008. Following input by the cooperating agencies and the public on the draft alternatives, detailed objectives and strategies for all the alternatives were developed in early 2009 with input by the cooperating agencies.

OUTREACH ACTIVITIES

In August 2008, the planning team presented four draft alternatives to the public, including a no-action alternative. One alternative (D) was identified as the proposed action. The Service's planning policy (FWS 2000b) requires that one alternative be identified as the draft proposed action. It is the alternative that the Service believes best fulfills the refuge purpose, mission, vision, and goals of the National Wildlife Refuge System. At this stage, the alternatives were described as conceptual approaches or themes including the type of management actions that would occur under each approach. For a planning process such as for the Charles M. Russell and UL Bend refuges, where an EIS is being prepared, the Service often solicits feedback on the draft alternatives prior to full development of them. While not required under the National Environmental Policy Act, this allows the public an opportunity to provide input earlier into the alternatives process. It also gives the refuge staff a chance to talk about what they would like to achieve. The Service does not select a preferred alternative until the preparation and publication of the final CCP and EIS.

Planning Updates

Planning Update, Issue 3, August 2008 was mailed or handed out in the refuge headquarters to over 720 persons and businesses during the comment period with most of the updates mailed the week of August 4, 2008 (FWS 2007a). This planning update outlined the initial draft alternatives developed by the planning team and provided the dates, times, and locations of the public workshops. The distribution list consisted of individuals, agencies, and organizations who had previously expressed an interest in refuge activities. In addition, the planning update was handed out at the meetings.

The Service followed up with another update (Planning Update, Issue 4, January 2009), which summarized what had been learned during the comment period. Both updates and a more detailed summary of comments were posted on the project website.

Press Release

On August 18, the Service issued a press release notifying the public of the schedule and location of the public meetings to nearly 270 media organizations throughout Montana including congressional offices, other Federal and State agency offices, and tribal agencies. A number of news articles about the planning process appeared in a number of newspapers, radio, TV, and online publications prior to the meetings.

Paid Advertisements

The Service placed paid advertisements in nine newspapers to announce the 2008 meetings. The advertisements, 3.75 inches by 6 inches, were placed in the

Billings Gazette (August 21), Bozeman Daily Chronicle (August 21), Great Falls Tribune (August 18), Circle Banner (August 21), Glasgow Courier, Glendive Ranger Review (August 20–21), Jordan Tribune (August 20–21), Lewiston News-Argus (August 20), and Phillips County News (August 20).

Public Workshop Meetings

One hundred and eighty-eight people attended one or more of the seven workshops from September 2-17, 2008, in Lewistown, Jordan, Malta, Glasgow, Billings, Bozeman, and Great Falls.

Following a brief welcome and introduction, the project leader made a short presentation highlighting:

- Project schedule
- Mission of the National Wildlife Refuge System, purposes of the refuge
- Process for alternatives development
- Definitions of reasonable alternatives, alternative concepts, objectives and strategies, and definition of proposed action versus preferred alternative (not until end of project)
- Overview of the alternatives
- Common issues

Following the presentation, the planning team used the remainder of the meeting to solicit feedback on the alternatives. For the first four meetings (Lewistown, Glasgow, Malta, and Jordan) participants broke into small working groups and rotated every 20-25 minutes through a discussion specific to each alternative. During the second week of meetings, audiences were small (average 15-25 people), and the Service held the discussions as one group. For all meetings, refuge staff presented information about each of the alternatives, and participants were asked to provide feedback and ask questions.

The Service did not use a public hearing format for public testimony, as the intent of the workshop format was to facilitate smaller group discussions during this phase of the project. Many participants liked this format, but others raised concerns in their written comments about not having an opportunity to provide scoping comments in a legal hearing format. The Service appreciates any feedback including criticism regarding the format used for meetings. A hearing format will be used for the meetings on the draft CCP and EIS. The Service has fully followed the requirements set forth in the National Environmental Policy Act in addition to departmental and bureau policies during the scoping process.

Other Meetings with Individuals and Groups

When asked, refuge staff provided briefings and status updates to stakeholder groups including the Conservation Districts, the Wilderness Society, World Wildlife Fund, Ranchers Stewardship Alliance, Montana Association of State Grazing Districts, Kalispell Sportsmen group, Gallatin Wildlife Association, and others.

The Service held several seminars during the development of the draft CCP and EIS to provide information about the Service's plans to use prescribed fire and grazing to meet the objectives of the draft CCP. These seminars included presentations by Dr. Sam Fuhlendorf and Dr. Cecil Frost, who assisted the Service in developing information for the analysis in the draft CCP and EIS. Many Federal, State, and local agencies, conservation organizations, and members of the public attended one or more of these sessions.

Other one-on-one discussions, briefings, and field trips occurred throughout the planning process. Service representatives engaged in many conversations with individuals that called or stopped by the refuge offices.

B.4 Comment Period

The Service accepted comments from early August 2008 through October 31, 2008, but also informed the public that comments were welcome throughout the development and writing of the Draft CCP and EIS until the formal comment period on the Draft CCP and EIS ended. The Service established an ending date for comments on the draft alternatives to use the information learned to fully develop each alternative with detailed objectives and strategies that would form the basis of the environmental analysis. The Service received one written request from the Six County Fort Peck Road Group, a group formed earlier by the six counties adjacent to the refuge, to extend the deadline for submitting comments on the draft alternatives. The Service denied the request and reiterated that comments were welcome past the October 31st deadline, but that the process needed to move forward, and sufficient time had been provided for review of the preliminary draft alternatives. The Service made all of its information available to the public in early August 2008, providing the public over 60 days to provide input. In addition, representatives of the cooperating agencies provided input into the alternatives concepts during several meetings held in April and June of 2008, and during the development of objectives and strategies in early 2009. Members of the Six County Fort Peck Road Group (a group made up of county commissioners to address roads) were also given an opportunity to participate in a meeting that specifically addressed roads in May 2009.

METHODS for COMMENT COLLECTION and ANALYSIS

The Service's primary objective in providing the public an early opportunity to review the alternatives was to gather additional input prior to writing the objectives and strategies and conducting the environmental analysis. All comments, questions, or issues, whether from written submissions or recorded at the public meetings were organized by topic into a spreadsheet and coded for organizational purposes. The planning team made every effort to document all issues, questions, and concerns. Regardless of whether comments and questions were general in nature or about specific points of concern, they were identified.

All comments were considered to be of equal importance. While the planning team valued the comments made in support or opposition to a specific alternative or issue, the team also was seeking feedback on the range of alternatives, whether there were other reasonable alternatives that should be included in the analysis, and whether any of the alternatives should be changed in some way.

NUMBER and SOURCE of COMMENTS RECEIVED

During the course of the comment period, the planning team received hundreds of questions and comments during the seven public meetings held across Montana and nearly 300 written responses in the form of letters, emails, and from the handout sheet provided at the public meetings. Twenty-six agencies and organizations submitted comments; the breakdown of type and number of comments follows:

Type of Comment	*Number of Comments*
Public meetings	hundreds
Form letters	123
Individuals letters, emails, questionnaires	134
Agency, organizations (included two legal letters)	27

There were two distinct form-type letters. While similar in content, one was generated from the Garfield County Conservation District and sent to livestock owners and published in at least some of the local papers. Nine people submitted a second form-type letter, and while the affiliation is not known, most came from the Glasgow area. The key issues identified in both form letters were: importance of livestock grazing and general opposition to prescriptive grazing, opposition to wildlife reintroduction, opposition to removal of interior fencing, support for more water development in upland areas and maintenance of current structures, desire for access for recreation, fire suppression, and livestock management, and the concern that Payment in Lieu of Tax payments are too low and don't represent fair market value, proposed wilderness units need to be reevaluated, wildlife needs to be kept on the refuge, the refuge needs to increase predator control, the refuge is the largest source of invasive plants, and fire suppression should be increased and prescribed fire should not be pursued.

An action alert by the Montana Wilderness Association generated many individual letters and emails. The key issues were: support for alternative D, support for reducing the 700-mile road network or limiting off-road travel, support for wilderness values particularly the proposed wilderness units, restricting livestock grazing where it is needed to maintain wildlife habitat and support for prescriptive grazing, removing obsolete fencing and letting wildlife move more freely, banning hot-season grazing in the river bottoms and limiting livestock grazing in riparian areas.

In addition, many other individuals and organizations voiced their concerns about other topics. Examples included concerns about boat access and types of boats, and hunting and general recreational access or the type of expertise the Service was using in the preparation of the CCP and EIS.

SUMMARY of COMMENTS

Commenters expressed highly varied opinions in support of or opposition to a range of topics including alternative preferences, habitat and wildlife management, prescriptive livestock grazing, wilderness, wildlife reintroductions, public access, roads, commercial recreation, interior fencing, water development, and prescribed fire. A detailed summary of the comments was posted on the project website and another planning update (Planning Update Issue 4) was mailed to the mailing list (FWS 2007a).

B.5 Changes to the Draft Alternatives

From a review of all of the comments, no new significant topics or issues were identified that had not been identified during scoping (refer to chapter 1). All of the action alternatives were clarified or refined in some way as a result of the comments. Suggestions for alternative approaches that were not carried forward in the analysis are discussed in chapter 3.

B.6 List of Entities Receiving the Draft CCP and EIS

The following Federal and State agencies, along with nonprofit organizations, grazing or outfitting permittees, or other businesses that were on the project mailing list received copies of the Draft CCP and EIS. All interested groups and the public on the project mailing list (800+ names) received a copy of Planning Update, Issue 5, which summarized the contents of the Draft CCP and EIS, announced the locations an times of the public hearings, and provided information on how to obtain a copy of the CCP and EIS, including downloading it from the project website.

FEDERAL ELECTED OFFICIALS

- U.S. House of Representatives, Montana Representative Dennis Rehberg
- U.S. Senate, Montana Senator Max Baucus
- U.S. Senate, Montana Senator Jon Tester

FEDERAL AGENCIES

- Army Corps of Engineers, Fort Peck
- Bureau of Land Management, Field Offices–Lewistown, Malta, Miles City; Montana State Office-Billings
- Department of Agriculture, Natural Resource Conservation Service, Bozeman, Montana; Forest Service, Rocky Mountain Research Station, Ogden, Utah
- Environmental Protection Agency, Helena, Montana
- Federal Highways Administration, Western Lands Office, Vancouver, Washington
- U.S. Fish and Wildlife Service—region 6 programs, Denver, Colorado, Invasive Strike Team–Great Falls, Ecological Services–Helena, Montana, region 9–Washington D.C.
- National Park Service, Lewis and Clark National Trail, Omaha, Nebraska, regional office–Denver, Colorado

TRIBES and TRIBAL ORGANIZATIONS

- Arapaho Business Council
- Assiniboine and Gros Ventre Tribes (Fort Belknap)
- Assiniboine and Sioux Tribes (Fort Peck)
- Chippewa Cree Tribe
- Northern Cheyenne Tribe
- Crow Tribe

MONTANA ELECTED OFFICIALS

- Governor Brian Schweitzer
- Representative Ed Butcher
- Representative Dave Kastin
- Representative Wayne Stahl
- Senator Jim Peterson
- Senator John Brenden
- Senator Johnathan Windy Boy

MONTANA STATE AGENCIES

- Department of Fish, Wildlife, and Parks, director–Helena, Montana, region 4–Great Falls, Lewistown Area Resource Office, region 6–Glasgow, region 7–Miles City, State Wildlife Grants–Great Falls
- Department of Natural Resources, director–Helena, Montana, Lewistown, Miles City,
- Department of Transportation, Lewistown
- Montana Historical Society and Preservation Office
- Natural Heritage Program, Helena

COUNTY and LOCAL GOVERNMENTS and AGENCIES

- Fergus County Commissioners
- Garfield County Commissioners
- McCone County Commissioners
- Petroleum County Commissioners
- Phillip County Commissioners
- Valley County Commissioners
- Missouri River Council of Conservation Districts–Great Falls; Fergus County Conservation District, Garfield County Conservation District, McCone County Conservation Districts, Petroleum County Conservation District, Phillips County Conservation District, Valley County Conservation District

ORGANIZATIONS and EDUCATIONAL INSTITUTIONS

- American Bird Conservancy, The Plains, Virginia
- American Prairie Foundation, Bozeman, Montana
- National Audubon Society–New York, Washington D.C.; Montana Audubon–Helena, Montana; Upper Missouri Breaks Audubon–Great Falls, Yellowstone Valley Audubon–Bozeman, Montana
- Defenders of Wildlife, Bozeman, Montana, Missoula, Montana, Washington D.C.
- Denver Museum of Nature and Science, Curator of Vertebrate Paleontology, Denver, Colorado
- Department of Natural Resource Ecology and Management, Iowa State University, Iowa

- Ducks Unlimited, Memphis, Tennessee
- Environmental Defense Center for Conservation Incentives, Boulder, Colorado
- Fort Peck Lake Association, Fort Peck, Montana
- Foundation for North American Wild Sheep, Cody, Wyoming
- Friends of the Missouri River Breaks, Lewistown, Montana
- Gallatin Wildlife Association, Bozeman, Montana
- Hellgate Hunters and Anglers, Missoula, Montana
- Izaak Conservation League, Gaithersburg, Maryland
- Maryland Ornithological Society, Ellicott City, Maryland
- Missouri River County, Wolf Point, Montana
- Montana Farm Bureau, Bozeman, Montana
- Montana Mountain Bike Alliance, Bozeman, Montana
- Montana Petroleum Association, Helena, Montana
- Montana Trail Vehicle Riders Association, Great Falls, Montana
- Montana Trappers Association, Winnett, Montana
- Montana Wildlife Federation, Helena, Montana
- Montana Wilderness Association, Great Falls, Helena, Montana
- Montana Wildlands Association, Central and Eastern Association, Lewistown and Billings, Montana
- Mule Deer Foundation, Eastern, Bismarck, North Dakota
- Museum of the Rockies, Montana State University, Bozeman, Montana
- National Trappers Association, New Martinsville, West Virginia
- National Wildlife Federation, Reston, Virginia, Northern Rockies Project Office–Missoula, Montana
- National Wildlife Refuge Association, Washington D.C.
- Nature Conservancy, Matador Ranch, Dodson, Montana
- Our Montana, Inc., Billings, Montana
- Ranchers Stewardship Alliance, Malta, Montana
- Sierra Club, San Francisco, California
- The Wilderness Society, Bozeman, Washington D.C.
- University of Montana, Missoula, Montana
- U.S. Humane Society, Washington D.C.
- Walleyes Unlimited of Montana, Big Sandy, Montana; Crooked Creek Chapter, Malta, Montana
- Western Watersheds Project, Inc., Mendon, Utah
- Wild Sheep Foundation, Montana Chapter
- Wildlife Conservation Society, Bozeman Montana
- World Wildlife Fund, Bozeman, Montana
- Yellowstone Buffalo Foundation, Bozeman, Montana

PUBLIC LIBRARIES

- Colorado State University, Morgan Library, Fort Collins, Colorado
- Garfield County Library, Jordan Montana
- Glasgow Library, Glasgow, Montana
- Great Falls Public Library, Great Falls, Montana
- Lewistown Public Library, Lewistown, Montana
- McCone County Library, Circle, Montana
- Montana State University Libraries—Billings, Bozeman, Havre, Montana
- Phillips County Library, Malta, Montana
- Petroleum County Library, Winnett, Montana
- U.S. Fish and Wildlife Service, National Conservation Training Center Library, Shepherdstown, West Virginia

Appendix C

Draft Compatibility Determinations

C.1 Uses

- Recreational hunting
- Recreational fishing
- Wildlife observation, photography, environmental education, and interpretation
- Camping
- Geocaching
- Guided hunting (outfitting)
- All-terrain vehicle and snowmobile use
- Prescriptive grazing
- Research

C.2 Refuge Names

- Charles M. Russell National Wildlife Refuge
- UL Bend National Wildlife Refuge

C.3 Establishing and Acquisition Authorities

The following laws and executive order established the refuges and authorized acquisition of refuge lands.

CHARLES M. RUSSELL NATIONAL WILDLIFE REFUGE

- Executive Order 7509, dated December 11, 1936
- Refuge Recreation Act
- Bankhead-Jones Farm Tenant Act
- Migratory Bird Conservation Act of 1929

UL BEND NATIONAL WILDLIFE REFUGE

- Fish and Wildlife Coordination Act
- Migratory Bird Conservation Act
- Fish and Wildlife Act 1956
- Refuge Administration Act
- Wilderness Act Legislation

C.4 Refuge Purposes

Each refuge was established for specific purposes, as described below.

CHARLES M. RUSSELL NATIONAL WILDLIFE REFUGE

- "For the conservation and development of natural wildlife resources and for the protection and improvement of public grazing lands and natural forage resources: Provided, That nothing herein contained shall restrict prospecting, locating, developing, mining, entering, leasing, or patenting the mineral resources of the lands under the applicable laws: … Provided, however, That the natural forage resources therein shall be first utilized for the purpose of sustaining in a healthy condition a maximum of four hundred thousand (400,000) sharptail grouse, and one thousand five hundred (1,500) antelope, the primary species, and such nonpredatory secondary species in such numbers as may be necessary to maintain a balanced wildlife population, but in no case shall the consumption of forage by the combined population of the wildlife species be allowed to increase the burden of the range dedicated to the primary species: Provided further, That all the forage resources within this range or preserve shall be available, except as herein provided with respect to wildlife, for domestic livestock." (Executive Order 7509, dated December 11, 1936)
- "Shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon." (16 U.S.C. 664, Fish and Wildlife Coordination Act)
- "Suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species" (16 U.S.C. 460k-1), " the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors." (16 U.S.C. 460k-2,Refuge Recreation Act [16 U.S.C. 460k–460k-4], as amended)

- "Purposes of a land-conservation and land-utilization program." (7 U.S.C. 1011, Bankhead-Jones Farm Tenant Act)
- "Particular value in carrying out the national migratory bird management program." (16 U.S.C. 667b, An Act Authorizing the Transfer of Certain Real Property for Wildlife)
- "Conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans." (16 U.S.C. 668dd [a] [2], National Wildlife Refuge System Administration Act)
- "For use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d, Migratory Bird Conservation Act)

UL BEND NATIONAL WILDLIFE REFUGE

- "For use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d, Migratory Bird Conservation Act), "reserved for the UL Bend National Wildlife Refuge" (Public Land Order 4588, dated March 25, 1969), "for the protection of lands for migratory waterfowl management." (Public Land Order 4826, dated May 15, 1970)
- "Shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon." (16 U.S.C. § 664, Fish and Wildlife Coordination Act)
- "Particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b, An Act Authorizing the Transfer of Certain Real Property for Wildlife)
- "For the development, advancement, management, conservation, and protection of fish and wildlife resources." (16 U.S.C. § 742f [a] [4])
- "For the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude." (16 U.S.C. § 742f [b] [1], Fish and Wildlife Act of 1956)
- "Conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans." (16 U.S.C. § 668dd [a] [2], National Wildlife Refuge System Administration Act)
- "To secure for the American people of present and future generations the benefits of an enduring resource of wilderness … wilderness areas ... shall be administered for the use and enjoyment of the American people in such manner as would leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness." (16 U.S.C. 1131, Wilderness Act)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

C.5 Description of Use:

Recreational Hunting

The Charles M. Russell National Wildlife Refuge recreational hunting program allows for the take of elk, pronghorn, white-tail and mule deer, waterfowl (ducks and geese), upland game birds (turkey, ring-necked pheasant, mourning dove, sage-grouse, sharp-tailed grouse, Hungarian partridge) and coyotes. Season dates, limits, and harvest methods are generally consistent with State regulations, with the exception of mule deer and coyotes. Both have refuge-specific restrictions at the time of publishing. Specific regulations are available to the public at our website at www.fws.gov/cmr or any office of the refuge (Lewistown, Sand Creek, Jordan, and Fort Peck).

In 2009, there was an estimated 103,000 hunter visits on the refuge, which is about 41 percent of the annual visitation for the refuge (annual visitation is about 250,350). The refuge is one of the most notable areas in the State of Montana for big game hunting. The refuge staff observes a small number of waterfowl and upland bird hunters each year. Recreational hunting is one of the six wildlife-dependent recreational uses on the refuge. The use of hunting is a tool used by the refuge system to control wildlife populations to maintain biological diversity and mimic natural processes that are missing or diminished.

Hunting takes place refugewide with the exception of administrative areas, closed areas (Slippery Ann Elk View Area), and recreational areas. Dual collateral refuge officers and currently one full-time refuge officer monitor hunters and their take. Especially during the big game rifle season when use on the refuge reaches its peak, refuge officers work in coordination with other Federal officers and State game wardens to ensure the use of safe and legal hunting practices.

AVAILABILITY of RESOURCES

Adequate resources are available to manage the existing hunting program at the current level of participation. The current road system provides access forhunters onto the refuge for hunting. Most refuge roads become impassible with only a minimal amount of precipitation. During the hunting season, this may cause clustering of hunters in localized, accessible areas of the refuge.

Increased use of the river as a motorway for access has provided many the opportunity for solitude and a primitive and unconfined hunt. This allows for access to resources that cannot be attained via the road system or easily on foot. Several wilderness units are only accessible on foot or via the Missouri River.

Aerial big game surveys are used during the year to establish counts and population statistics on elk, mule deer, white-tailed deer, and pronghorn. These monitoring survey's assist in the overall health of the populations, which could be used to establish limits or expand the hunting program. To assist in enforcement on the refuge all four of the dual-function officers participate in a weekend rotation conducting law enforcement duties. The refuge currently has only one full-time officer. Additional needs are addressed in the comprehensive conservation plan (CCP).

A refuge hunting regulation brochure is available to inform the public of hunting opportunities, refuge regulations, and safety precautions. Maps are also available which show the location of roads, recreation areas, and those areas closed to hunting.

ANTICIPATED IMPACTS of the USE

Temporary disturbance would exist to wildlife near the activity. Animals surplus to populations would be removed by hunting. A temporary decrease in populations of wildlife might help ensure that carrying capacity (especially for big game species) is not exceeded. Closed areas would provide some sanctuary for game and nongame species, minimize conflicts between hunters and other visitors, and provide a safety zone around communities and administrative areas. The harvest of these species would be compensatory mortality, with minimal impact to the overall health of their populations.

Temporary impacts to the habitat are expected due to the use of camping grounds, tree stands, and possible illegal off road travel. To mitigate the possible impacts, the refuge has established camping areas providing parking and vault toilets. We also enforce a pack-in, pack-out policy encouraging folks to remove their trash.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Recreational public hunting and those commercial outfitters retaining special use permits are compatible.

Stipulations necessary to ensure compatibility. To en-sure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, recreational hunting can occur on the refuge if the following stipulations are met:

1. Hunting is prohibited in all administrative sites, closed areas, and recreational areas.
2. Target shooting with firearms is prohibited at all times on the refuge.
3. Collection of antlers, artifacts, and fossils is prohibited.
4. All boats, trailers, and ATVs must be properly licensed from the State of origin. In addition, all ATVs must be street legal, which requires brake lights and rear mirror in addition to licensing.
5. All vehicles, including ATVs are only allowed on open, numbered roads.
6. Nonmotorized game carriers are allowed on the refuge except on the UL Bend Wilderness.
7. The use of firewood is allowed for those dead and downed trees. No live cutting is permitted.

Justification. Recreational public hunting is a historical wildlife-dependent use of the refuge complex, and is designated as one of the priority public uses as specified in the Refuge Improvement Act of 1997. Infrastructure is already in place to support hunting programs, and current personnel levels and funding are adequate. Special regulations are in place to minimize negative impacts to the refuges and associated wildlife. Montana State law further controls hunter activities. Hunting is a legitimate wildlife management tool that can be used to control wildlife populations. Hunting harvests a small percentage of the renewable resources, which is in accordance with wildlife management objectives and principals.

Mandatory 15-year reevaluation date: (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.6 Description of Use:

Recreational Fishing

The refuge allows public recreational fishing in accordance with the State fishing regulations and seasons,

and in coordination with refuge and United States Army Corp of Engineers regulations. The uses covered in the determination would be fishing on refuge reservoirs, fishing on the Missouri River, fishing on the Fort Peck Lake as well as the use of such areas as boat ramps, parking areas, fishing areas, and the use of other structures maintained to facilitate the refuge's fishing program.

During the months that ice fishing is available, ice houses are permitted on the Fort Peck Reservoir December 1 to March 31. The owner's name and address must be attached to the outside wall of the structure.

In 2009, the refuge had more than 60,000 visitors for recreational fishing. Lake trout, salmon, bass and upriver paddle fish are some of the more popular species sought after. Recreation fishing is allowed throughout the year, however access is variable based on road conditions. Licensed vehicles and licensed all terrain vehicles are allowed on refuge numbered routes and the ice surface of Fort Peck Lake. Snowmobiles are only allowed to travel on the surface of Fort Peck Lake. Travel off Fort Peck Lake and numbered routes is not allowed with any vehicle (i.e., travel along the shoreline).

AVAILABILITY of RESOURCES

Anglers use the existing network of roads to access the river, lake, and various reservoirs of the refuge for fishing. There are twelve locations for launching boats; however, with the water level fluctuation of the Fort Peck Reservoir some boat ramps may be inaccessible to the water. The refuge complex has adequate administrative and management staff to maintain its fishing program.

Annual funding is needed for seasonal workforce salary and for supplies to maintain fishing facilities (including mowing, painting, and repairing facilities, litter pickup, restroom cleaning supplies, and periodic pumping costs of vaulted toilets). Funding is needed for law enforcement staff salaries, fuel costs, repairs, and maintenance of patrol vehicles, and associated costs to support the law enforcement program. Routine law enforcement patrols occur year-round. The refuge is currently hiring an additional law enforcement officer at the Fort Peck Field Station and a portion of their duties would be to patrol recreational fishing on the refuge.

ANTICIPATED IMPACTS of the USE

The anticipated impacts of recreational fishing are considered minimal. Recreational fishing is one of the six wildlife-dependent priority public uses identified by Service policy. These uses are encouraged when compatible with refuge purposes. The disturbance is expected to be limited in scope and duration. All motor vehicle use is restricted to numbered routes and parking areas, which reduces disturbance to wildlife. The vast size of the nearly 250,000-acre Fort Peck Reservoir allows for a large number of anglers and an opportunity for solitude.

The CCP's proposed action (alternative D) recommends establishing clear access for ice fishing. This recommendation could assist in diverting potential violators from disturbing shoreline and upland habitat to access the ice for fishing. Anglers occasionally violate regulations; however, these incidents usually have only minor impacts to fish populations or refuge resources.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Recreational public fishing is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, recreational fishing can occur on the refuge if the following stipulations are met:

1. This use must be conducted in accordance with State and Federal regulations, and applicable special refuge regulations published.
2. Travel is only permitted on numbered routes with licensed motor vehicles.
3. Travel is permitted on the surface of Fort Peck Reservoir with licensed motor vehicles and snowmobiles.
4. Shoreline travel is not permitted on the refuge.

Justification. Recreational fishing is a historical wildlife-dependent use at Charles M. Russell National Wildlife Refuge and is one of the priority public uses as specified in the Refuge Improvement Act of 1997. Infrastructure is already in place to facilitate this activity. Current personnel levels and funding resources are adequate. Special refuge regulations are in place to minimize negative impacts to refuge habitat and wildlife.

Mandatory 15-year reevaluation date: (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.7 Description of Use: Wildlife Observation, Photography, Environmental Education, and Interpretation

Currently, public use on the refuge accounts for nearly 87,100 visitors. This includes participants in wildlife observation, wildlife photography, environmental education, interpretation and other recreational participants. These activities may take place on foot, bicycle, automobile, motorized boat, canoe, horse, cross-county skis and snowshoes. The refuge complex is open from dawn to dusk, and entry into closed areas is allowed through a special use permit and special conditions that are evaluated on a case-by-case basis.

With four of the above accounted uses being one of the six priority public uses of the Refuge System, these uses are to be encouraged when found to be compatible with the refuge purpose.

Refuge staff would assist in activities when available. Organized groups, such as schools, scouts, and 4-H organizations, may have instructors or leaders who would use refuge habitat and facilities to conduct compatible programs. Ages of participants range from preschool to college and beyond.

AVAILABILITY of RESOURCES

The refuge provides outstanding opportunities for the above uses due to the abundance of deer, elk, eagles, prairie dogs, and other unique species that people find interesting. The opportunity for solitude and premier landscape views are numerous across the entire refuge.

The CCP's proposed action (alternative D) recommends expanding interpretation and environmental education, and maintaining wildlife observation programs and facilities. The interpretation and environmental education programs would emphasize the principles of natural plant and animal communities and ecological processes and restoration.

Implementing improvements or expanding public use opportunities would be addressed in future step-down management plans and through future funding requests. Program expansion would require increased funding for operations and maintenance. When funding is not adequate to operate and maintain programs, they would be reduced in scope or discontinued. Information kiosks, interpretive signs, and other infrastructure are in place for the present level of public use activities.

ANTICIPATED IMPACTS of the USE

The disturbance of wildlife is considered a minimal impact of public use. The disturbance is considered temporary and local, such as running off feeding deer and elk or the flushing of upland bird species. The benefits of educating the public and providing for a quality outdoor recreational experience are considered to outweigh the potential impacts of disturbing wildlife and the associated habitat.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Wildlife observation, photography, environmental education, and interpretation is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, wildlife observation, photography, environmental education, and interpretation can occur on the refuge if the following stipulations are met:

1. Managers would monitor use patterns and densities and make adjustments in timing, location, and duration as needed to limit disturbance.
2. Use would be directed to public use facilities (both existing and in the future) or those areas appropriate for the use, which would not be within sensitive areas.
3. Observation areas would continue to provide wildlife information and safe areas for the public to pull the main roadway for view and photography.

Justification. Public use for wildlife observation, photography, environmental education, and interpretation is a historical wildlife-dependent use of the refuge. These activities are designated as priority public uses as specified in the Refuge Improvement Act of 1997. Special regulations are in place to minimize negative impacts to the refuges and associated wildlife. The proposed action (alternative D) for the refuge CCP would support the addition of two outdoor recreation specialists to assist in the area of public use. Disturbance to wildlife is limited by the size and remote nature of large parts of the refuge. Disturbance is also generally short-term and only temporarily displaces wildlife and the adjacent wildlife habitat.

Mandatory 15-year reevaluation date: (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.8 Description of Use: Camping

Camping is defined as erecting a tent or shelter, preparing a sleeping bag or other bedding material for use, parking of a motor vehicle or camper trailer fit for occupancy. The use of camping on the refuge is not considered one of the wildlife-dependent uses established in the National Wildlife Refuge System Improvement Act of 1997, but it facilitates the use of all six uses considered wildlife-dependent. Due to the remote location of the refuge, it is necessary for the health and safety of those who are recreating on the refuge to be allowed to establish a location to camp. This use is being proposed due to the remote location of the refuge and as a necessary convenience when taking into consideration the health and safety of the recreationists using the refuge.

The refuge currently has 21 established camping areas. While camping is allowed refugewide, these areas contain facilities that are not available everywhere. Driving off-road to establish a campsite is only allowed within 100 yards of a numbered route. Driving off-road for all other purposes is prohibited. Camping is allowed to occur at all times on the refuge. Most of the camping occurs during open hunting seasons in August through most of November. Most camping takes place within 100 yards of a numbered route and ranges in facilities such as a tent of natural or synthetic material or a camper trailer with minimal modern conveniences.

AVAILABILITY of RESOURCES

Resources involved in the administration and management of the use: Resources involved in the use of camping on the refuge would include law enforcement officers to ensure compliance with refuge regulations, maintenance of facilities available for recreationists and camping, and funding to produce refuge brochures explaining refuge regulations and mapping locations.

Maintenance costs, special equipment, facilities, or improvements necessary to support the use: Maintenance of current vault toilets and hardened campsites is minimal and although funding is not optimum, personnel is available to allow this use at current levels.

Offsetting revenues: The refuge does not currently charge a fee or require a permit for camping.

ANTICIPATED IMPACTS of the USE

Short-term impacts: There would be localized disturbance of vegetation in the area where camping facilities are set-up. Other uses such as setting up a campfire and general use of the area around the campsite would have an impact on the vegetation and cause a disturbance to wildlife in the area. Due to the refuge limit of camping for a maximum of 14 days within any 30-day period, these impacts are short term and expected to recover back to a natural state with little to no restoration conducted by refuge staff.

Long-term impacts: Due to the high number of campers during the hunting season, certain locations on the refuge receive a higher concentration of users. These areas have consistent use and require longer to recover back to a natural state. In these areas not only is the refuge vegetation and wildlife heavily impacted, but refuge regulation violations can be high as well. During fishing and hunting season, it is more common to find violations due to dogs off leash, intoxication, illegal drugs, illegal firearm use, human waste, littering, disturbances to other users, and noise violations. This increase in refuge violations has become a recurring expense on the refuge law enforcement.

Cumulative impacts: While certain times of year and locations receive a greater number of users and a higher potential for long-term impacts, the use of camping on the refuge is deemed to have a greater benefit to the public by supporting wildlife-dependent uses on the refuge.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Camping is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, camping can occur on the refuge if the following stipulations are met:

1. Except where designated as closed, camping (other than backpacking) must take place within 100 yards of the waters of the Missouri River and Fort Peck Reservoir or within 100 yards of refuge numbered roads that are designated as open.
2. All camping is limited to 14 days within any 30-day period. Any property, including camping equipment, boats, trailers, and other personal property left unattended for a period in excess of 72 hours is subject to removal.
3. Use of dead and downed wood for campfires is allowed on the refuge. Removal of live limbs and trees is prohibited.
4. Actively promote the pack-in/pack-out policy for trash removal and campsite restoration.

5. Continue to enforce public use regulations protecting the habitat and limiting the disturbance to other refuge visitors.

Justification. Currently, all six of the wildlife-dependent uses are used on the refuge. Due to the remote location of the refuge, lodging establishments are nonexistent. For the health and safety of those who are utilizing the resources of the refuge and taking part in recreational activities, camping is necessary. The time at which camping on the refuge is at its peak is not considered to be a critical period for wildlife on the refuge. In the fall during hunting season, all wildlife has produced young of the year and migratory bird species have completed nesting. The size of the refuge and difficulty of public access to certain locations provides alternative areas for disturbed wildlife.

While regulation violations and disturbance to other visitors can locally be a problem, with the cooperation of State and local law enforcement the workload is minimized. Due to the primitive nature of camping sites throughout the refuge and the existence of very few facilities, maintenance needs are minimal.

Given the above, camping does not materially interfere with the purposes of the refuge or the mission of the Refuge System.

Mandatory 15-year reevaluation date: (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.9 Description of Use: Geocaching

Traditional geocaching (the burying, placement or removal of a physical cache) is generally not an appropriate use for national wildlife refuges in accordance with Service and Department of the Interior regulations and policies. However, other forms of geocaching have emerged that do not require burying, placing, or removing objects. Some of the most current types are Virtual Geocaching, Letterboxing, Earthcaching, Trail Link, and GPS Adventures. Geocaching is not a priority public use; however, certain types of geocaching may offer benefits to support our educational and interpretive programs and to learn more about our visitors.

The use of geocaching would be allowed refugewide with the exception of closed areas. Those participating in geocaching would be responsible for following all rules and regulations required of all refuge users. Geocaching would be allowed year round with the understanding that access to the refuge during the winter months is highly variable and most likely very limited. Refuge roads are often impassible due to the drifting of snow, and most roads are not maintained in the winter season. The refuge would evaluate the type of geocaching requested and how it benefits environmental education and interpretation. In accordance with refuge policy, refuge users are prohibited from disturbing archaeological resources, removing refuge resources such as plants, artifacts, and sheds, and abandoning property.

Geocaching has become a rapidly growing outdoor recreational activity. While traditional geocaching, which consists of burying or placing of a physical cache, would cause damage to the wildlife habitat, other forms of geocaching facilitates environmental education and interpretation, which are both wildlife-dependent priority public uses. By allowing geocaching to take place on the refuge, we are providing the opportunity for those who take part in the recreational activity to view wildlife and wildlife habitat.

AVAILABILITY of RESOURCES

Resources involved in the administration and management of the use: The issuance of special use permits to those wanting to participate in geocaching on the refuge would be an additional administrative resource involved. The level of need for special use permits for geocaching is not known at this time. Depending on the number of user groups, it may be that the current level of refuge resources is sufficient, or it may show that there is a greater than anticipated interest and additional resources are necessary.

Special equipment, facilities, or improvements necessary to support the use: The refuge is not responsible for providing any additional equipment necessary to conduct this recreational use. The current refuge facilities that support refuge visitors are considered sufficient for the expected number of users.

Maintenance costs: The maintenance of general recreational facilities is not expected to significantly increase due to the use of geocaching on the refuge.

Monitoring costs: The increase in unfamiliar monitoring techniques using websites and additional monitoring methods with the frequently changing technological activities would require additional administrative resources. Websites that track geocaches and allow for a central location for users to communicate can also be used if there is an unapproved cache or abuse of the use on the refuge by disabling the proposed activity from its web pages and alerting its users of the inappropriate use.

Offsetting revenues: None.

ANTICIPATED IMPACTS of the USE

Short-term impacts: The disturbance of wildlife, trampling of vegetation, and potential littering are all considered to be a minimal impact of public use. The prohibited practice of removing or leaving a cache on the

refuge would be considered to negatively impact the refuge resources, but by monitoring the use and communicating the rules and regulations, the benefits of educating the public and providing for a quality outdoor recreational experience are considered to outweigh the potential impacts.

Long-term impacts: There are no long-term impacts foreseen with the use of geocaching. By complying with refuge rules and regulations for this use, the long-term impacts are considered minimal to nonexistent.

Cumulative impacts: The potential short-term and long-term impacts are considered to be minimal the use of geocaching on the refuge is considered to have a positive impact by facilitating environmental education, interpretation, and wildlife observation.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Geocaching is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, geocaching can occur on the refuge if the following stipulations are met:

1. All refuge recreationists are responsible for knowing and following all refuge regulations.
2. The removal of refuge resources is prohibited. That includes, but is not limited to: the illegal take of wildlife, vegetation, archeological resources, antler sheds, and geological resources.
3. The burial of caches on the refuge is prohibited.
4. The abandonment or leaving of a cache on the refuge is prohibited.
5. Caches that deface public or private property, whether a natural or constructed object, to provide a hiding place, a clue or a logging method are prohibited.

Justification. The use of geocaching on the refuge is determined to be compatible with the refuge purpose and the mission of the Service. It allows an opportunity for the public to take part in wildlife observation, wildlife photography, environmental education, and interpretation, which are all considered priority public uses. With recreationists adhering to refuge regulations, it would minimize the impacts to the wildlife and wildlife habitat. By allowing the use of this rapidly growing activity, the refuge is providing the opportunity for the American public, not currently aware of the Refuge System's conservation mission, to be environmentally educated and involved in conservation.

Mandatory 15-year Reevaluation Date. (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.10 Description of Use: Guided Hunting (Outfitting)

The refuge would authorize commercial hunting guide operations within the refuge, and regulate such use through the implementation of a hunting guide program and issuance of special use permits with conditions. This activity provides recreational opportunity for hunters who desire a successful, quality experience, but who may lack the necessary equipment, skills, or knowledge to hunt within the expansive Missouri River, Missouri River Breaks, and the rugged country the refuge encompasses. While guided hunts are not specifically identified as a priority public use, hunting is a priority public use.

Guided hunting operates under the same regulations as the public hunting. The use is allowed refuge-wide with the exception of closed areas, recreational areas, and administrative sites. There are currently 11 special use permits issued to outfitters on the refuge to conduct guided hunts. These 11 are spread throughout the entire refuge. Guided hunts are under the same Federal and State regulations and must adhere to the same limits, season dates, and wildlife-specific regulations. All guided hunts take place during the big game hunting seasons starting with bow season in late August through the general rifle season in November.

The refuge has consistently issued special use permits and established special conditions in addition to the Service's general conditions for special use permits. Refuge law enforcement would be responsible for regulating the use and any compliance issues that arise. Each outfitter would receive an outfitter identification card for operations on the refuge. The permits are valid only within the Charles M. Russell National Wildlife Refuge and UL Bend National Wildlife Refuge executive order boundaries. Including Service lands and United States Army Corps of Engineers (USACE) lands. All refuge outfitters must keep a log of use, and when requested by a refuge officer, State warden, or special agent, shall provide for inspection, current outfitter records as specified by 8.39.703 (Outfitters Records) of Chapter 39–Montana Administrative Rules.

Based on the existing client demand for guide services, a significant number of the hunting public is

willing to pay for the expertise and local knowledge provided by guides. To increase the chance of the public having a successful and quality hunting experience, the use of guides is a necessary approach due to the remote location and vast area of land.

AVAILABILITY of RESOURCES

Resources involved in the administration and management of the use: The use of refuge law enforcement in cooperation with other Federal, State, and local officers during the hunting season is no greater due to guided hunts than with the public hunters. The issuance of special use permits takes time and effort of refuge staff with costs for printing the permits, issuing ID cards, and retaining records. The current staff is capable of issuing permits and managing the guided hunting program on the refuge.

Special equipment, facilities, or improvements necessary to support the use: The current equipment and facilities are adequate to meet the needs of the guided hunting program and the current participation levels.

Maintenance costs: As with the public hunting program, maintenance of vault toilets and camping facilities is necessary during peak recreation times of the year. Starting in August with big game bow hunting through the end of the big game rifle season in November, maintenance of recreation areas, vault toilets, camping areas, and general use of the refuge is necessary.

Monitoring costs: The cost of law enforcement, both full-time, dual collateral, other Federal, State, and local officers, is at its highest during the fall hunting season. The addition of a full-time refuge officer on the east end of the refuge would assist in the heavy burden during this time of year. All other needs are addressed in the comprehensive conservation plan.

Offsetting revenues: The current fee for an outfitting permit on the refuge is $250.00. This fee is retained by the refuge to use as discretionary funding whether to provide overtime for employees or to maintain and enhance current refuge facilities.

ANTICIPATED IMPACTS of the USE

Short-term impacts: It is anticipated that the disturbance of guided hunting would not be measurably greater than the disturbance from the general hunting public.

Temporary disturbance would exist to wildlife near the activity. Animals surplus to populations would be removed by hunting. A temporary decrease in populations of wildlife might help ensure that carrying capacity (especially for big game species) is not exceeded. Closed areas would provide some sanctuary for game and nongame species, minimize conflicts between hunters and other visitors, and provide a safety zone around communities and administrative areas. The harvest of these species would be compensatory mortality, with minimal impact to the overall health of their populations.

Temporary impacts to the habitat are expected due to the use of camping grounds, tree stands, and possible illegal off road travel. To mitigate the possible impacts, the refuge has established camping areas providing parking and vault toilets. We also enforce a pack-in, pack-out policy encouraging folks to remove their trash.

Long-term impacts: The primary concern regarding commercial guided hunting activities is the potential for conflict between guided activities and other refuge users, particularly unguided hunters. Based on experiences on this refuge and on other national wildlife refuges, commercial guiding operations can increase user conflicts. An important part of this issue is public perception that hunting guides and clients have an advantage of equipment and technique and are taking game that would otherwise be available to regular hunters. Guides, since they are running a business, may also be viewed as more aggressive compared to unguided hunters. The State and refuge regulations should assist in easing the tensions between guided hunters and the public hunters. However, this conflict between hunters could be considered a potential long-term impact.

Cumulative impacts: Guide operations may increase use of some refuge facilities such as boat ramps, campsites, and other facilities frequented by general user groups. With the dispersal of outfitters throughout the entire refuge from one end to the other, this increase would not be significant compared to the overall use.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Guided hunting (outfitting) is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, guided hunting (outfitting) can occur on the refuge if the following stipulations are met:

1. Regulations that apply to recreational users would apply. See refuge guide map and information (revised 2004).

2. Outfitters and their licensed guides must have in their possession an outfitter ID card for the Charles M. Russell refuge while operating on the refuge.
3. Charles M. Russell refuge outfitter permits are valid only on lands administered by the Service within the boundary of the Charles M. Russell and UL Bend refuges (including USACE lands within the refuge).
4. Charles M. Russell refuge outfitter permits do not give exclusive use of any area.
5. All violations of refuge regulations, special conditions of an outfitter permit, MFWP statutes, or Board of Outfitters Rules by a Charles M. Russell refuge outfitter, licensed guide, client, or a violation occurring in the presence of an outfitter or guide must be reported to the appropriate official immediately. Failure to report violations would be grounds for cancellation of the permit.
6. Permitted outfitters may not use licensed outfitters as guides.
7. Outfitters must meet State of Montana minimum insurance requirements. In addition, the policy shall (1) name the United States Government as co-insured, (2) specify that the insurance company shall have no right of subrogation against the United States of America, and (3) the permittee shall indemnify the United States. A current certificate of insurance must be provided to the refuge's Lewistown office.
8. All refuge outfitters on request of a refuge officer, State warden or special agent, shall provide for inspection, current outfitter records as specified by 8.39.703 (Outfitters Records) of Chapter 39–Montana Administrative Rules.
9. Refuge outfitters are not allowed to use aircraft for locating game on the refuge.
10. Outfitter logs, along with hunter use days are required to be turned into Charles M. Russell National Wildlife Refuge, P.O. Box 110, Lewistown, Montana 59457, by December 31 of each year. Failure to submit logs would be grounds for cancellation of the following year's permit.
11. Violation of any permit special conditions may be grounds for cancellation.
12. Outfitters who wish to retain their refuge permit and remain inactive with the State of Montana license requirements, must pay the $250 permit fee. Outfitters would be allowed to renew their permit with the Charles M. Russell refuge for 2 years while remaining inactive with the State. If at the beginning of a third year, an outfitter is still inactive with the State, he or she would not be offered an opportunity to renew with the refuge.

Justification. With the current regulations specific to guided hunting, and the spatial distribution of the outfitters, allowing guided hunting on the refuge would not materially interfere with or detract from the purposes of the refuge or the mission of the Refuge System. By allowing guided hunts on the refuge, it would provide an opportunity for those hunters looking to have a quality hunting experience and a greater chance of a successful hunt by using the knowledge, skills and abilities of those with local experience and the necessary equipment.

Mandatory 15-year reevaluation date. (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.11 Description of Use:

All-terrain Vehicles and Snowmobiles

This applies to the proposed use and the restriction of use on the refuge uplands, Fort Peck Lake, and the Missouri River. Snowmobile use occurs during the winter season and is only allowed across the Fort Peck Lake. It is prohibited along the Missouri River and across the refuge uplands including all roads. All-terrain vehicle (ATV) use occurs year-round and is allowed over the Fort Peck Lake during the winter season and on refuge numbered roads. ATV use is prohibited off road on the refuge uplands and along the Missouri River. Neither use is deemed a priority public use according to the National Wildlife Refuge System Administration Act of 1997.

As the table below depicts, ATV use would be allowed on refuge numbered routes and the Fort Peck Lake. Snowmobile access is only allowed over the Fort Peck Lake. Neither use is allowed along the Missouri River nor can either use take place off road over the refuge uplands.

Vehicle Type	*Fort Peck Lake*	*Missouri River*	*Refuge Roads*
Snowmobile	Allowed	Prohibited	Prohibited
ATV	Allowed	Prohibited	Allowed

Use locations that are both allowed and/or prohibited by the use of snowmobiles and ATVs.

ATV use occurs year-round on refuge numbered routes and during the winter months over the Fort Peck Lake. Snowmobile use is only allowed over the Fort Peck Lake during the winter season when ice and snow are present. ATVs are required to use refuge roads, the Fort Peck Lake ice during winter months, and all must be street legal. Montana residents must have a metal license plate and all operators must possess the proper driver's license.

Nonresident operators who wish to operate their ATV on the refuge should contact the refuge office regarding proper licensing requirements. Snowmobiles and their operators need to comply with State licensing requirements.

Due to the remote area in and around the refuge, the use of smaller and more navigable motorized vehicles is necessary to access or disperse access for wildlife dependent recreation. Snowmobiles and ATVs are both used to access the large Fort Peck Lake for ice fishing opportunities away from the main access points. ATVs on the refuge are used during hunting season and general access year-round.

AVAILABILITY of RESOURCES

Resources involved in the administration and management of the use: The main cost of these uses is going to be the time and effort of regulating the use. With one full-time law enforcement officer and four dual collateral officers to cover the 1.1 million-acre refuge are considered a marginal number of resources at best given the sheer size of the refuge and the number of users. Other Federal, State, and local law enforcement officers may assist, as they are available.

Special equipment, facilities, or improvements necessary to support the use: Additional equipment and facilities are not necessary to monitor the use within the refuge and Fort Peck Lake.

Maintenance costs: The most obvious maintenance cost is to the road system and to the vehicles used by refuge staff for patrolling the uses on the refuge.

Monitoring costs: The cost of monitoring the use of the refuge is the most expensive cost we incur. Either by plane or by vehicle, the cost of gas and staff time is significant. Due to the remote location and inaccessibility of certain areas, traversing the refuge is extremely time consuming and a fast reaction to a refuge violation could take hours.

Offsetting revenues: The refuge does not currently charge a fee for the use of the road system, or for access.

ANTICIPATED IMPACTS of the USE

Short-term impacts: Snowmobiling has little to no resource impact given the season of use and regulation confining snowmobiles to ice covered waters. Snowmobiles do generate noise that may disturb other users in the area. ATV use has little to no resource impacts as well given that ATV use is restricted to refuge numbered routes and to ice covered waters. As with snowmobiles, ATVs generate a disturbance due to noise that may disturb wildlife as well as other users within the area. Neither is considered to have an impact on the refuge habitat, as both are restricted to roads and the ice.

Long-term impacts: There are no long-term impacts associated with the use of ATVs and snowmobiles due to the use restrictions. The refuge roads are already disturbed areas of the refuge, and the long-term impacts to the Fort Peck Lake are considered nonexistent.

Cumulative impacts: The greatest impact overall would be the disturbance to other users in the area with the use of ATVs and snowmobiles. The noise generated from both snowmobiles and ATVs could disturb those who are viewing wildlife, hiking, snowshoeing, cross-country skiing, fishing, and hunters pursuing game.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

The use of ATVs and snowmobiles is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, the use of ATVs and snowmobiles can occur on the refuge if the following stipulations are met:

1. All appropriate State and Federal ATV and snowmobile regulations apply.
2. ATVs belonging to Montana residents must be street legal and have a metal license plate. Operators must also possess the proper driver's license. Nonresident ATV owners who wish to operate their ATVs on the refuge should contact the refuge staff regarding licensing requirements. Anyone intending to operate an ATV on the refuge should contact the refuge staff to ensure the ATV meets the necessary requirements for legal use.
3. ATVs are required to stay on refuge numbered routes or over the ice on Fort Peck Lake.
4. Snowmobiles are only allowed use on the Fort Peck Lake.
5. Operation of ATVs, as well as all motor vehicles, off road is illegal.

Justification. Although there is a minor disturbance to wildlife and other refuge users, the use of snowmobiles and ATVs allows for greater access and more dispersed access benefiting wildlife-dependent public uses. It increases access into areas that may not be accessible with traditional motor vehicles or on foot. While both generate a noise disturbance, those who are looking for a solitude and quiet recreational

experience have many opportunities elsewhere on the refuge. Disturbed wildlife also has many opportunities to retreat to a less disturbed area.

With stipulations in place, recreational snowmobiling and ATV use, given the location and season of most use and the physical nature and size of the refuge, does not materially interfere with or detract from the conservation purposes of the refuge.

Mandatory 15-year reevaluation date. (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.12 Description of Use: Prescriptive Grazing

Prescriptive grazing is the controlled removal of vegetation using various livestock as a habitat management tool to achieve specific habitat conditions to benefit wildlife species. The Service employees the strategy of adaptive management in the development of habitat management plans. Adaptive management is defined as a process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels.

Prescriptive grazing is used to improve or maintain the health and vigor of selected plant(s) and to maintain a stable and desired plant community, provide or maintain food, cover, and shelter for animals of concern, maintain or improve water quality and quantity and reduce accelerated soil erosion and maintain or improve soil condition for susceptibility of the resource.

The proposed use is to implement prescriptive grazing across the refuge to meet wildlife and habitat objectives as identified in various management plans. Currently about 30 percent of refuge lands are enrolled in a prescriptive grazing management plan. Most habitat units with annual grazing programs are not meeting residual grass cover for priority species. The use would be implemented across the refuges where the Service has control over the use. For example, habitat units that are fenced from common pastures would be the first units enrolled into prescriptive grazing. Habitat units that are not fenced from private or other government-owned lands would be managed under existing management plans.

The use would be conducted according to approved habitat management plans to meet specific wildlife and/or habitat objectives. Use could occur during any season depending on the specific objectives to be achieved. Prescriptive grazing would be administered through issuance of a special use permit. Permittees would be selected using the criteria identified in the Refuge Manual. Habitat management plans would identify season of use, number of animals and length of time to achieve the management objectives.

A critical step in developing an effective and ecologically sound prescriptive grazing program is establishing criteria by which the prescription's implementation and effectiveness will be measured. By collecting quantitative data over time, one is better equipped to detect trends toward or away from the desired effects of grazing treatments. Furthermore, monitoring during grazing treatments will help to determine whether grazing treatments are applied at the appropriate season, duration, frequency, and intensity to meet specific wildlife and habitat objectives.

This use is being proposed to move from an annual grazing program to a prescriptive gazing program to meet specific wildlife and habitat management objectives. Currently habitat surveys indicate that most grazed habitat units are not meeting the 70 percent residual grass cover as specified in the 1986 EIS. Residual grass cover is important for several grassland nesting birds. In addition to the grass cover, new monitoring for highly palatable, first to decline forbs and shrubs (sentinel plants) are declining and being eliminated due to overuse and lack of natural ecological processes. These plants are extremely important to numerous wildlife species, especially birds and pollinators. The Great Plains have evolved over time through ecological disturbances like fire and grazing. These disturbances can be described as "pulse" and "press." A pulse occurrence occurs sporadically but still occurs, whereas a press disturbance is constant (Frost 2008). Like fire, originally, ungulate grazing (herbivory) was a pulse disturbance. Prior to 1882, there were many years with periods of abandonment by wild ungulates where less grazing took place due to its interaction with fire. Since 1882, it has become a press (constant) disturbance because of fences and fire control. As a result, highly palatable species (particularly shrubs and forbs such as chokecherry and white prairieclover) have dramatically declined. These species evolved with and are highly adapted to grazing when combined with several-year periods of abandonment for recovery. Palatable shrubs require several years to grow from seed to seed bearing maturity and are alive above ground (or vulnerable to damage from grazing) 12 months of the year. Present-day livestock grazing systems typically only rest pastures for 1 entire year or less from livestock use (with no rest from wild ungulate use). A prescriptive grazing program would allow the refuge to fulfill the intent of the Game Range Act of 1976 and the National Wildlife Refuge System Improvement Act of 1997.

AVAILABILITY of RESOURCES

Resources involved in the administration and management of the use: Refuge staff would continue to monitor permittees for violations of permit conditions

and trespass. Biologists and station managers would monitor habitat conditions using current HDP and sentinel plant species.

Special equipment, facilities, or improvements necessary to support the use: The refuge would continue to monitor grazing activities using ground surveys and aerial counts. New permanent or temporary fences would be needed to be constructed to implement prescriptive grazing on common pastures. Temporary water developments may be necessary to facilitate prescriptive grazing in some habitat units to meet habitat objectives.

Maintenance costs: Maintenance costs could be reduced due to the reduction in interior fences necessary to manage prescriptive grazing program according to CCP alternatives. There may be additional costs with the construction and maintenance of boundary fences, which would be constructed anyway to manage livestock in common pastures.

Monitoring costs: refuge personnel currently spend approximately 25 to 35 percent of their time issuing permits, monitoring for trespass livestock and habitat conditions. The refuge monitors livestock trespass via fixed wing aircraft that costs $140 per hour with a monthly fixed cost of $770.

Offsetting revenues: The refuge receives approximately $60,000 in 6860 (grazing) funds per year; however, these funds are being reduced each year due to the increase in oil and gas development on other refuges. Refuges receive a percentage of the amount of revenue that is generated from commercial activities on refuges. It is expected the revenue generated by grazing on the refuge would continue to decline over the years. These funds do not cover current expenses incurred managing current grazing program and probably would not cover the costs of implementing the prescriptive grazing program.

ANTICIPATED IMPACTS of the USE

Short-term impacts: Short-term impacts would include loss of vegetative cover, which could result in increased soil erosion. Highly palatable forbs and shrubs would be heavily impacted by grazing affecting a large number of wildlife species from pollinators to big game. However, the benefit would be to the wildlife species that require short cover such as prairie dogs, mountain plovers, and McCown's longspur and grazing ungulates (elk and deer) that would graze the fresh growth of grasses. Prescriptive grazing can reduce invasive species and reduce fuels in sage-grouse habitat. In weed-infested areas, grazing must be carefully managed to reduce rather than increase invasive plant establishment and spread. Ecologically based grazing prescriptions pay careful attention to positively directing plant community change, not just removing the weedy species (Sheley et al. 1996). Moving from annual grazing to prescriptive grazing could have an impact on some current permittees from an economic standpoint. Prescriptive grazing would be implemented over time and with input from current permittees to lessen potential financial impacts. Permittees that are able to meet refuge needs may benefit financially by taking advantage of increased grazing opportunities.

Long-term impacts: The habitats of the refuge evolved with a pulse fire/grazing interaction (pyric herbivory). As fires burned across the landscape, grazing ungulates grazed less selective on all plant species and thus highly palatable shrubs and forbs benefited from less grazing pressure. This interaction resulted in highly resilient systems that have a great diversity of species that promote heterogeneity and ecological integrity. Restoring this historical process would promote healthy habitats that promote biodiversity and resiliency to climate change.

Cumulative impacts: Changes in grazing management would likely reduce the availability of grazing land in the region. However, since the refuge supplies less than 1 percent of all AUMs in the region, the cumulative effect of implementing prescriptive grazing, when combined with other land management changes would be negligible.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Prescriptive grazing is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, prescriptive grazing can occur on the refuge if the following stipulations are met:

1. Habitat management plans would be developed with specific wildlife and habitat objectives.
2. Prescriptive grazing would be one of the tools used to meet these objectives.

Justification. Sharp-tailed grouse, pronghorn, sage-grouse, large ungulates, and other wildlife species need a diversity of and abundant group of plants for food and cover all year. Refuge monitoring has indicated that several highly palatable forbs and shrubs are declining due to the natural fire-grazing interaction being out of balance. Prescriptive grazing and

other adaptive management strategies would permit flexibility necessary for the restoration of these important plant species. Prescriptive grazing is a valuable management tool that supports refuge objectives.

Mandatory 15-year reevaluation date. (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

C.13 Description of Use: Research

The refuge allows research on a variety of biological, physical, archeological, and social issues and concerns to address refuge management information needs or other issues not related to refuge management. Studies are conducted by Federal, State, and private entities, including the U.S. Geological Survey, State agencies, State and private universities, and independent researchers and contractors.

Research is allowed refugewide and is addressed on a case-by-case basis for the need and potential impacts. The exact locations of the studies would be determined by the focus of the study. Research requests would be considered during all times of the year and on a case-by-case basis. Due to the difficulty in accessing the refuge lands during the winter months, studies at that time may be more heavily scrutinized as to their biological need and benefit. The location of the study may have an impact on when the use would be conducted, especially if it is during a specific hunting season.

Researchers would be required to submit a written proposal that outlines the methods, materials, timing, and justification for proposed projects. These proposals would be reviewed by refuge staff to assess the appropriateness of the research for the refuge, environmental impacts, assure that the projects do not interfere with the other resource operations, and provide suggested modifications to the project to avoid disruptions to refuge wildlife and operations. A special use permit is issued to those whose requests are deemed valid and necessary. The refuge staff would be responsible for monitoring their use and that it is appropriate and consistent with the terms and conditions in their special use permit.

Research on the refuge is allowed as a symbiotic relationship between the refuge research needs and the need for the requesting agency and individual to complete the research. The Service encourages and supports research and management studies on refuge lands that would improve and strengthen decisions on managing natural resources. All research requests would be evaluated on the refuge need and be in the best interest of wildlife and sound biological information.

AVAILABILITY of RESOURCES

Resources involved in the administration and management of the use: The refuge currently uses the existing staff to issue special use permits and to monitor researchers. Current staff resources are deemed adequate to manage issuing permits and monitoring the researchers for compliance at the existing levels.

Special equipment, facilities, or improvements necessary to support the use: The research group or individual would be responsible for supplying their own equipment necessary to complete the study.

Maintenance costs: There are no foreseen maintenance costs with allowing research studies on the refuge.

Monitoring costs: The current refuge staff is adequate to monitor the research completed by non-Service personnel. Research studies in access of available refuge resources would not be allowed.

Offsetting revenues: The refuge does not charge a fee to conduct research studies on the refuge.

ANTICIPATED IMPACTS of the USE

Short-term impacts: Research activities have the potential to impact and disturb wildlife through observation, capture/release techniques, and banding or marking. The access of multiple research sites several times in a short period may noticeably disturb vegetation either by walking, trampling, or by the use of a motor vehicle. Efforts to capture wildlife may cause not only disturbance, but also injury or even death. The energy costs of disturbance may be appreciable in terms of disruption of feeding, displacement from preferred habitat, and the added energy expended to avoid the disturbance of the research being conducted.

Long-term impacts: There are no anticipated long-term impacts with the approval of research studies on the refuge.

Cumulative impacts: With most of the research taking place on the refuge during the summer months, the compilation of several studies may be excessive disturbance on refuge resources. Even with this, no cumulative impacts are expected due to the ability of the refuge manager to control the location and timing of all research studies conducted. The size of the refuge is also considered to be such that the tolerance of several studies on the wildlife and habitat is high.

PUBLIC REVIEW and COMMENT

Public review and comment would be solicited through posting of notices at the refuge, notices in local newspapers and the Federal Register, public meetings held during the CCP process, and formal public review

of this compatibility determination as part of the draft CCP and EIS for the refuge.

DETERMINATION

Research is compatible.

Stipulations necessary to ensure compatibility. To ensure compatibility with refuge purposes and the mission of the National Wildlife Refuge System, research can occur on the refuge if the following stipulations are met:

1. Prior to conducting investigations, researchers would obtain special use permits from the refuge that make specific stipulations related to when, where, and how the research would be conducted. Managers retain the option to prohibit research on the refuge that does not contribute to the purpose of the refuge or the mission of the Refuge System.
2. Researchers must possess all applicable State and Federal permits for the capture and possession of protected species, and for conducting all other regulated activities.
3. Research activities would be monitored to assure compliance with permit conditions and assess impacts.
4. If proposed research methods would impact or potentially impact complex resources (habitat or wildlife), it must be demonstrated that the research is necessary (i.e., critical to survival of a species, would enhance restoration activities of native species, would help in control of invasive species or provide valuable information that would guide future complex activities), and the researcher must identify the issues in advance of the impact.
5. Researchers must clearly mark posts, equipment platforms, fencing material, and other equipment left unattended so it does not pose a hazard. Such items shall be removed as soon as practicable on completion of the research.
6. Cultural and archeological surveys would be coordinated with the Regional Historical Preservation Officer and the appropriate State Historic Preservation Officer to assure compliance with the Archeological Resource Protection Act.
7. All research activities would be performed in accordance with the stipulations in this determination and the stipulations within the specific special use permit.
8. Researchers would submit a final report concerning refuge research to the refuge manager.

Justification. Research is compatible with the mission of the Service and the purpose of the refuge. Research studies on the refuge can be used to manage trust resource responsibilities of the Service by providing information on a sound scientific basis. Research conducted on biological, physical, archeological and social components of the refuge provide a means to analyze management actions, impacts from internal and outside forces, and ongoing natural processes within the refuge ecosystems. Research provides scientific evidence used to make management decisions and ensure the refuge is managed as intended during establishment by Congress.

Negative short-term impacts caused during the research activities would be minimized with the stipulations above and are not considered significant in nature. Conducting research studies on the refuge would not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose for which the refuge was established.

Mandatory 15-year reevaluation date. (The year of evaluation will be inserted here in the final CCP, based on the date the regional director approves the final CCP.)

Signature

(*to be determined*) *Date*
Project Leader
Charles M. Russell National Wildlife Refuge Complex
Lewistown, Montana

Concurrence

Richard A. Coleman, Ph.D. *Date*
Assistant Regional Director
National Wildlife Refuge System
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Lakewood, Colorado

Appendix D

Key Legislation and Policy

This appendix briefly describes the guidance for the National Wildlife Refuge System and other policies and key legislation that guide the management of Charles M. Russell National Wildlife Refuge Complex.

D.1 National Wildlife Refuge System

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. (National Wildlife Refuge System Improvement Act of 1997.)

Goals

- To fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.
- Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.
- Perpetuate migratory bird, interjurisdictional fish, and marine mammal populations.
- Conserve a diversity of fish, wildlife, and plants.
- Conserve and restore, where appropriate, representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.
- To foster understanding and instill appreciation of fish, wildlife, and plants, and their conservation, by providing the public with safe, high quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

Guiding Principles

There are four guiding principles for management and public use of the Refuge System established by Executive Order 12996 (1996):

- **Public Use**—The Refuge System provides important opportunities for compatible wildlife-dependent recreational activities involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation.
- **Habitat**—Fish and wildlife will not prosper without high quality habitat, and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges.
- **Partnerships**—America's sportsmen and women were the first partners who insisted on protecting valuable wildlife habitat within wildlife refuges. Conservation partnerships with other Federal agencies, State agencies, tribes, organizations, industry, and the public can make significant contributions to the growth and management of the Refuge System.
- **Public Involvement**—The public should be given a full and open opportunity to participate in decisions regarding acquisition and management of our national wildlife refuges.

D.2 Other Legal and Policy Guidance

Management actions on national wildlife refuges are constrained by many mandates including laws and executive orders. The more common regulations that affect refuge management are listed below.

American Indian Religious Freedom Act (1978)—Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act (1992)—Prohibits discrimination in public accommodations and services.

Antiquities Act (1906)—Authorizes the scientific investigation of antiquities on Federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Archaeological and Historic Preservation Act (1974)—Directs the preservation of historic and archaeological data in Federal construction projects.

Archaeological Resources Protection Act (1979), as amended—Protects materials of archaeological interest from unauthorized removal or destruction and requires Federal managers to develop plans and schedules to locate archaeological resources.

Architectural Barriers Act (1968)—Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Bald and Golden Eagle Protection Act (1940)—Provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds.

Bankhead-Jones Farm Tenant Act (1937)—Some early refuges and hatcheries were established under the authority of this Act that required the Secretary of Agriculture to develop a program of land conservation and use.

Clean Air Act (1970, amended 1990)—Restricts the amount of pollutants that can be emitted into the air. Designated wilderness areas including UL Bend National Wildlife Refuge have the highest standards (class I) for pollution and visibility and air quality is monitored at the refuge.

Clean Water Act (1977)—Requires consultation with the U.S. Army Corps of Engineers (404 permits) for major wetland modifications.

Data Quality Act (2001)—Requires Government agencies to ensure and maximize the quality, objectivity, utility, and dissemination of information by Federal agencies.

Emergency Wetlands Resources Act (1986)—Promotes wetland conservation for the public benefit to help fulfill international obligations in various migratory bird treaties and conventions. The act authorizes the purchase of wetlands form Land and Water Conservation Fund monies.

Endangered Species Act (1973)—Requires Federal agencies to carry out programs for the conservation of endangered and threatened species.

Enhancement Act (2000)—Authorized the Secretary of Army, working with the Secretary of Interior, to identify cabin sides suitable for conveyance to current lessees. The funds received will be used for acquiring other lands with greater wildlife and other public value for the refuge.

Executive Order 7509 (1936)—Establishes the Fort Peck Game Range for the conservation and development of natural wildlife resources and for the protection and improvement of public grazing lands and natural forage resources. In 1963, it was renamed the Charles M. Russell National Wildlife Range (Public Land Order 2951).

Executive Order 11988 (1977)—Requires Federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)—Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the Refuge System.

Executive Order 13007, Indian Sacred Sites (1996)—Directs Federal land management and other agencies to accommodate access to and ceremonial uses of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Executive Order 13352, Cooperative Conservation (2004)—Directs Federal agencies to implement laws relating to the environment and natural resources in a manner that promotes cooperative conservation with an emphasis on appropriate inclusion of local participation in Federal decisionmaking in accordance with respective agency missions and policies.

Executive Order 13443, Facilitation of Hunting Heritage and Wildlife Conservation (2007)—Directs Federal land management and other agencies to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

Federal Noxious Weed Act (1990)—Requires the use of integrated management systems to control or contain undesirable plant species and an interdisciplinary approach with the cooperation of other Federal and State agencies.

Federal Records Act (1950)—Requires the preservation of evidence of the Government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Fish and Wildlife Coordination Act (1958)—Allows the U.S. Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Game Range Act (1976)—Public Law 94-223 transferred the management of all game ranges to the sole authority of National Wildlife Refuge System. This included Charles M. Russell Game Range and in 1978, the refuge was renamed Charles M. Russell National Wildlife Refuge (Public Land Order 5635).

Migratory Bird Conservation Act (1929)—Establishes procedures for acquisition by purchase, rental, or gifts of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934)—Authorizes the opening of part of a refuge to waterfowl hunting.

Migratory Bird Treaty Act (1918)—Designates the protection of migratory birds as a Federal responsibility;

and enables the setting of seasons and other regulations, including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

Native American Policy (1994)—Articulates the general principles that guide the Service's government-to-government relationship to Native American Governments in the conservation of fish and wildlife resources.

National Environmental Policy Act (1969)—Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate this Act with other planning requirements, and prepare appropriate documents to facilitate better environmental decisionmaking. [From the Code of Federal Regulations (CFR), 40 CFR 1500]

National Historic Preservation Act (1966), as amended—Establishes as policy that the Federal Government is to provide leadership in the preservation of the Nation's prehistoric and historical resources.

National Trails System Act (1968)—Established a national trails system, including provisions for national historic trails that follow as closely as possible the original trails or routes of travel of national historic significance.

National Wildlife Refuge System Administration Act (1966)—Defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge, provided such use is compatible with the major purposes for which the refuge was established.

National Wildlife Refuge System Improvement Act of 1997—Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System; mandates comprehensive conservation planning for all units of the Refuge System.

Native American Graves Protection and Repatriation Act (1990)—Requires Federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Paleontological Resources Preservation Act of 2009—Requires the Secretary of Interior and Agriculture to manage and protect paleontological resources on Federal land using scientific principles and expertise.

Public Land Order (4588)—Establishment of UL Bend National Wildlife Refuge and revocation of Executive Order, 7509 on these lands.

Public Law (94-557) of 1976—Designation of wilderness areas within the National Wildlife Refuge System including portions of UL Bend National Wildlife Refuge.

Refuge Recreation Act (1962)—Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Rehabilitation Act (1973)—Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the Federal Government to ensure that any person can participate in any program.

Rivers and Harbors Act (1899)—Section 10 of this Act requires the authorization of U.S. Army Corps of Engineers prior to any work in, on, over, or under navigable waters of the United States.

Volunteer and Community Partnership Enhancement Act (1998)—Encourages the use of volunteers to assist in the management of refuges within the Refuge System; facilitates partnerships between the Refuge System and non-Federal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

Wild and Scenic Rivers Act (1968)—Set aside certain rivers in the Nation to be preserved in free-flowing condition among other provisions. This included portions along the western boundary of the Refuge, which is part of the Upper Missouri National Wild and Scenic River most of which flows through the Upper Missouri Breaks National Monument (BLM). The Act was modified in 1976 by Public Law 94-486 to apply the scenic designation to the river and its bed for the portion that flows through the refuge.

Wilderness Act (1964)—The Act (Public Law 88-577) [16 U.S.C.1131–6]) defines wilderness as "A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Approximately 20,819 acres within UL Bend National Wildlife Refuge are designated as wilderness, and approximately 176,140 acres within Charles M. Russell NWR are proposed for inclusion in the National Wilderness Preservation System, and is managed as if were designated wilderness.

Appendix E

Wilderness Review and Summary

As guided by the Wilderness Stewardship Policy (FWS 2008d) that provides an overview and foundation for implementing the Wilderness Act and the National Wildlife Refuge System Administration Act of 1966, as amended (Improvement Act), the Service is reviewing and updating existing lands within Charles M. Russell National Wildlife Refuge for current wilderness potential.

E.1 Background

The Improvement Act directs the Secretary to complete a comprehensive conservation plan (CCP) for every unit, or group of related units, of the Refuge System. As part of this process, the Service is required to conduct a wilderness review concurrent with the development of the CCP, with a summary of the review incorporated into the plan (FWS 2000c). All lands and waters of the Refuge System outside of Alaska and not currently designated wilderness are subject to the review including proposed wilderness reevaluation to determine if it remains viable wilderness.

With the passage of The Wilderness Act of September 3, 1964 (Public Law 88-577), the Secretary of Interior was required to review every roadless area of 5,000 acres or more and every roadless island, regardless of size, within the National Wildlife Refuge System within 10 years after the effective date of the Act, and report to the President of the United States his recommendations as to the suitability or unsuitability of each such area or island for preservation as wilderness.

On May 3, 1974, the Directors of the Bureau of Sport Fisheries and Wildlife (Service) and the Bureau of Land Management (BLM) released a draft environmental impact statement for 13 proposed wilderness units within Charles M. Russell National Wildlife Refuge. During the process, five separate public hearings were held on the proposals in Malta, Miles City, Billings, Denver, and Jordan between May 20 and May 29, 1974. The comment period was extended until June 28, 1974 to allow for additional written comments on the proposed wilderness units. A total of 283 individuals attended the five hearings with 101 statements read into the record. The complete proposal recommended 176,140 acres of proposed wilderness within 13 separate units. The individual units proposed are identified in table A.

Table A. Original 13 proposed wilderness units for the Charles M. Russell and UL Bend refuges.

Area	*Proposed Unit*	*Acres*
1	Antelope Creek	5,390
2	Mickey Butte	17,880
3	Burnt Lodge	26,520
4	Sage Creek	10,790
5	Sheep Creek	13,080
6	West Hell Creek	13,480
7	Snow Creek	6,760
8	Billy Creek	11,900
9	Seven Blackfoot	28,500
10	Lost Creek	11,500
11	Alkali Creek	7,990
12	Crooked Creek	14,340
13	Fort Musselshell	8,010
	Total	176,140

Pursuant to House Document No. 93-403, part 35 dated December 4, 1974, changes were made to the original 13 proposed wilderness units due to a portion of its surface lands not being withdrawn from mineral entry, and the unknown stature of the minerals within the proposed areas. In addition to the need for a mineral survey, the excluded lands were also considered replete with constructed improvements needed for wildlife management or grazing purposes. It was then recommended that 155,288 acres of the Charles M. Russell National Wildlife Refuge retain their pristine character through the protection as proposed wilderness units (note: the proposal that went forward to Congress identified 155,388 acres but the actual acreage added up to 155,288 acres and this is considered to be legal acreage). The 155,288 acres was divided between 15 units as shown in table B.

With advances in technology, the Service has since refined all of the proposed wilderness units and entered them into a geographical information system (GIS). Through the minimization of errors and correction of boundaries, the acreage the Service recognizes today as proposed wilderness units is closer to 158,619 acres. Following this wilderness review, the final recommendations would incorporate the more current acreage. Below is a complete description of each

area currently managed as proposed wilderness. As directed by Congress, the Service is required to manage all proposed wilderness units for their wilderness characteristics including closure of roads, minimum tool usage, and providing the public with solitude or a primitive and unconfined type of recreation.

Table B. Current proposed wilderness units for the Charles M. Russell and UL Bend refuges.

Area	*Proposed Unit*	*Acres*
1	East Seven Blackfoot	11,744
2	Mickey Butte	16,893
3	Burnt Lodge	21,576
4	Billy Creek	10,916
5	West Seven Blackfoot	6,456
6	Antelope Creek	5,062
7	West Hell Creek	11,896
8	Fort Musselshell	8,303
9	Sheep Creek	11,784
10	West Beauchamp	6,736
11	Wagon Coulee	10,480
12	Alkali Creek	6,592
13	Crooked Creek	6,842
14	East Hell Creek	14,744
15	East Beauchamp	5,264
	Total	155,288

With advances in technology, the Service has since refined all of the proposed wilderness units and entered them into a geographical information system (GIS). Through the minimization of errors and correction of boundaries, the acreage the Service recognizes today as proposed wilderness units is closer to 158,619 acres. Following this wilderness review, the final recommendations would incorporate the more current acreage. Below is a complete description of each area currently managed as proposed wilderness. As directed by Congress, the Service is required to manage all proposed wilderness units for their wilderness characteristics including closure of roads, minimum tool usage, and providing the public with solitude or a primitive and unconfined type of recreation.

E.2 Current Proposed Wilderness

The map for alternative A (figure 7) in chapter 3 and the wilderness map (figure A) in this appendix show the locations of the proposed wilderness units. The areas (numbered 1–21) are areas excluded from consideration (see table G).

1. East Seven Blackfoot—11,744 acres

The BLM Wilderness Study Area surrounds the southern boundary of this unit. This unit, like the Billy Creek Unit and West Seven Blackfoot Unit is extremely rugged with high ridges and numerous side drainages and coulees. Slaymaker Ridge is the most notable physical feature, running north and south in the middle of the proposed wilderness unit. Vegetation types are forested areas in limited amounts, grassy benches, and sagebrush and greasewood flats. Much of the land is barren due to the soils, slope, and topography.

2. Mickey Butte—16,893 acres

The Mickey Butte Unit is situated on the east side of the UL Bend National Wildlife Refuge, contiguous with the UL Bend Wilderness. This unit is characterized by high bluffs on the northwest side yielding to steep, rugged coulees draining the area to the east and southeast. The coulees are relatively short as they rise to the bluffs. Forested areas become sparser in this area compared to the western portion of the refuge, with grasses, sagebrush, and greasewood increasing in percentage of ground cover.

3. Burnt Lodge—21,576 acres

The Burnt Lodge Unit is one of the most rugged and scenic areas within the Missouri River Breaks. The area varies from rolling Bear Paw shale hills in the west to the extremely rugged eastern portion, which is an extension of the Larb Hills. Scattered patches of Ponderosa Pine and Juniper dominate the north slopes and high bench lands. Grasses, sagebrush and greasewood predominate in the area west of Killed Woman Creek. Currently the northern boundary of this unit is met with a BLM wilderness study area adjacent to the refuge proposed wilderness unit.

4. Billy Creek—10,916 acres

This unit is extremely rugged with short, steep-sided drainages. Much of the area is inaccessible to livestock with grasses, sagebrush, and greasewood dominating the vegetation. Forested areas are isolated and occur only where soil, slope, and aspects are conducive to their growth.

5. West Seven Blackfoot—6,456 acres

The BLM Wilderness Study Area surrounds the southern boundary of this unit. The West Seven Blackfoot proposed wilderness unit is similar in comparison to the East Seven Blackfoot. A long high ridge running west to east and paralleling the reservoir dominates the proposed wilderness unit landscape. Vegetation is similar to adjacent proposed wilderness units, with a higher presence of forested areas on the north facing aspect of the ridge.

INSERT 11x17
Figure A

BLANK 11x17

back of Figure A

6. Antelope Creek—5,062 acres

This area is forested with long and geologically well-developed drainages. The bordering ridges are steep and relatively narrow-crested. It is located in the very Northwest corner of the refuge contiguous to the Upper Missouri River National Monument Wilderness Study Area administered by the BLM.

7. West Hell Creek—11,896 acres

This proposed wilderness unit is physically a transition between the badlands to the east and the Missouri River Breaks to the west. Forested areas are somewhat more plentiful in this unit than in the area east of Hell creek, but the landscape is still dominated by grass, sagebrush and other shrubs.

8. Fort Musselshell Unit—8,303 acres

There are major drainages that run parallel to Fort Peck Reservoir in this unit instead of being perpendicular as in most areas. The slopes are well vegetated with conifers, grass, sagebrush and other shrubs.

9. Sheep Creek—11,784 acres

This unit is situation between Cracker Creek Bay and Gilbert Creek Bay west of the Sage Creek Wilderness Unit. The topography contains an inconsistent erosion pattern. Grass with some sagebrush and other shrubs dominate the landscape. Trees are virtually absent in this unit.

It should be noted that some lands within this unit have been identified as having wilderness characteristics but for several reasons (private inholding and/or private roads), it provides difficult management challenges and wilderness complications. With the acquisition of private lands, Sheep Creek proposed wilderness unit would then be free of encumbrances and at that point would make for an improved proposed wilderness unit, and this option has been identified in several alternatives.

10. West Beauchamp Creek—6,736 acres

This unit is comprised of three short coulees between ridges that start from CK ridge and proceed in a southeasterly direction, ending at the Missouri River. These coulees are characterized by scattered stands of Ponderosa pine and Juniper, and the ridge tops by sagebrush shrub type mixed with western and bluebunch–wheatgrass grassland.

11. Wagon Coulee—10,480 acres

This unit comprises much of the most rugged portions of the south facing aspect of Harper's Ridge. It contains the lower 2 miles of the Cabin Coulee Drainage and an approximately 2-mile section of the middle reaches of Carpenter Creek. The coulees within the unit contain nice stands of Ponderosa pine with the ridge tops consisting of primarily grass and scattered sage.

12. Alkali Creek—6,592 acres

The terrain is characterized by short drainages producing a jumbled appearance. Slopes are well forested and due to the northern exposure, well vegetated with grasses, sagebrush and other shrubs. There are 4 miles of improved trails that will be closed and allowed to revert.

13. Crooked Creek—6,842 acres

Drainages are relatively short in this unit with well-forested side slopes. Away from the reservoir, the forest is interspersed with small grassy parklands.

14. East Hell Creek—14,744 acres

This proposed wilderness unit is similar physically to the West Hell Creek proposed wilderness unit. Landscapes include grassy, flat ridge tops or mesas, gentle rolling breaks, and numerous steep drainages and canyons nearer the lake. Vegetation is typical of the Missouri River Breaks and the refuge with a mix of forested areas and juniper patches, grasslands, and sagebrush flats.

15. East Beauchamp Creek—5,264 acres

This unit is comprised of the lower reaches of the Beauchamp Creek drainage, which is a 20-mile-long watershed. A wide intermittent drainage, at this point has the potential for excellent riparian habitat. Secondary side coulees are characterized by ponderosa pine and juniper.

Evaluation of Proposed Units Against Wilderness Criteria

In addition to the descriptions above, the Service evaluated the existing wilderness units to determine if they still meet the wilderness criteria identified in the Wilderness Act and Service guidelines on wilderness (refer to table C). A checkmark (√) generally indicates the area still meets the wilderness criteria and a dash (—) indicates that it does not completely meet the wilderness criteria. Nearly all the existing proposed wilderness units still meet most of the wilderness criteria. However, several of the wilderness units have private or State lands within or adjacent to the refuge, which makes it difficult to close roads.

Table C. Evaluation of how well the current proposed wilderness units for the Charles M. Russell and UL Bend refuges meet wilderness criteria.

Wilderness Criteria	*Wilderness Unit Number**														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Size greater than 5,000 acres	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Connects to other wilderness study areas or wilderness	√	√	√	√	√	√	√	√	—	√	—	√	√	—	√
Natural and scenic conditions maintained	√	√	√	√	√	√	√	√	—	—	√	√	√	—	—
Quality plants and wildlife	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Quality water and air	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Natural night skies and soundscapes	√	√	√	√	√	√	√	√	√	√	√	√	√	—	√
Retains primeval character	√	√	√	√	√	√	√	√	—	√	√	√	√	—	√
Serves as benchmark for research	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Retains human wilderness values	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

√ Meets the criteria
— Does not or marginally meets the criteria
**Wilderness unit numbers:*
Unit 3–The BLM Wilderness Study Area abuts the northern boundary. Old road closure disappointed locals.
Unit 9–Private/State inholding negatively affects wilderness characteristics. Would have excellent proposed wilderness unit potential if private land is acquired.
Unit 10–Surrounded by refuge road 201, which is a main refuge artery.
Unit 14–Contains two private inholding within and adjacent to proposed wilderness unit
Unit 15–State inholding, refuge road 201 separates west from east Beauchamp Creek
Units 9 and 14–Across the bay from each other but not physically connected.

E.3 Wilderness Changes Under Alternatives in the Draft CCP and EIS

The Service is evaluating four alternatives in this CCP and EIS for managing wilderness on the refuge (refer to the wilderness analysis under section 5.7 in chapter 5 for a full discussion of the effects). Prior to any changes being designated, the recommendations made in this CCP will be reviewed by the U.S. Fish and Wildlife Service, the Secretary of the Interior, and Congress. Currently, all new potential new wilderness lands within this review are considered wilderness study areas. On the approval and recommendation of the Secretary of the Interior, those approved lands will be known as proposed wilderness. An act of Congress is required for all proposed wilderness units to then become designated wilderness. As a provision to all lands becoming proposed wilderness, a minimum tool requirement would be completed. Currently game carts are allowed in the proposed wilderness units, and this would be common to all alternatives. The UL Bend Wilderness would still prohibit the use of game carts within the wilderness. For a complete list of definitions related to this review, refer to the end of this appendix. The Bureau of Land Management (BLM) currently manages several wilderness study areas adjacent to the refuge (see figure 7, map of the no-action alternative A, in chapter 3). These areas were taken into consideration in reviewing refuge lands that contain wilderness characteristics and potential areas that could be suited for wilderness proposal and designation. In three general areas along the refuge boundary, there are either BLM wilderness study areas or the Upper Missouri River Breaks National Monument. These protected areas provide crucial unobstructed corridors for wildlife migration in central Montana. The changes being considered in the CCP and EIS are described below.

Alternative A

Alternative A is the no-action alternative, and there would be no additions or subtractions to the acreages of proposed wilderness units (see figure 7, map of alternative A, in chapter 3 and figure A).

Alternative B

The Service is considering ten proposed additions to current wilderness units for alternative B. This will expand current wilderness units and allow for management on a large landscape scale. There would be a net increase of 25,037 acres. There would be no loss of proposed wilderness acres in any of the 15 proposed wilderness units. The additions are shown in table D and in figure 8 (map of alternative B) in chapter 3.

Alternative C

This alternative looks to expand wildlife-dependent recreational opportunities and economic uses while protecting wildlife populations and their habitat. In an effort to open up lands for additional uses and easier access, in addition to existing road access for private or State lands, this alternative proposes a reduction of 35,881 currently proposed wilderness acres as shown in table E and figure 9 (map of alternative C) in chapter 3.

Alternative D

This alternative has an emphasis on promoting natural ecological process with minimal management to promote the biological diversity, biological integrity, and environmental health. Through this alternative the Service would expand six proposed wilderness units and eliminate two complete wilderness units. This will allow more efficient management of large landscapes and remove more costly management in areas where there are inholdings or complex management. There is a net loss of 8,185 acres as shown in table F (see figure 10, map of alternative D, in chapter 3).

Table D. Additions to proposed wilderness units at the Charles M. Russell and UL Bend refuges under CCP alternative B.

Area	*Proposed Unit Name*	*Acres*	*Added Acres*	*Total Acres*
1	East Seven Blackfoot	11,744	0	11,744
2 G	Mickey Butte	16,893 0	0 550	17,443 0
3	Burnt Lodge	21,576	0	21,576
4	Billy Creek	10,916	0	10,916
5	West Seven Blackfoot	6,456	0	6,456
6 A	Antelope Creek	5,062 0	0 1,836	6,898 0
7 J	West Hell Creek	11,896 0	0 641	12,537 0
8	Fort Musselshell	8,303	0	8,303
9 I	Sheep Creek	11,784 0	0 5,726	17,510 0
10 B	West Beauchamp	6,736 0	0 359	7,095 0
11 H	Wagon Coulee	10,480 0	0 4,843	15,323 0
12 E, F	Alkali Creek	6,592 0	0 2,687	9,279 0
13 C, D	Crooked Creek	6,842 0	0 8,394	15,236 0
14	East Hell Creek	14,744	0	14,744
15	East Beauchamp	5,264	0	5,264
	Total	155,288	25,037*	180,324

**Rounded acreage.*

Table E. Reductions to proposed wilderness units at the Charles M. Russell and UL Bend refuges under CCP alternative C.

Area	*Proposed Unit Name*	*Acres*	*Reduced Acres*	*Total Acres*
1	East Seven Blackfoot	11,744	0	11,744
2	Mickey Butte	16,893	0	16,893
3 CC	Burnt Lodge	21,576 0	0 9,137	12,439 0
4	Billy Creek	10,916	0	10,916
5	West Seven Blackfoot	6,456	0	6,456
6	Antelope Creek	5,062	0	5,062
7	West Hell Creek	11,896	0	11,896
8	Fort Musselshell	8,303	0	8,303
9	Sheep Creek	11,784	0	11,784
10 BB	West Beauchamp	6,736 0	0 6,736	0 0
11	Wagon Coulee	10,480	0	10,480
12	Alkali Creek	6,592	0	6,592
13	Crooked Creek	6,842	0	6,842
14 DD	East Hell Creek	14,744 0	0 14,744	0 0
15 AA	East Beauchamp	5,264 0	0 5,264	0 0
	Total	155,288	35,881	119,407

Table F. Reductions and additions to proposed wilderness units at the Charles M. Russell and UL Bend refuges under CCP alternative D.

Area	*Proposed Unit Name*	*Acres*	*Reduced Acres*	*Added Acres*	*Total Acres*
1	East Seven Blackfoot	11,744	0	0	11,744
2	Mickey Butte	16,893	0	0	16,893
3	Burnt Lodge	21,576	0	0	21,576
4	Billy Creek	10,916	0	0	10,916
5	West Seven Blackfoot	6,456	0	0	6,456
6	Antelope Creek	5,062	0	0	6,898
A		0	0	1,836	0
7	West Hell Creek	11,896	0	0	12,537
J		0	0	641	0
8	Fort Musselshell	8,303	0	0	8,303
9	Sheep Creek	11,784	0	0	17,510
I		0	0	5,726	0
10	West Beauchamp	6,736	0	0	0
AA		0	6,736	0	0
11	Wagon Coulee	10,480	0	0	15,323
H		0	0	4,843	0
12	Alkali Creek	6,592	0	0	9,279
E, F		0	0	2,687	0
13	Crooked Creek	6,842	0	0	9,668
D		0	0	2,826	0
14	East Hell Creek	14,744	0	0	0
DD		0	14,744	0	0
15	East Beauchamp	5,264	0	0	0
AA		0	5,264	0	0
	Total	155,288	26,744	18,559	128,544

E.4 Wilderness Exclusions

On an evaluation of existing lands on the refuge, a number of lands are not being considered for proposed wilderness designation at this time. If the land status changes or some other factor changes, then they could be considered in the future. Table G describes those areas that are currently not being considered for proposed wilderness designation, based on four wilderness criteria:

1. Generally appear to have been affected primarily by the forces of nature with the imprint of man substantially unnoticeable.
2. Has outstanding opportunities for solitude or a primitive and unconfined type of recreation.
3. Has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition.
4. May also contain ecological, geological, or other features of scientific or historical value.

Table G. Areas excluded from consideration for wilderness designation at the Charles M. Russell and UL Bend refuges.

*Exclusion Area**	*Physical Boundary Description*	*Acres*	*Justification*
1	North and west: Antelope Creek proposed wilderness unit and the proposed addition (A) South: river East: Highway 191	4,606	This unit lies directly within the Highway 191 corridor leaving little to no opportunity for solitude or a primitive and unconfined type recreation; less than 5,000 acres
2	North: refuge boundary South: river West: Highway 191 East: refuge road 851 south to refuge road 202 to the river	41,948	Within this portion of the refuge is the auto tour route visited by 10,000 vehicles each year. The Slippery Ann elk view area also resides in this portion of the refuge, which is heavily visited each fall by visitors looking to view elk.
3	North: refuge boundary South: river West: refuge road 851 south to refuge road 202 to the river East: A portion of the refuge boundary, State section in T R section, refuge road 201 and then the southern boundary of the West Beauchamp proposed wilderness unit	66,449	This exclusion is a heavily recreated area during the hunting season. Portions of road 201, the main artery along the North side of the refuge, traverse through this region. In addition, there are four State sections and three privately owned tracts.
4	North and east: refuge boundary West: East Beauchamp proposed wilderness unit South: UL Bend National Wildlife Refuge boundary	1,348	This sliver of land is not large enough to be considered on its own, nor does it contain any ecological, geological, or other features of scientific or historic value.
5	North and west: refuge boundary South: UL Bend National Wildlife Refuge boundary and the river East: Burnt Lodge proposed wilderness unit boundary	21,061	Within this exclusion lies Forchette Creek Recreation Area, which receives visitation by hunters and recreationists year-round. This land is intersected by five roads and contains three State parcels.
6	North: refuge boundary West: Burnt Lodge proposed wilderness unit boundary South and east: Timber Creek/ Missouri River as it meanders off the refuge to the north	833	This sliver of land is not large enough to be considered on its own, nor does it contain any ecological, geological, or other features of scientific or historic value.
7	North: river West and south: refuge boundary East: Highway 191	18,913	This exclusion is interspersed with privately owned land, two State sections, and four refuge roads. It is also along the Highway 191 corridor that prohibits from providing solitude or primitive and unconfined type of recreation.
8	North: river West: Highway 191 South: refuge boundary East: Fort Musselshell proposed wilderness unit	32,929	Including the eastern side of highway 191 S of the river, this area too does not provide solitude or primitive and unconfined type of recreation. It also contains the Sand Creek Field Station, multiple privately owned tracts, three State sections, and a portion of the main artery traversing the S side of the refuge.

Table G. Areas excluded from consideration for wilderness designation at the Charles M. Russell and UL Bend refuges.

*Exclusion Area**	*Physical Boundary Description*	*Acres*	*Justification*
9	North and east: river South: refuge road 315 and proposed CCP addition to the Crooked Creek proposed wilderness units (C) West and south: refuge boundary	12,560	There are two private inholdings, two State sections and several refuge roads within this unit of wilderness consideration. These encumbrances, along with a lack of significant ecological, geological, or other features, justify this section as currently not meeting the wilderness criteria.
10	North: Crooked Creek drainage and refuge road 411 West: refuge boundary South: refuge road 103 to a point where it intersects with Crooked Creek	4,046	Within this area is the Crooked Creek Recreation Area managed by USACE. It is a heavily recreated area and thus would not be suitable wilderness habitat.
11	North: Township line 18N South and west: refuge boundary East: the Musselshell River as it meanders off the refuge	1,773	This area is less than the recommended 5,000-acre minimum for a wilderness, and does not contain any ecological, geological, or other feature of scientific, educational, scenic, or historical value to classify as wilderness on its own.
12	North and west: Musselshell River as it enters the refuge and joins the Missouri River South: refuge boundary East: the boundary of the West Seven Blackfoot proposed wilderness unit	48,301	There are multiple privately own parcels within this portion of the refuge. Between the multiple refuge roads and the privately owned lands, there is not enough of the refuge to be considered for its wilderness characteristics.
13	North: Missouri River coming through the refuge at the southern boundary of the West Hell Creek proposed wilderness unit and through the hell Creek Bay to the southern boundary of the East Hell Creek proposed wilderness unit South and east: refuge boundary	32,359	Within this exclusion is the Hell Creek Recreation Area, which consists of a campground, marina, boat ramp, and multiple private inholdings. The area is noticeably affected by the presences of people, and does not provide the best opportunity for a primitive and unconfined type of recreation.
14	North: Fort Peck Reservoir and that portion of the refuge south of Sheep Creek proposed wilderness unit to refuge road 357 East: refuge road 357 South: refuge boundary West: township line running north and south known as R38E.	8,225	Within this exclusion, there is a single private inholding and five refuge roads. It holds potential for providing a wilderness experience; however, due to the private inholding and the open refuge roads, this area is not considered suitable during this period of review.
15	North: Fort Peck Reservoir and that portion also known as the Big Dry Arm West: West Gilbert Creek drainage as it meanders off of the refuge South: refuge boundary East: that portion of the refuge that meanders from the Fort Peck Reservoir south to the Big Dry Arm and Big Dry Creek as it meanders off the refuge in T20N R42E	48,835	This long and narrow strip of refuge lands contains multiple roads and multiple private inholdings. With the combination of inholdings and roads, there is not a single 5,000-acre block of land. The Rock Creek Recreation Area is also within this block of land. It consists of multiple privately owned cabin sites and recreational lands.

Table G. Areas excluded from consideration for wilderness designation at the Charles M. Russell and UL Bend refuges.

*Exclusion Area**	*Physical Boundary Description*	*Acres*	*Justification*
16	This exclusion starts where exclusion #15 ends. West: from the Big Dry Creek as it exits the refuge and following the east shoreline North all the way to the Fort Peck Reservoir until it meets Duck Creek road on the north side of the Fort Peck Reservoir East: starting from that point where the refuge boundary meets Big Dry Creek meandering off the refuge, and following the refuge boundary east and north around the Big Dry Arm and the north side of the Fort Peck Reservoir until it meets Duck Creek road	57,446	Like exclusion #15, this long and narrow strip of land is riddled with multiple roads and private inholdings. Several USACE recreation areas and multiple State owned sections are in this area. With the presence of the recreation areas, scattered private inholdings, and meandering roads, this area is not considered to meet the wilderness criteria.
17	North: refuge boundary East: Duck Creek road South: Fort Peck Reservoir West: refuge road 331 from the point at which it enters the refuge to the Fort Peck Reservoir	45,494	This unit contains four partial or full State sections and multiple private inholdings. There is an open refuge road along each ridge and several that meander throughout. While it has been primarily untouched by humans, with the frequency of the refuge roads, it does not provide and single block of land of sufficient size meeting the wilderness criteria.
18	North: refuge boundary East: refuge road 331 from the point at which it enters the refuge to the Fort Peck Reservoir South: Fort Peck Reservoir West: refuge road 327 from the point at which it enters the refuge to the Fort Peck Reservoir (also the boundary of Wagon Coulee proposed wilderness unit)	36,666	Currently, this area contains both private inholdings and numerous refuge roads. While this is important habitat, with the encumbrances mentioned it is not suitable wilderness.
19	North: refuge boundary East: Wagon Coulee proposed wilderness unit South: Fort Peck Reservoir East: Timber Creek and road 339 as it meanders off the refuge	23,560	This unit contains the Bone Trail Boat Ramp along with multiple private inholdings. Due to the amount of inholdings and the recreational facilities, this area is considered to have extreme human impacts and does not meet the required wilderness criteria.
20	Islands within the Missouri River	Unknown	This unit consists of the Missouri River and the multitude of islands both permanent and those appearing and disappearing with the rise and fall of the river levels.
21	UL Bend National Wildlife Refuge–All land that is currently not part of UL Bend Wilderness		A network of roads crosses through the center of the UL Bend refuge. Due to these roads and their public use, these areas would not be suitable for wilderness proposal.

**The exclusion numbers correspond to figure A above.*

E.5 UL Bend Wilderness

Although the UL Bend Wilderness is not part of this review, information about its designation is provided. There are no new lands within the UL Bend refuge being considered for wilderness designation (refer to exclusion area 21 in table G).

Observed on May 21, 1809 by Lewis and Clark, as evidenced by their journals, was the Missouri River in its course making a sudden downward and extensive bend to receive the Musselshell River. Known today as the UL Bend National Wildlife Refuge, this portion of the refuge located at its very southern tip, is composed to 17,909 acres of designated wilderness. An additional 2,984 acres of designated wilderness are located in the very northwest corner of the refuge. In May 1974, the Service submitted 20,893 acres for inclusion as proposed wilderness units. On October 19, 1976, Congress passed Public Law 94-557 designating 20,890 acres as UL Bend Wilderness. Currently, the UL Bend Wilderness consists of 20,819 due to a subtraction in acres allowing for lake access (FWS 2008a).

The first wilderness study conducted for the UL Bend refuge was in 1974. The primary objectives for the refuge were to provide nesting, resting and feeding habitat for ducks, geese, swans, and other migratory birds. Other objectives included the protection of rare and endangered wildlife species, promoting and preserving diversity and healthy abundance of all wildlife, and providing compatible levels of wildlife-dependent recreation. Today, the UL Bend refuge is home to the black-footed ferret reintroduction effort. The refuge provides a large expansive location for large acreage, black-tailed prairie dog colonies, a keystone species that the ferrets heavily depend on. Providing a steady source of water are the many impoundments and pools of water gathered throughout the refuge. The bearpaw shale that makes up the main soil-type in the area is composed of dark gray, clayey shale and includes thin beds of bentonite. This type of soil provides a good seal for water with little percolation into the lower layers of loam allowing wetlands to develop. These wetlands are ideal for migrating waterfowl and resident wildlife.

E.6 Definitions

Several definitions are used in this wilderness review.

Wilderness Definition and Criteria. The definition of wilderness is in section 2(c) of the Wilderness Act: "A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value."

Designated Wilderness. An area designated in legislation and administered as part of the National Wilderness Preservation System).

Proposed Wilderness. An area of the Refuge System that the Secretary of the Interior (Secretary) has recommended to the President for inclusion in the National Wilderness Preservation System. The President then transmits the wilderness proposal to Congress. Once the Secretary transmits the recommendation to the President, the Service considers the area proposed wilderness and will manage it as designated wilderness.

Recommended Wilderness. An area of the Refuge System that the Director of the Service has recommended to the Secretary through the Assistant Secretary for Fish, Wildlife, and Parks for inclusion in the National Wilderness Preservation System.

Wilderness Review. The inventory, study, and decision making process the Service uses to determine whether to recommend Refuge System lands and waters for wilderness designation.

Wilderness Study Area. An area the Service is considering for wilderness designation. The Service identifies and establishes wilderness study areas through the inventory component of a wilderness review. The study areas include all areas that are still undergoing the review process, areas for which a final determination of suitability and recommendation for wilderness designation in the record of decision for the CCP and EIS is pending, and areas recommended for wilderness designation in a final CCP and awaiting approval by the Director. The Service considers areas recommended by the Director "recommended wilderness."

Wilderness Values. Wilderness values are biophysical (ecosystems, scenery, and natural processes), psychological (opportunity for solitude or primitive and unconfined recreation), symbolic (national and natural remnants of American cultural and evolutionary heritage), and spiritual (sense of connection with nature and values beyond one's self).

Appendix F

List of Plant and Animal Species

This appendix contains the common and scientific names of plants, amphibians, reptiles, fish, birds, and mammals of the Charles M. Russell National Wildlife Refuge and UL Bend National Wildlife Refuge.

Sentinel Plant Species

Sentinel plants are those species that vanish first when the ecological processes that occur within an ecosystem are out of balance. The following sentinel plant species occur on the upland plains and draws and north slopes on the Charles M. Russell National Wildlife Refuge and UL Bend National Wildlife Refuge.

SHRUBS AND TREES

rubber rabbitbrush, *Chrysothamnus nauseosus* spp. *nauseosus*
green rubber rabbitbrush, *Chrysothamnus nauseosus* spp. *graveolens*
saltbush, *Atriplex aptera*
winterfat, *Krascheninnikovia lanata*
silver buffaloberry, *Shepherdia argentea*
chokecherry, *Prunus virginiana*
boxelder, *Acer negundo*
green ash, *Fraxinus pennsylvanica*
plains cottonwood, *Populus deltoides*
redosier dogwood, *Cornus stolonifera*
golden current, *Ribes aureum*
aspen, *Populus tremuloides*

WARM-SEASON FORBS

purple coneflower, *Echinacea angustifolia*
stiff sunflower, *Helianthus pauciflorus*
dotted gayfeather, *Liatris punctata*
white prairieclover, D*alea candida*
purple prairieclover, *Dalea purpurea*
Maximilian sunflower, *Helianthus maximiliani*

Plant List

Scientific Name	*Common Name*
Aceraceae	**Maple Family**
Acer negundo	box elder
Agavaceae	**Century-plant Family**
Yucca glauca	soapweed yucca
Alismataceae	**Water Plantain Family**
Alisma gramineum	narrowleaf water plantain
A. triviale	northern water plantain
Sagittaria cuneata	arumleaf arrowhead
S. latifola	bulltongue arrowhead
Amaranthaceae	**Amaranth Family**
Amaranthus albus	prostrate pigweed
A. arenicola	sandhill amaranth
A. blitoides	mat amaranth

Scientific Name	*Common Name*
A. californicus	California amaranth
A. retroflexus	redroot amaranth
Anacardiaceae	**Sumac Family**
Rhus trilobata	skunkbush
Toxicodendron rydbergii	western poision ivy
Apaceae	**Carrot Family**
Cymopterus acaulis	plains spring parsley
Heracleum sphondylium	eltrot
Lomatium foeniculaceum	dessert biscuitroot
Musineon divaricatum	wild parsley
Osmorhiza longistylis	longstyle sweetroot
Sium suave	hemlock waterparsnip
Apocynaceae	**Dogbane Family**
Apocynum cannabinum	Indianhemp
Asclepiadaceae	**Milkweed Family**
Asclepias speciosa	showy milkweed
A. verticillata	whorled milkweed
Asteraceae	**Aster Family**
Achillea millefolium	common yarrow
Acroptilon repens	hardheads
Agoseris glauca	pale agoseris
Ambrosia artemisifolia	annual ragweed
Antennaria dimorpha	low pussytoes
A. microphylla	littleleaf pussytoes
A. neglecta	field pussytoes
A. parvifolia	small-leaf pussytoes
A. rosea	rosy pussytoes
Arctium lappa	greater burdock
Arnica sororia	twin arnica
Artemisia absinthium	absinthium
A. biennis	biennial wormwood
A. campestris	field sagewort
A. cana	silver sagebrush
A. dracunculus	tarragon
A. frigida	prairie sagewort
A. longifolia	longleaf wormwood
A. ludoviciana	white sagebrush
A. tridentata wyomigensis	Wyoming big sage
Aster brachyactis	aster brachyactis
A. falcatus	white prairie aster
Bidens cernua	nodding beggartick
B. frondosa	devil's beggartick
Brickellia eupatoroides	false boneset
Centaurea stoebe	spotted knapweed
Chaenactis douglasii	Douglas' dustymaiden
Chrysothamnus viscidiflorus	yellow rabbitbrush
Cirsium arvense	Canadian thistle
C. flodmanii	Flodman's thistle
C. undulatum	wavyleaf thistle
C. vulgare	bull thistle
Conzya canadensis	Canadian horseweed
Crepis atribarba	largeflower hawksweed
C. occidentalis	largeflower hawksweed
C. runcinata	fiddleleaf hawksweed
Cyclachaena xanthifolia	giant sumpweed
Dyssodia papposa	field marigold

Scientific Name	Common Name
Echinacea angustifolia	blacksamson echinaceae
Ericameria nauseosa ssp. *nauseosa* var. *glabrata*	rubber rabbitbrush
E. nauseosa ssp. *nauseosa* var. *nauseosa*	rubber rabbitbrush
Erigeron caespitosus	tufted fleabane
E. compositus	cutleaf daisy
E. corymbosus	longleaf fleabane
E. ochroleucus	buff fleabane
E. pumilus	shaggy fleabane
E. strigosus	prairie fleabane
Gallardia aristata	common gallardia
Gnaphalium palustre	western marsh cudweed
Grindelia squarrosa	curlycup gumweed
Gutierrezia sarothrae	broom snakeweed
Helenium autunmale	common sneezeweed
Helianthus annuus	common sunflower
H. maximiliani	Maximilian sunflower
H. pauciflorous	stiff sunflower
H. petiolaris	prairie sunflower
Heterotheca villosa	hairy false golden aster
Hieracium umbllatum	narrowleaf hawkweed
Hymenopappus polycephalus	manyhead hymenopappus
Hymenoxys richardsonii	pingue rubberweed
Iva axillaris	poverty weed
Lactuca tatarica	blue lettuce
Latuca punctata	dotted blazing star
Lygodesmia juncea	rush skeletonplant
Machaeranthera canescens	hoary tansyaster
M.grindelioides	rayless tansyaster
M. pinnatifida	lacy tansyaster
M. tanacetifolia	tansyleaf tansyaster
Microseris nutans	nodding microceris
Nothocalais cuspidata	sharppoint prairie-dandelion
Packera cana	wolly groundsel
Picradeniopsis oppositifolia	opposite leaf bahia
Ratibida columnifera	upright prairie coneflower
Senecio integerrimus	lambstongue ragwort
S. serra	tall ragwort
Solidago canadensis	Canada goldenrod
S. missouriensis	Missouri goldenrod
S. mollis	velvety goldenrod
S. rigida	stiff goldenrod
Sonchus arvensis spp. uliginosus	moist sowthistle
S. oleraceus	common sawthistle
Stenotus acaulis	stemless mock goldenweed
Stephanomeria runcinata	desert wirelettuce
Symphyotrichum ericoides var. pansum	manyflowered aster
S. laeve	smooth blue aster
Taraxacum laevigatum	rock dandelion
T. officinale	common dandelion
Townsedia exscupa	stemless Townsend daisy
Townsendia hookeri	Hooker's Townsend daisy
Tragopogon dubius	yellow salsify
Xanthium strumarium	rough cocklebur
Boraginaceae	**Borage Family**
Cryptantha celosioides	buttecandle
Cryptantha spiculifera	Snake River cryptantha

Scientific Name	*Common Name*
Hackelia deflexa	nodding stickseed
Lappula redowskii	flatspine stickseed
L. squarrosa	European stickseed
Lithospermum incisum	narrowleaf stoneseed
Plagiobothrys leptocladus	finebranched popcorn flower
Brassicaceae	**Mustard Family**
Alyssum desertorum	desert madwort
Arabis hirsuta	hairy rockcress
A. holboellii	Holboell's rockcress
Armoracia rusticans	horseradish
Camelina microcarpa	littlepod false flax
Cardaria draba	whitetop
Chorispora tenella	crossflower
Conringia orientalis	hare's ear mustard
Descurainia richardsonii	mountain tansy mustard
Draba albertina	slender draba
D. nemorosa	woodland draba
D. reptans	Carolina draba
Erysimum asperum	western wallflower
E. inconspicuum	shy wallflower
E. cheiranthoides L.	wormseed wallflower
Hesperis matronalis	dames rocket
Lepidium densiflorum	common pepperweed
L. perfoliatum	clasping pepperweed
Lesquerella alpina	alpine bladderpod
L. ludoviciana	foothill bladderpod
Physaria didymocarpa	common twinpod
Rorippa sinuata	spreading yellowcress
Sisymbrium altissimum	tall tumbleweed mustard
Thelypodium paniculatum	northweastern thelypody
Thlaspi arvense	field pennycress
Callitrichareae	**Water-starwort Family**
Callitriche hermaphroditica	northern water-starwort
Campanulaceae	**Bellflower Family**
Campanula rotundifolia	bluebell bellflower
Triodanis leptocarpa	slimpod Venus looking glass
Capparidaceae	**Caper Family**
Cleome serrulata	Rocky Mountain beeplant
Polanisia dodecandra spp. *trachysperma*	sandyseed clammyweed
Caprifoliaceae	**Honeysuckle Family**
Symphoricarpos albus	common snowberry
S. occidentalis	western snowberry
Caryophyllaceae	**Pink Family**
Arenaria lateriflora	bluntleaf sandwort
Cerastium arvense	field chickweed
C. nutans	nodding chickweed
Paronychia sessiliflora	creeping nailwort
Silene latifolia	bladder campion
S. menziesii	Menzies' campion
S. oregana	Oregon silene
Cactaceae	**Cactus Family**
Coryphantha missouriensis	Missouri pincushion
C. vivipara	purple pincushion
Opuntia fragilis	brittle prickly pear
O. poluacantha	plains prickly pear

Scientific Name	*Common Name*
Chenopodiaceae	**Goosefoot Family**
Atriplex argentea	silverscale saltbush
A. canescens	fourwing saltbush
A. confertifolia	shadescale saltbush
A. gardneri	Gardner's saltbush
A. patula	spear saltbush
A. powellii	Powell's saltbush
A. rosea	tumbling saltbush
Bassia scoparia	burning bush
Chenopodium album	lambsquarter
C. atrovirens	pinyon goosefoot
C. desiccatum	aridland goosefoot
C. fremontii	Fremont's goosefoot
C. glaucum	oakleaf goosefoot
C. leptophyllum	narrowleaf goosefoot
C. pratericola	desert goosefoot
C. rubrum	red goosefoot
C. subglabrum	smooth goosefoot
Endolepis diocicia	Suckley's endolepis
Krascheninnikovia lanata	winterfat
Monolepis nuttalliana	Nuttall's povertyweed
Salicornia rubra	red swapfire
Salsola tragus	prickly Russian thistle
Sarcobatus vermiculatus	greasewood
Suaeda calceoliformis	Pursh seepweed
Suaeda moquinii	Mojave seablite
Commelinaceae	**Spiderwort Family**
Tradescantia occidentalis	prairie spiderwort
Convolvulaceae	**Morning Glory Family**
Calystegia sepium	hedge false bindweed
Convolvulus arvensis	field bindweed
Cornaceae	dogwood
Cornus siricea spp. *siricea*	redosier dogwood
Cupressaceae	**Cypress Family**
Juniperus communis	common juniper
J. horizontalis	creeping juniper
J. scopulorum	Rocky Mountain juniper
J. scopulorum × *horizontalis*	hybrid of creeping and Rocky Mountain junipers
Cyperaceae	**Sedge Family**
Carex brevior	shortbreak sedge
C. douglasii	Douglas sedge
C. duriusula	needleleaf
C. filifolia	threadleaf sedge
C. hoodii	Hood's sedge
C. lanuginosa	American willyfruit sedge
C. pensylvanica	Pennsylvania sedge
C. rossii Boott.	Ross' sedge
C. sprengelii	Sprengel's sedge
C. vulpinoidea	fox sedge
C. xerantica	whitescale sedge
Eleocharis acicularis	needle spikerush
E. palustris	common spikerush
Schoenoplectus acutus	hardstem bulrush
S. americanus	chairmaker's bulrush
S. maritimus	cosmopolitan bulrush
S. tabernaemontani	softstem bulrush

Scientific Name	*Common Name*
Dryopteridaceae	**Wood Fern Family**
Cystopteris fragilis	brittle bladder fern
Woodsia oregana	Oregon cliff fern
Elaeagnaceae	**Oleaster Family**
Elaeagnus angustifolia	Russian olive
E. communtata	silverberry
Shepherdia argentea	silver buffaloberry
Elatinaceae	**Waterwort Family**
Elatine triandra	threestamen waterwort
Equisetaceae	**Horsetail Family**
Equisetum arvense	field horsetails
E. hyemale	scouringrush horsetails
E. laevigatum	smooth horsetail
E. variegatum	variegated scouringrush
Euphorbiaceae	**Spurge Family**
Euphorbia brachycera	horned spurge
Euphorbia esula	leafy spurge
Euphorbia glyptosperma	ribseed sandmat
Euphorbia serpyllifolia	thymeleaf sandmat
Euphorbia spathulata	water spurge
Fabaceae	**Legume Family**
Astragalus agrestis	purple vetch
A. bisulcatus	two grooved milkvetch
A. canadensis	Candian milkvetch
A. crassicarpus	groundplum milkvetch
A. flexuosus	flexile milkvetch
A. geyeri	Geyer's milkvetch
A. gilviflorus	plains milkvetch
A. gracilis	slender milkvetch
A. grummondii	Drummonds milkvetch
A. kentrophyta	spiny milkvetch
A. laxmanni var. *robustior*	prairie milkvetch
A. lentiginosus	freckled milkvetch
A. lotiflorus	lotus milkvetch
A. purshii	woolypod milkvetch
A. spatulatus	tufted milkvetch
Caragana arborescens	Siberian peashrub
Dalea candida	white prairie clover
D. purpurea	purple prairie clover
Glycyrrhiza lepidota	American licorice
Lupinus argenteus	silvery lupine
L. pusillus	rusty lupine
Medicago lupulina	black medrich
M. sativa	alfalfa
Melilotus officinalis	yellow sweetclover
Oxytropis besseyi	Bessey's locoweed
O. lambertii	purple locoweed
O. monticola	yellow flower locoweed
O. sericea	white locoweed
Pediomelum argophyllum	silverleaf breadroot
P. esculentum	large indian breadroot
P. lanceolatum	lemon scurfpea
P. tenuiflorum	slimflower scurfpea
Thermopsis rhombifolia	prairie thermopsis
Trifolium hybridum	alsike hybridum

Scientific Name	*Common Name*
Trifolium repens	white clover
Vicia americana	American vetch
Geraniaceae	**Geranium Family**
Geranium carolinianum	Carolina geranium
Grossulariaceae	**Currant Family**
Ribes americanum	American black currant
R. aureum	golden currant
R. cereum	wax currant
R. setosum	inland gooseberry
R. viscosissimum	sticky currant
Haloragidaceae	**Water Milfoil Family**
Myriophyllum spicatum	Eurasian water milfoil
Hydrophyllaceae	waterleaf
Ellisia nyctelea	Aunt Lucy
Nemophila breviflora	basin nemophila
Phacelia linearis	threadleaf phacelia
P. thermalis	heated phacelic
Iridaceae	**Iris Family**
Sisyrinchium montanum	strict blue-eyed grass
Juncaceae	**Rush Family**
Juncus balticus	Baltic rush
J. bufonius	toad rush
J. interior	inland rush
J. tenuis	Poverty rush
J. torreyi	Torrey's rush
Juncaginaceae	**Arrow-Grass Family**
Triglochin concinnum	slender arrowgrass
Lamiaceae	**Mint Family**
Dracocephalum parviflorum	American dragonhead
Hedeona drummondii	Drummond's false pennyroyal
Hedeona hispida	false penny royal
Lycopus asper	rough bungleweed
Mentha arvensis	wild mint
Monarda fistulosa	wild bermont (beebulm)
Nepeta cataria	catnip
Lemnaceae	**Duckweed Family**
Lemna minor	common duckweed
Liliaceae	**Lily Family**
Allium textile	textile onion
Asparagus officinalis	garden asparagus
Calochortus nuttallii	sego lily
Fritillaria pudica	yellow fritillary
Maianthemum stellatum	starry false lily of the valley
Prosartes trachycarpa	rough fruit fairybells
Smilax herbacea	smooth carrionflower
Zigadenus venenosus	meadow deathcamas
Linaceae	**Flax Family**
Linum lewisii	Lewis flax
L. rigidum	stiffstem flax
Loasaceae	**Loasa Family**
Mentzelia albicaulis	whitestem blazingstar
M. decapetala	ten petal blazingstar
M. laevicaulis	smooth stemmed blazingstar
Malvaceae	**Mallow Family**
Malva parviflora	cheeseweed mallow
Sphaeralcea coccinea	scarlet gold mallow

Scientific Name	*Common Name*
Najadaceae	**Water-nymph Family**
Najas guadalupensis	southern waternymph
Nyctaginaceae	**Four o'clock Family**
Mirabilis linearis	narrowleaf four o'clock
Oleaceae	**Olive Family**
Fraxinus pennsylvanica	green ash
Onagraceae	**Evening Primrose Family**
Calylophus serrulatus	yellow sundrops
Epilobium angustifolium	fireweed
E. ciliatum	fringed willow herb
E. pbrachycarpum	tall annual willowherb
E. pygmaeum	smooth spike primrose
Gaura coccineae	scarlet beeblossom
Oenothera albicaulis	whitest evening primrose
O. biennis	common evening primrose
O. cespitosa	gumbo evening primrose
O. flava	yellow evening primrose
O. nuttllii	Nuttall's evening primrose
O. villosa	hairy evening primrose
Orbanchaceae	**Broomrape Family**
Orobanche fasciculata	clustered broomrape
O. ludoviciana	Louisiana broomrape
Pinaceae	**Pine Family**
Pinus flexis	limber pine
Pinus ponderosa	ponderosa pine
Pseudotsuga menziesii	Douglas-fir
Plantaginaceae	**Plantain Family**
Plantago aristata	largebracted plantain
P. elongata	prairie plantain
P. lanceolata	narrow leaf plantain
P. major	common plantain
P. patagonica	hairy plantain (Indian wheat)
Poaceae	**Grass Family**
Achnatherum hymenoides	indian ricegrass
Agropyron cristatum	crested wheatgrass
Agrostis sabra	rough bentgrass
Agrostit stolonifera	creeping bentgrass
Andropogon hallii	sand bluestem
Avena sativa	common oat
Beckmannia syzigachne	American sloughgrass
Bouteloua dactyloides	buffalo grass
B. gracilis	blue grama
Bromus arvensis	field brome (Japanese brome)
B. carinatus	California brome
B. ciliatus	fringed brome
B. commutatus	bald brome
B. inermis	smooth brome
B. inermis spp. *pumpellianus*	Pumpelly's brome
B. tectorum	cheatgrass
Calamagrostis canadensis	bluejoint
C. montanensis	plains reedgrass
Calamovilfa longifolia	prairie sandreed
Dactylis glomerata	orchardgrass
Danthonia unispicata	onespike danthonia
Distichlis stricta	saltgrass

Scientific Name	Common Name
Echinochloa crus-galli	barnyard grass
Elymus canadensis	Canada wildrye
E. elymoides	squirreltail
E. lanceolatus	thickspike wheatgrass
E. repens	quackgrass
E. trachycaulum	slender wheatgrass
Eragrostis cilianensis	stinkgrass
E. pectinacea	tufted lovegrass
Festuca rubra	red fescue
Glyceria striata	fowl mannagrass
Hesperostipa comatga	needle and thread
Hordeum jubatum	foxtail barley
H. pusillum	little barley
Koeleria macrantha	prairie Junegrass
Leymus triticoides	heartless wildrye
Muhlenbergia asperifolia	scratchgrass
M. cuspidata	plains muhly
Munroa squarrosa	false buffalo grass
Nassella viridula	green needlegrass
Panicum cappillare	witchgrass
Pascopyrum smithii	western wheatgrass
Phalaris arundinaceae	reed canarygrass
Phleum pratense	timothy
Piptatherum micrantha	littleseed ricegrass
Poa annua	annual bluegrass
P. arida	plains bluegrass
P. bulbosa	bulbous bluegrass
P. compressa	Canada bluegrass
P. cusickii	Cusick's bluegrass
P. palustris	fowl bluegrass
P. pratensis	Kentucky bluegrass
P. secunda	Sandberg bluegrass
Polypogon monspeliensis	annual rabbit's foot grass
Pseudoroegneria spicata	bluebunch wheatgrass
Puccinellia nuttalliana	Nuttall's alkali grass
Schedonnardus paniculatus	tumble grass
Schizachyrium scoparium	little bluestem
Setaria viridis	green bristlegrass
Spartina gracilis	alkali cordgrass
Sporobolus airoides	alkali sacaton
S. cryptandrus	sand dropseed
Thinopyrum intermedium	intermediate wheatgrass
Torreyochloa pallida	pale false mannagrass
Triticum aestivum	common wheat
Vulpia octoflora	sixweeks fescue
Polemoniaceae	**Phlox Family**
Collomia linearis	tiny trumpet
Microsteris gracilis	slender phlox
Phlox alyssifolia	alyssumleaf phlox
P. hoodii	spiny phlox
Polygalaceae	**Milkwort Family**
Polygala alba	white milkwort
P. verticillata	whorled milkwort
Polygonaceae	buckwheat
Eriogonum annuum	annual buckwheat

Scientific Name	*Common Name*
E. cernuum	nodding buckwheat
E. flavum	alpine golden buckwheat
E. ovalifolium	cusion buckwheat
E. pauciflorum	few flower buckwheat
Polygonum aviculare	prostate knotweed
P. convolvulus	black bindweed
P. erectum	erect knotweed
P. lapathifolium	curlytop knotweed
P. punctatum	dotted smartweed
P. ramossissimum	bushy knotweed
Rumex acetosella	common sheep sorrel
R. aquaticus	western dock
R. crispus	curly dock
R. maritimus	golden dock
R. salicifolius	willow dock
R. venosus	veiny dock
Portulaceae	**Purslane Family**
Claytonia perfoliata	miner's lettuce
Portulaca oleracea	little hogweed
Potamagetonaceae	**Pondweed Family**
Potamogeton diversifolius	waterthread pondweed
P. foliosus	leafy pondweed
P. praelongus	whitesteam pondweed
P. pusillus	small pondweed
Stuckenia pectinat	sago pondweed
Primulaceae	**Primrose Family**
Androsace filiformis	filiformis rockjasmine
A. occidentalis	western rockjasmine
Ranunculaceae	**Buttercup Family**
Anemone cylindrica	candle anemone
A. multifida	Pacific anemone
Clematis ligusticifolia	western white clematis
Delphinium bicolor	little larkspur
Pulsatilla patenes	cutleaf anemone
Ranunculus aquatilis	white water crowfoot
R. cymbalaria	alkali buttercup
R. glaberrimus	sagebrush buttercup
R. macounii	Macoun's buttercup
R. sceleratus	cursed buttercup
Thalictrum venulosum	veiny meadow-rue
Rosaceae	**Rose Family**
Amelanchier alnifolia	Saskatoon serviceberry
Crataegus chrysocarpa	fineberry hawthorn
Fragaria virginiana	Virginia strawberry
Geum aleppicum	yellow avens
G. triflorum	prairie smoke
Potentilla anserina	silverweed cinquefoil
P. arguta	tall cinquefoil
P. biennis	biennial cinquefoil
P. gracilis	slender cinquefoil
P. paradoxa	paradox cinquefoil
P. pensylvanica	Pennsylvania cinquefoil
Prunus virginiana	chokecherry
Rosa acicularis spp. *sayi*	prickly rose

Scientific Name	*Common Name*
R. arkansana	prairie rose
R. woodsii	Wood's rose
Rubiaceae	**Bedstraw Family**
Galium aparine	stickywilly (catchweed bedstraw)
G. boreale	northern bedstraw
G. trifidum	threepetal bedstraw
Salicaeae	**Willow Family**
Populus deltoides	eastern cottonwood
P. tremuloides	quaking aspen
P. balsamifera	balsam poplar
Salix amygdaloides	peachleaf willow
S. bebbiana	Bebb willow
S. exigua	narrowleaf willow
S. fragilis	crack willow
S. lasiandra	Pacific willow
S. lutea	yellow willow
Santalaceae	**Sandalwood Family**
Comandra umbellata	bastard toadflax
Saxifragaceae	**Saxifrag Family**
Heuchera parvifolia	littleleaf alumroot
Scrophulariaceae	**Figwort Family**
Bacopa rotundifolia	disk waterhyssop
Besseya wyomingensis	Wyoming besseya
Castilleja sessiliflora	downy paintedcup
Collinsia parviflora	maiden blue eyed Mary
Limosella aquatica	water mudwort
Orthocarpus leteus	yellow owl's clover
Penstemon albidus	white penstemon
P. nitidus	waxleaf penstemon
Veronica anagallis-aquatica	water speedwell
V. pergrina	neckweed
Selaginellaceae	**Spikemoss Family**
Selafinella densa	lesser spikemoss
Solanaceae	**Potatoe Family**
Solanum rostratum	buffalo nightshade
S. triflorum	cutleaf nightshade
Tamaricaceae	**Tamarisk Family**
Tamarix chinensis	five stamen tamarisk (saltcedar)
Typhaceae	**Cattail Family**
Typha latifolia	broadleaf cattail
Urticeae	**Nettle Family**
Parietaria pensylvanica	Pennsylvania
Urtica dioica	stinging nettle
Verbenaceae	**Verbena Family**
Verbena bracteata	bigbract verbena
Violaceae	**Violet Family**
Viola adunca	hookedsur violet
V. canadensis	Canadian white violet
V. nephrophylla	northern bog violet
V. nuttallii	smooth stemmed blazing star
Vitaceae	**Grape Family**
Parthenocissus inserta	Virginia creeper
Zannichelliaceae	horned pondweed family
Zigadenus venenosus	meadow deathcamas

Animal List

BUTTERFLIES

Source: Big Sky Institute.

Scientific Name	*Common Name*
Nymphalidae	**Brush-footed Butterflies**
Limenitidinae	**Admirals and Relatives**
Limenitis arthemis	red-spotted purple
L. archippus	viceroy
L. weidemeyerii	Weidemeyer's admiral
L. arthemis arthemis	white admiral
Heliconiinae	**Longwings**
Speyeria aphrodite	Aphrodite fritillary
S. callippe	callippe fritillary
S. coronis	coronis fritillary
S. edwardsii	Edwards' fritillary
S. egleis	great basin fritillary
S. cybele	great spangled fritillary
S. hydaspe	hydaspe fritillary
S. mormonia	Mormon fritillary
S. hesperis	northwestern fritillary
S. zerene	Zerene fritillary
Boloria bellona	meadow fritillary
B. selene	silver-bordered fritillary
Euptoieta claudia	variegated fritillary
Nymphalinae	**True Brush-foots**
Nymphalis vaualbum	Compton tortoiseshell
N. antiopa	mourning cloak
Euphydryas editha	Edith's checkerspot
E. gillettii	Gillette's checkerspot
E. chalcedona	variable checkerspot
Phycoides pulchellus	field crescent
P. cocyta	northern crescent
P. pallid	pale crescent
P. tharos	pearl crescent
P. batesii	tawny crescent
Chlosyne gorgone	Gorgone checkerspot
C. palla	northern checkerspot
C. acastus	sagebrush checkerspot
Polygonia progne	gray comma
P. faunus	green comma
P. gracilis	hoary comma
P. satyrus	satyr comma
Aglais milberti	Milbert's tortoiseshell
Vanessa cardui	painted lady
V. atalanta	red admiral
V. annabella	west coast lady
Riodinidae	**Metalmarks**
Apodemia mormo	Mormon metalmark
Parnassiinae	**Parnassians**
Parnassian smintheus	Rocky Mountain parnassian
Papilioninae	**Swallowtails**
Papilio zelicaon	anise swallowtail
P. canadensis	Canadian tiger swallowtail
P. machaon	old world swallowtail
P. eurymedon	pale swallowtail

Scientific Name	Common Name
P. multicaudata	two-tailed swallowtail
P. rutulus	western tiger swallowtail

AMPHIBIANS and REPTILES

Ambystomatidae	**Mole Salamanders**
Ambistoma tigrinum	tiger salamander
Hylidae	**Chorus Frogs**
Pseudacris triseriata	western chorus frog
Ranidae	**True Frogs**
Rana pipiens	northern leopard frog
Bufonidae	**True Toads**
Bufo woodhousei	Woodhouse's toad
B. cognatus	Great Plains toad
Scaphiopodidae	**Spadefoots**
Scaphiopus bombifrons	plains spadefoot
Chelydridae	**Snapping Turtles**
Chelydra serpentin	snapping turtle
Emydidae	**Pond Turtles**
Chrysemys picta	painted turtle
Trionychidae	**Softshell Turtles**
Trionyx spiniferus	spiny softshell
Colubridae	**Colubrid Snakes**
Coluber constrictor	racer
Thamnophis elegans	terrestrial garter snake
T. radix	plains garter snake
T. sirtalis	common garter snake
Lampropeltis triangulum	milk snake
Pituophis catenifer	gopher snake or bull snake
Heterodon nasicus	western hog-nosed snake
Viperidae	**Vipers**
Crotalus viridus	prairie rattlesnake

FISHES

Sources: Fishes of Montana (Brown); Fishery Survey of the Streams of Charles M. Russell National Wildlife Refuge, Montana (Bramblett and Zale).

Acipenseridae	**Sturgeons**
Scaphirhynchus albus (N)	pallid sturgeon
S. platorynchus (N)	shovelnose sturgeon
Polyodontidae	**Paddlefishes**
Polyodon spathula	paddlefish
Lepisosteidae	**Gars**
Lepisosteus platostomus	shortnose gar
Hiodontidae	**Mooneyes**
Hiodon alosoides	goldeneye
Salmonidae	**Trout**
Oncorhynchus mykiss	rainbow trout
Salmo trutta	brown trout
Salvelinus namaycush	lake trout
Coregonus artedi	cisco
Cyprinidae	**Minnows**
Hybognathus hankinsoni	brassy minnow
H. placitus	plains minnow
H. argyritis	western silvery minnow
Cyprinus carpio	common carp

Scientific Name	*Common Name*
Notropis atherinoides	emerald shiner
Pimephales promelas	fathead minnow
Hybopsis gracilis	flathead chub
Couesius plumbeus	lake chub
Rhynichthys cataractae	longnose dace
Phoxinus eos	northern redbelly dace
P. eos × *P. neogaeus*	northern redbelly dace × finescale dace
Notropis hudsonius	spottail shiner
N. ludibundus	sand shiner
Semotilus atromaculatus	creek chub
Macrhybobsis gelida	sturgeon chub
M. meeki	sicklefin chub
Castostomidae	**Suckers**
Catostomus catostomus	longnose sucker
C. commersoni	white sucker
Carpoides carpio	river carpsucker
Cycleptus elongate	blue sucker
Ictiobus bubalus	smallmouth buffalo
I. cyprinellus	bigmouth buffalo
Moxostoma macrolepidotum	shorthead redhorse
Ictaluridae	**Bullheads/Catfishes**
Ictalurus melas	black bullhead
I. punctatus	channel catfish
Noturus flavus	stonecat
Esocidae	**Pikes/Pickerels**
Esox lucius	northern pike
Gadidae	**Burbot**
Lota lota	burbot
Gasterosteidae	**Sticklebacks**
Culaea inconstans	brook stickleback
Centrarchidae	**Sunfishes**
Pomoxis nigromaculatus	black crappie
P. annularis	white crappie
Lepomis cyanellus	green sunfish
L. macrochirus	bluegill
Micropterus salmoides	largemouth bass
Percidae	**Perches**
Etheostoma exile	Iowa darter
Stizostedion canadense	sauger
S. vitreum	walleye
Perca flavenscens	yellow perch
Sciaenidae	**Drums**
Aplodinotus grunniens	freshwater drum
Fundulidae	**Killfishes**
Fundulus zebrinus	plains killfish

Scientific Name	*Common Name*

BIRDS

Of the bird species recorded, there are the following:

- 5 introduced species
- 1 extinct species
- 2 extirpated species
- 125 breeding species
- 2 federally endangered species
- 2 federally threatened species

The order of birds below follows the American Ornithologists' Union checklist of Northern American birds (2000).
* indicates a documented breeding record
# indicates a migratory nongame bird species of management concern in the United States (FWS 1995)

Gaviidae	**Loons**
Gavia immer	common loon#
G. stellata	red-throated loon
G. pacifica	Pacific loon
G. adamsii	yellow-billed loon
Podicipedidae	**Grebes**
Podilymbus podiceps	pied-billed grebe*
Podiceps auritus	horned grebe*
P. grisegena	red-necked grebe
P. nigricollis	eared grebe*
Aechmophorus occidentalis	western grebe*
A. clarkia	Clark's grebe*
Pelicanidae	**Pelicans**
Pelecanus erythrorhynchos	American white pelican*
Phalacrocoracidae	**Cormorants**
Phalacrocorax auritus	double-crested cormorant*
Ardeidae	**Bitterns/Herons/Egrets**
Botaurus lentiginosus	American bittern*#
Ardea herodias	great blue heron*
A. alba	great egret
Egretta thula	snowy egret
Nycticorax nycticorax	black-crowned night heron
Threskiornithidae	**Ibises/Spoonbills**
Plegadis chihi	white-faced ibis
Cathartidae	**New World Vultures**
Cathartes aura	turkey vulture
Anatidae	**Swans/Geese/Ducks**
Anser albifrons	greater white-fronted goose
Chen caerulescens	snow goose
C. rossii	Ross' goose
Branta canadensis	Canada goose*
Cygnus columbianus	tundra swan
Aix sponsa	wood duck
Anas strepera	gadwall*
A. americana	American wigeon*
A. rubripes	American black duck
A. platyrhynchos	mallard*
A. discors	blue-winged teal*
A. cyanoptera	cinnamon teal*
A. clypeata	northern shoveler*
A. acuta	northern pintail*
A. crecca	green-winged teal*

Scientific Name	*Common Name*
Aythya valisineria	canvasback*
A. americana	redhead*
A. collaris	ring-necked duck*
A. affinis	lesser scaup*
Melanitta fusca	white-winged scoter
Clangula hyemalis	long-tailed duck
Bucephala albeola	bufflehead*
B. clangula	common goldeneye
B. islandica	Barrow's goldeneye
Lophodytes cucullatus	hooded merganser
Mergus merganser	common merganser
M. serrator	red-breasted merganser
Oxyura jamaicensis	ruddy duck*
Accipitridae	**Osprey/Kites/Hawks/Eagles**
Pandion halliaetus	osprey
Haliaeetus leucocephalus	bald eagle (threatened)
Circus cyaneus	northern harrier
Accipiter striatus	sharp-shinned hawk
A. cooperii	Cooper's hawk
A. gentilis	northern goshawk
Buteo platypterus	broad-winged hawk
B. swainsoni	Swainson's hawk
B. jamaicensis	red-tailed hawk*
B. regalis	ferruginous hawk
B. lagopus	rough-legged hawk
Aquila chrysaetos	golden eagle*
Falconidae	**Falcons/Caracaras**
Falco sparverius	American kestrel
F. columbarius	merlin
F. rusticolus	gyrfalcon
F. peregrinus	peregrine falcon
F. mexicanus	prairie falcon
Phasianidae	**Gallinaceous birds**
Perdix perdix	gray partridge (introduced)
Phasianus colchicus	ring-necked pheasant (introduced)
Centrocercus urophasianus	greater sage-grouse
Tympanuchus phasianellus	sharp-tailed grouse
Meleagris gallopavo	wild turkey
Rallidae	**Rails**
Rallus limicola	Virginia rail
Porzana carolina	sora
Fulica americana	American coot
Gruidae	**Cranes**
Grus canadensis	sandhill crane
Charadriidae	**Plovers**
Pluvialis squatarola	black-bellied plover
P. dominica	American golden-plover
Charadrius semipalmatus	semipalmated plover
C. melodus	piping plover (threatened)
C. vociferous	killdeer
C. montanus	mountain plover
Recurvirostridae	**Stilts/Avocets**
Himantopus mexicanus	black-necked stilt
Recurvirostra americana	American avocet

Scientific Name	*Common Name*
Scolopacidae	**Sandpipers/Phalaropes**
Tringa melanoleuca	greater yellowlegs
T. flavipes	lesser yellowlegs
T. solitaria	solitary sandpiper
Actitus macularius	spotted sandpiper
Catoptrophorus semipalmatus	willet
Artramia longicauda	upland sandpiper
Numenius borealis	Eskimo curlew (extirpated)
N. phaeopus	whimbrel
N. americanus	long-billed curlew
Limosa fedoa	marbled godwit
Arenaria interpres	ruddy turnstone
Calidris alba	sanderling
C. pusilla	semipalmated sandpiper
C. mauri	western sandpiper
C. minutilla	least sandpiper
C. fuscicollis	white-rumped sandpiper
C. bairdii	Baird's sandpiper
C. melanotos	pectoral sandpiper
C. alpine	dunlin
C. himantopus	stilt sandpiper
Limnodromus scolopaceus	long-billed dowitcher
Phalaropus tricolor	Wilson's phalarope
P. lobatus	red-necked phalarope
Tryngites subruficollis	buff-breasted sandpiper
Gallinago delicate	Wilson's snipe
Laridae	**Gulls/Terns/Jaegers**
Larus pipixcan	Franklin's gull
L. philadelphia	Bonaparte's gull
L. delawarensis	ring-billed gull
L. californicus	California gull
L. thayeri	Thayer's gull
L. hyperboreus	glaucous gull
L. canus	mew gull
L. argentatus	herring gull
L. glaucescens	glaucous-winged gull
L. marinus	great black-backed gull
Sterna caspia	Caspian tern
S. hirundo	common tern
S. forsteri	Forster's tern
S. antillarum	least tern (endangered)
Chlidonias niger	black tern
Xema sabini	Sabine's gull
Rissa tridactyla	black-legged kittiwake
Stercorarius pomarinus	pomarine jaeger
Columbidae	**Pigeons/Doves**
Columba livia	rock dove (introduced)
C. fasciata	band-tailed pigeon
Zenaida macroura	mourning dove
Ectopistes migratorius	passenger pigeon (extinct)
Cuculidae	**Cuckoos/Anis**
Coccyzus erythropthalmus	black-billed cuckoo
Strigidae	**Owls**
Bubo virginianus	great horned owl
Nyctea scandiaca	snowy owl

Scientific Name	*Common Name*
Surnia ulula	northern hawk-owl
Athene cunicularia	burrowing owl
Asio otus	long-eared owl
A. flammeus	short-eared owl
Glaucidium gnoma	northern pygmy-owl
Aegolius acadicus	northern saw-whet owl
Caprimulgidae	**Goatsuckers/Allies**
Chordeiles minor	common nighthawk
Phalaenoptilus nuttallii	common poorwill
Apodidae	**Swifts**
Chaetura pelagica	chimney swift
Aeronautes saxatalis	white-throated swift
Trochilidae	**Hummingbirds**
Archilochus colubris	ruby-throated hummingbird
Selasphorus rufus	rufous hummingbird
Alcedinidae	**Kingfishers**
Ceryle alcyon	belted kingfisher
Picidae	**Woodpeckers**
Melanerpes erythrocephalus	red-headed woodpecker
Picoides pubescens	downy woodpecker
P. villosus	hairy woodpecker
Colaptes auratus	northern flicker
Sphyrapicus nuchalis	red-naped sapsucker
Tyrannidae	**New World Flycatchers**
Contopus sordidulus	western wood-pewee
Empidonax traillii	willow flycatcher
E. minimus	least flycatcher
E. oberholseri	dusky flycatcher
Sayornis saya	Say's phoebe
Tyrannus verticalis	western kingbird
T. tyrannus	eastern kingbird
T. vociderans	Cassin's kingbird
Laniidae	**Shrikes**
Lanius ludovicianus	loggerhead shrike
L. excubitor	northern shrike
Vireonidae	**Vireos**
Vireo gilvus	warbling vireo
V. philadelphicus	Philadelphia vireo
V. olivaceus	red-eyed vireo
Corvidae	**Crows/Jays/Magpies**
Cyanocitta cristata	blue jay
Pica hudsonia	black-billed magpie
Corvus brachyrhynchos	American crow
C. corax	common raven
Gymnorhinus cyanocephalus	pinyon jay
Nucifraga columbiana	Clark's nutcracker
Alaudidae	**Larks**
Eremophila alpestris	horned lark
Hirundinidae	**Swallows**
Tachycineta bicolor	tree swallow
Stelgidopteryx serripennis	northern rough-winged swallow
Riparia riparia	bank swallow
Petrochelidon pyrrhonota	cliff swallow
Hirundo rustica	barn swallow
Tachycineta thalassina	violet-green swallow

Scientific Name	*Common Name*
Paridae	**Chickadees/Titmice**
Poecile atricapilla	black-capped chickadee*
P. gambeli	mountain chickadee
Sittidae	**Nuthatches**
Sitta canadensis	red-breasted nuthatch
S. carolinensis	white-breasted nuthatch
Certhiidae	**Creepers**
Certhia americana	brown creeper
Troglodytidae	**Wrens**
Troglodytes aedon	house wren
Cistothorus palustris	marsh wren
Salpinctes obsoletus	rock wren
Cinclidae	**Dippers**
Cinclus mexicanus	American dipper
Regulidae	**Kinglets**
Regulus satrapa	golden-crowned kinglet
R. calendula	ruby-crowned kinglet
Turdidae	**Thrushes**
Sialia sialis	eastern bluebird
S. currocoides	mountain bluebird
Myadestes townsendi	Townsend's solitaire
Ctharus fuscescens	veery
C. minimus	gray-cheeked thrush
C. ustulatus	Swainson's thrush
C. guttatus	hermit thrush
Turdus migratorius	American robin
Mimidae	**Mockingbirds/Thrashers/Allies**
Dumetella carolinensis	gray catbird
Toxostoma rufum	brown thrasher
Mimus polyglottos	northern mockingbird
Oreoscoptes montanus	sage thrasher
Sturnidae	**Starlings**
Sturnus vulgaris	European starling (introduced)
Motacillidae	**Wagtails/Pipits**
Anthus ruescens	American (water) pipit
A. spragueii	Sprague's pipit
Bombycillidae	**Waxwings**
Bombycilla garrulus	Bohemian waxwing
B. cedrorum	cedar waxwing
Parulidae	**New World Warblers**
Vermivora peregrina	Tennessee warbler
V. celata	orange-crowned warbler
Dendroica petechia	yellow warbler
D. magnolia	magnolia warbler
D. tigrina	Cape May warbler
D. coronata	yellow-rumped warbler
D. townsendi	Townsend's warbler
D. palmarum	palm warbler
D. striata	blackpoll warbler
Mniotilta varia	black-and-white warbler
Setophaga ruticilla	American redstart
Seiurus aurocapillus	ovenbird
S. noveboracensis	northern waterthrush
Oporornis tolmiei	MacGillivray's warbler
Geothlypis trichas	common yellowthroat

Scientific Name	*Common Name*
Wilsonia pusilla	Wilson's warbler
W. canadensis	Canada warbler
Icteria virens	yellow-breasted chat
Thraupidae	**Tanagers**
Piranga ludoviciana	western tanager
Emberizidae	**Buntings/Seedeaters**
Pipilo maculatus	spotted towhee
Spizella arborea	American tree sparrow
S. passerina	chipping sparrow
S. pallida	clay-colored sparrow
S. breweri	Brewer's sparrow
S. pusilla	field sparrow
Pooecetes gramineus	vesper sparrow
Chondestes grammacus	lark sparrow
Calamospiza melanocorys	lark bunting
Passerculus sandwichensis	Savannah sparrow
Ammodramus savannarum	grasshopper sparrow
A. bairdii	Baird's sparrow
Melospiza melodia	song sparrow
M. lincolnii	Lincoln's sparrow
Zonotrichia alicollis	white-throated sparrow
Z. querula	Harris' sparrow
Z. leucophrys	white-crowned sparrow
Junco hyemalis	dark-eyed junco
Calcarius mccownii	McCown's longspur
C. lapponicus	Lapland longspur
C. ornatus	chestnut-collared longspur
Plectrophenax nivalis	snow bunting
Pipilo chlorurus	green-tailed towhee
Melospiza georiana	swamp sparrow
Zonotrichia atricapilla	golden-crowned sparrow
Cardinalidae	**Saltators/Cardinals/Allies**
Pheucticus ludovicianus	rose-breasted grosbeak
P. melanocephalus	black-headed grosbeak
Passerina amoena	Lazuli bunting
Cardinalis cardinalis	northern cardinal
Passerina cyanea	indigo bunting
Icteridae	**Blackbirds/Orioles**
Dolichonyx oryzivorus	bobolink*
Agelaius phoeniceus	red-winged blackbird*
Surnella neglecta	western meadowlark*
Xanthocephalus xanthocephalus	yellow-headed blackbird*
Euphagus carolinus	rusty blackbird
E. cyanocephalus	Brewer's blackbird*
Quiscalus quiscula	common grackle*
Molothrus ater	brown-headed cowbird*
Icterus spurius	orchard oriole*
I. galbula	Baltimore oriole*
I. bullockii	Bullock's oriole
Fringillidae	**Finches/Crossbills**
Pinicola enucleator	pine grosbeak
Carduelis flammea	common redpoll
C. hornemanni	hoary redpoll
C. pinus	pine siskin
C. tristis	American goldfinch

Scientific Name	Common Name
Leucosticte tephrocotis	gray-crowned rosy-finch
Pinicola enucleator	pine grosbeak
Loxia curvirostra	red crossbill
L. leucoptera	white-winged crossbill
Coccothraustes vespertinus	evening grosbeak
Passeridae	**Old World Sparrows**
Passer domesticus	house sparrow (introduced)

MAMMALS

Sources: Peterson Field Guides–Mammals (Burt and Grossenheider), A Guide To Montana Mammals (Hoffman and Pattie), The Wild Mammals of Montana (Foresman), Montana Natural Heritage Program.

Soricidae	**Shrews**
Sorex cinereus	cinereus (masked) shrew*
S. merriami	Merriam's shrew
S. haydeni	Hayden's shrew (R)
S. monticolus	montane shrew
Vespertilionidae	**Vesper Bats**
Myotis evotis	long-eared myotis
M. lucifugus	little brown myotis*
M. ciliolabrum	western small-footed myotis
M. thysanodes	fringed myotis
M. volans	long-legged myotis
Lasiurus borealis	eastern red bat
L. cinereus	hoary bat
Lasionycteris noctivagans	silver-haired bat
Eptesicus fuscus	big brown bat
Corynorhinus townsendii	Townsend's big-eared bat
Leporidae	**Hares/Rabbits**
Sylvilagus nuttalli	mountain cottontail
S. audubonii	desert cottontail
Lepus townsendii	white-tailed jackrabbit*#
Sciuridae	**Squirrels**
Tamias minimus	least chipmunk
T. amoenus	yellow-pine chipmunk
T. ruficaudus	red-tailed chipmunk
Spermophilus richardsonii	Richardson's ground squirrel*#
S. tridecemlineatus	thirteen-lined ground squirrel*#
Cynomys ludovicianus	black-tailed prairie dog
Marmota flaviventris	yellowbelly marmot (R)
Geomyidae	**Pocket Gophers**
Thomomys talpoides	northern pocket gopher*#
Heteromyidae	**Pocket Mice/Kangaroo Rats**
Perognathus fasciatus	olive-backed pocket mouse*#
Dipodomys ordii	Ord's kangaroo rat
Castoridae	**Beavers**
Castor canadensis	American beaver*
Muridae	**Mice/Voles/Rats/Lemmings**
Reithrodontomys megalotis	western harvest mouse
Peromyscus leucopus	white-footed mouse
P. maniculatus	deer mouse*#
Onychomys leucogaster	northern grasshopper mouse*#
Neotoma cinerea	bushy-tailed woodrat
Mus musculus	house mouse*
Microtus ochrogaster	prairie vole*

Scientific Name	*Common Name*
Lemmiscus curtatus	sagebrush vole*
Ondatra zibethicus	common muskrat*#
Microtus longicaudus	long-tailed vole
Dipodidae	**Jumping Mice**
Zapus princeps	western jumping mouse(#?)
Erethizontidae	**New World Porcupines**
Erethizon dorsatum	common porcupine*
Canidae	**Wolves/Coyotes/Foxes**
Canis latrans	coyote*#
C. lupus	gray wolf*# (extirpated)
Vulpes velox	swift fox*#
V. vulpes	red fox*
Ursidae	**Bears**
Ursus americanus	black bear*
U. arctos	grizzly (brown) bear* (extirpated)
Procyonidae	**Raccoons**
Procyon lotor	raccoon*
Mustelidae	**Weasels**
Mustela frenata	long-tailed weasel*#
M. nigripes	black-footed ferret
M. nivalis	least weasel*
M. vison	American mink*
M. ermine	short-tailed weasel
Gulo gulo	wolverine*
Taxidea taxus	American badger*#
Lontra canadensis	northern river otter
Mephitidae	**Skunks**
Mephitis mephitis	striped skunk*#
Felidae	**Cats**
Felis catus	feral cat* (introduced)
Lynx rufus	bobcat*
Puma concolor	mountain lion
Cervidae	**Deer/Moose/Elk**
Cervus elephus	Wapiti (elk)*
Odocoileus hemionus	mule deer*
O. virginianus	white-tailed deer*
Alces alces	moose
Antilocapridae	**Pronghorns**
Antilocapra americana	pronghorn*#
Bovidae	**Bison/Goat/Sheep**
Bos bison	American bison (extirpated)
B. taurus	domestic cattle
Ovis canadensis	bighorn sheep

Bibliography

Alfonso, James M. 1991. South fork of Rock Creek riparian habitat. Rehabilitation project summary. U. S. Fish and Wildlife Service internal memo. Unpublished.

American Bird Conservancy. 2009. Threats to birds–introduced species. Downloaded from<http://www.abcbirds.org/conservationissues/threats/invasives.html> accessed February 2010.

American Ornithologists' Union. 2000. American Ornithologists' Union checklist of Northern American birds, (7th ed. 1998; 42nd supplement 2000).

American Prairie Foundation. 2008. American Prairie Foundation Annual Report. <http://www.americanprairie.org/about/annual_reports/Annual_Report_2008.pdf>

Ames, Charles R. 1977. Wildlife Conflicts in Riparian Management: Grazing. In Importance, Preservation and Management of Riparian Habitat: A Symposium. Tucson, Arizona. General Technical Report RM–43. USDA Forest Service Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado. 49–51.

Anderson, Stanley, H. Managing our Natural Resources. 1985. Charles E. Merrill Publishing Co. Columbus, Ohio. 156 p.

Anderson, R.C. 1990. The historic role of fire in the North American grassland. Pages 8–18 in S.L. Collins and L.L. Wallace, editors. Fire in North American tallgrass prairies. University of Oklahoma Press. Norman, Oklahoma.

Atkinson, Shirley. J.; Dood, Arnold R. 2006. Montana interior least tern management plan. Montana Fish, Wildlife and Parks, Bozeman, Montana. 47 p.

———. 2006. Montana piping plover management plan. Montana Department of Fish, Wildlife and Parks, Bozeman, Montana. 78 p.

Auble, G.T.; Scott, M.L. 1998. Fluvial disturbance patches and cottonwood recruitment along the upper Missouri River, MT. Wetlands 18:546–56.

Auble, G.T., Scott, M.L.; Frazier, J.; Krause, C.; Merigliano, M. 2005. Cottonwood in the Missouri Breaks National Monument. U.S. Geological Survey, Biological Resources Discipline, Fact Sheet 2005–3132. 4 p.

Bailey, Joseph K.; Schweitzer, Jennifer A.; Whitham, Thomas G. 2001. Salt Cedar negatively Affects Biodiversity of Aquatic Macroinvertebrates. Wetlands 21(3):442–7.

Battazzo, A.M. 2007. Winter survival and habitat use by female greater sage-grouse in South Phillips County, Montana 2004–2006. M.S. Thesis. University of Montana, Missoula, USA.

Big Sky Institute. MSU–Bozeman.

Bureau of Economic Analysis. 2008. U.S. Department of Commerce. Regional Economic Information System, www.bea.gov, last accessed December 2009.

———. 2009. U.S. Department of Commerce, Regional Economic Information System, <http://www.bea.gov/regional/reis/default.cfm?selTable=CA25>, last accessed December 2009.

Belsky, A.J.; Matzke, A.; Uselman, S. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. Journal of Soil and Water Conservation 54:419–31.

Bender-Keigley, Janet. 2008. Landowners' Guide to Eastern Montana Wetlands and Grasslands. Montana Watercourse:http://www.mtwatercourse.org/Publications/Publications.htm.

Bengston, David N. 1994. Changing Forest Values and Ecosystem Management. Society and Natural Resources 7:515–33.

Biggins, Dean E.; Godbey, Jerry L.; Gage, Kenneth L.; Carter, Leon G.; Montenieri, John A. 2010. Flea control improves survival of three species of prairie dogs (*Cynomys*): evidence for enzootic plague? Vector-borne and Zoonotic Diseases 10(1):17–26.

Black, Scott Hoffman; Hodges, Nathan; Vaughan, Mace; Shepherd, Matthew. 2007. Pollinators in natural areas: a primer on habitat management. The Xerces Society for Invertebrate Conservation. 8 p.

Bock, Carl E. [unknown date] Birds and Bovines: Effects of Livestock grazing on birds in the West. Downloaded from <http://www.publiclandsranching.org/htmlres/wr_birds_bovines/htm> accessed on August 31, 2009. 4 p.

Bock, Carl E.; Saab, V.A.; Rich, T.D.; Dobkin, D.S. 1993. Effects of Livestock Grazing on Neotropical Migratory Landbirds in Western North America. Rocky Mountain Forest and Range Experiment Station, U.S. Dept. of Agriculture, Forest Service.

Boughton, John and Lynelle Peteson. 2007. Fort Peck: National Register eligibility of 13 archaeological sites in Phillips County, Montana. Report produced by Ethnoscience, Incorporated, Billings, Montana. Report produced for the U.S. Army Corps of Engineers, Omaha. Contract number W(9128F–06–0185). 370 p.

Bovee, K.; Scott, M.L. 2002. Implications of flood pulse restoration for *Pupulus* regeneration on the upper Missouri River. River Research and Applications 18:287–98.

Bragg, T.B; Steuter, A.A. 1995. Mixed Prairie of the North American Great Plains: Transactions, 60th of the North American Wildlife and Natural Resource Conference. 60:335–48.

Bramblett, Robert G.; Zale, Alexander V. 1999. Fishery Survey of the Streams of the Charles M. Russell National Wildlife Refuge, Montana. Montana Cooperative Fishery Research Unit, USGS, Montana State University, Bozeman, Montana. 40 p.

———. 2000. The Ichthyofauna of Small Streams on the Charles M. Russell National Wildlife Refuge, Montana. Intermountain Journal of Sciences 6(2):57–67.

Bramblett, Robert G.; Jones-Wuellner, Melissa A; Guy, Christopher S.; Zale, Alexander V. 2004. Annual Report 2004. Montana Prairie Riparian Native Species Study. Montana Cooperative Fisheries Unit, Montana State University, Bozeman. 50 p.

Brennan, Leonard A.; Kuvlesky, William P., Jr. 2005. North American Grassland Birds: An Unfolding Conservation Crisis? Journal of Wildlife Management 69(1):1–13.

Briske, D.D.; Fuhlendorf, S.D.; Smeins, F.E. 2005. State-and-transition models, thresholds, and rangeland health: A synthesis of ecological concepts and perspectives. Rangeland Ecology and Management 58:1–10.

Briske, D.D.; Derner, J.D.; Brown, J.R. [et al.]. 2008. Rotational grazing on Rangelands: Reconciliation of perception and experimental evidence. Rangeland Ecology and Management 61:3–17.

Brooks, Matthew L.; D'Antonio, Carla D.; Richardson, David M. [et al]. 2004. Effects of Invasive Alien Plants on Fire Regimes. BioScience 54(7):677–88.

Brown, Stephen; Hickey, Catherine; Gill, B.; Gorman, L.; Gratto, C.; Haig, S.; Harrington, B.; Hunter, C.; Morrison, G.; Page, G.; Sanzenbacher, P.; Skagen, S.; Warnock, N. 2000. National Shorebird Conservation Assessment: Shorebird Conservation Status, Conservation Units, Population Estimates, Population Targets, and Species Prioritization. U.S. Shorebird Conservation Plan.

Brown, Stephen; Hickey, C.; Harrington, B.; Gill, B. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Brumley, John. 2006. Nemont Telephone Cooperatives 2006 Dagmar, Glentanna and Larslan Exchanges: Cultural Resources Inventory. Prepared for Nemont Telephone Cooperative by Ethos Consultants. On file at the Montana Archaeological Society, Helena.

Brunson, Mark; Gilbert, Lael. 2003. Recreationist responses to livestock grazing in a new national monument. Journal of Range Management. 56:570–6.

[BLM] Bureau of Land Management. 2008a. U.S. Department of Interior. Proposed Resource Management Plan and Final Environmental Impact Statement. Upper Missouri River Breaks National Monument. 1466 p.

———. 2008. Record of Decision and approved Resource Management Plan. Upper Missouri River Breaks National Monument.

Burt, William H.; Grossenheider, Richard P. Peterson Field Guides–Mammals.

Callaway, Ragan M.; Walker, Lawerence.R. 1997. Competition and Facilitation: A Synthetic Approach to Interactions in Plant Communities. Ecology 78(7):1958–65.

Carlson, Charles. 1993 Second Survey of Birdlife in Two Coulees Near Bobcat Creek on The C.M. Russell National Wildlife Refuge.

Carver, Erin; Caudill, James. 2007. Banking on nature 2006: The economic benefits to local communities of national wildlife refuge visitation. Washington D.C.: U.S. Department of the Interior, Fish and Wildlife Service, Division of economics. 382 p.

Chaikina, Natalia A.; Ruckstuhl, Kathreen, E. 2006. The Effect of Cattle Grazing on Native Ungulates: The Good, the Bad, and the Ugly. Rangelands 28(3):8–14.

Chapman, Erik W.; Ribic, Christine A. 2002. The impact of buffer strips and stream-side grazing on small mammals in southwestern Wisconsin. Agriculture, Ecosystems and Environment 88(1):49–59.

Churchwell, Roy T.; Davis, Craig A.; Fuhlendorf, Samuel D.; Engle, David M. 2007. Effects of Patch-Burn Management on Dickcissel Nest Success in a Tallgrass prairie. The Journal of Wildlife Management 72(7):1596–603.

Cid, Silvia M.; Detling, James K.; Whicker, April D.; Brizuela, Miguel A. 1991. Vegetational responses of a mixed-grass prairie site following exclusion of prairie dogs and bison. Journal of Range Management 44(2):100–5.

Coe, Priscella K.; Johnson, Bruce K.; Kern, John W.; Findholt, Scott L.; Kie, John G.; Wisdom, Michael J. March 2001. Responses of Elk and Mule Deer to Cattle in Summer. Journal of Range Management. 54:A51–A76.

Cole, David N.; Landers, Peter B. 1996. Threats to Wilderness Ecosystems: Impacts and Research Needs. Ecological Applications 6(1):168–84.

Colorado Division of Wildlife. 2007. A guide to wildlife viewing and photography blinds. Creating facilities to connect people with nature featuring blinds from the western United States. 43 p.

Colorado State Parks. 1998. Native Plant Revegetation Guide for Colorado. Caring for the Land Series. Volume III. <http://parks.state.co.us/NR/rdonlyres/00A97125–2219–4E68–A28F–6CC62300D43A/0/revegetation.pdf> accessed February 9, 2010. 269 p.

Cook, Bradley J.; Ehrhart, R.C.; Hansen, Paul L.; Parker, Tom; Thompson, Bill. 1996. Riparian and wetland ecological health. Evaluation of selected

streams on the Charles M. Russell National Wildlife Refuge. Riparian and Wetland Research Program. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana. 38 p.

Cousins, Sara A.O.; Lindborg, Regina. 2004. Assessing changes in plant distribution patterns: indicator species versus plant functional types. Ecological Indicators. 4:17–27.

Cunningham, Mary Ann; Johnson, Douglas H. 2006. Proximate and landscape factors influence grassland bird distributions. Ecological Applications 16(3):1062–75.

Cushman, Samuel A.; McKelvey, Kevin S.; Flather, Curtis H.; McGarigal, Kevin. 2008. Do forest community types provide a sufficient basis to evaluate biological diversity? Front. Ecol. Environ. 6(1):13–7.

Davis, Les; Stallcop, Emmett. 1965. The Keaster Site (24PH401): A Stratified Bison Kill Occupation in the Missouri Breaks Area of North Central Montana. Memoir No. 2. Report produced by the Montana Archaeological Society.

Davis, Stephen K; Dunan, David C. 1999. Grassland song bird abundance in native and crested wheatgrass pastures of southern Saskatchewan. Ecology and Conservation of grassland birds of the western hemisphere: proceedings of a conference. Tulsa, Oklahoma, October 1995. 19:211–8.

Davy, Douglas. Historic properties survey of selected areas at Fort Peck Lake, Montana. Report prepared for the U.S. Corps of Engineers. Produced by EBASCO Environmental, Sacramento, California. On file at the U.S. Army Corps of Engineers, Omaha, Nebraska.

Dechant, J.A.; Sondreal, M.L.; Johnson, D.H.; Igl, L.D.; Goldade, C.M.; Nenneman, M.P.; Euliss, B.R. 1998 (revised 2003). Effects of management practices on grassland birds: Mountain Plover. Northern Prairie Wildlife Research Center, Jamestown, ND. 15 p.

Defenders of Wildlife. 2008. Keeping every cog and wheel. Reforming and improving the National Wildlife Refuge System Washington D.C. 30 p.

DeLuca, T.H.; Nilsson, M.C.; Zackrisson, O. 2002. Nitrogen mineralization and phenol accumulation along a fire chronosequence in northern Sweden. Oecologia. 133(2):206–14.

DeLuca, T.H.; MacKenzie, M.D.; Gundale, M.J.; Holben, W.E. 2006a. Wildfire-produced charcoal directly influences nitrogen cycling in ponderosa pine forests. Soil Sci. Soc. AM. J. 70:448–53.

DeLuca, Thomas H.; Sala, Anna. 2006b. Frequent fire alters nitrogen transformations in ponderosa pine stands of the inland Northwest. Ecology 87(10).

DeLuca, Thomas H; Aplet, Gregory H. 2008. Charcoal and Carbon Storage in forest soils of the Rocky Mountain West. Frontiers in Ecology and Environment 6(1):18–24.

Destination Lewistown, Montana. http://www.destinationlewistownmontana.com/wp/community-resources/economic-development-opportunities/, last accessed December 2009.

Dhol, Sukvinder; Horton, Jean; Jones, Robert E. 1994. 1994 Non-waterfowl evaluation of Manitoba's North American Waterfowl Management Plan. Wildlife Branch, Manitoba Department of Natural Resources. 12 p.

Dickson, Tom. 2008. Drawing a Line—Club members participating in the Sportsman User Value Mapping Project are saying "Don't develop where we hunt and fish." Montana Outdoors. September–October 2008:28–31.

DiTomaso, Joseph M. 2000. Invasive weeds in rangelands: Species, impacts, and management. Weed Science 48:255–65.

Dixon, M.D.; Johnson, W.C.; Scott, M.L.; Bowen, D. 2009. Annual Report—Missouri River Cottonwood Study. USACE internal report.

Donaldson, G.M.; Hyslop, C.; Morrison, R.I.G.; Dickson, H.L.; Davidson, I. 2000. Canadian Shorebird Conservation Plan. Canadian Wildlife Service. 34 p.

Douglass, K.S.; Hamann, S.J.; Joslin, G.1999. Vegetation, Soils, and Water. Pages 9.1–9.11 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of the Wildlife Society. 307 p.

Douglass, Richard J. 1984. The use of rodents in monitoring ecological impacts of oil shale development in the Piceance Basin, Colorado. P. 70–75. IN: R.L. Comer (ed), Issues and technology in the management of impacted western wildlife. Thorne Ecological Institute, Boulder, Colorado.

Douglass, Dr. Rick; Hughes, Kevin. 2003. Montana Tech 2002 Hantavirus longitudinal study: Summary of data collected from the Charles M. Russell National Wildlife Refuge. Montana Tech University. 13 p.

Dryer, Mark P.; Sandvol, Alan J. 1993. Pallid Sturgeon (*Scaphirhynchus albus*) Recovery Plan. Prepared by Pallid Sturgeon Recovery Team for the Department of the Interior, United States Fish and Wildlife Service, Region 6. 64 p.

Duff, D. A. 1983. Livestock grazing impacts on aquatic habitat in Big Creek, Utah. In Proceedings of the Workshop on Livestock and Wildlife–Fisheries Relationships in the Great Basin. Sparks, Nevada. Special Publication 33901. USDA Forest Service Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 129–42.

Duffield, J.; Neher, C. 2002. The Prairie Foundation: Socioeconomic impacts on Valley and Philips

Counties. Prepared for The Prairie Foundation by Bioeconomics, Inc.

Dullum, Jo Ann L.D.; Foresman, Kerry R; Matchett, Marc R. 2005. Efficacy of translocations for restoring populations of black-tailed prairie dogs. Wildlife Society Bulletin 33(3):842–50.

Ecological Solutions Group, LLC. 2009. Internal Report on Lotic Wetland Health Assessment Survey. Charles M. Russell National Wildlife Refuge.

———. 2010. U.S. Lotic Wetland Health Assessment for Large River Systems. Downloaded from <http://www.ecologicalsolutionsgroup.com>. Accessed May 2010.

Economic Research Service. 2009. U.S. Department of Agriculture. <http://www.ers.usda.gov/>

Egan, A.F.; Luloff, A.E. 2000. The Exurbanization of America's Forests: Research in Rural Social Sciences. Journal of Forestry 98(3):26–30.

Ehrhart, Robert C.; Hansen, Paul L. 1997. Effective cattle management in riparian zones: a field survey and literature review. Montana BLM Riparian Technical Bulletin No. 3 USDI Bureau of Land Management, Montana State Office, Billings, Montana. 47 p.

Ellison, Lincoln. 1960. Influence of Grazing on Plant Succession of Rangelands. Botanical Review 26(1):1–78.

Fairfield, George M. 1968. Chestnut-Collared Longspur. Life Histories of North American Cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. [unknown volume] 1635–52.

Fandrich, Blain and Lynelle Peterson. 2005. A traditional cultural property study Fort Peck Lake, Montana. Report produced by Ethnoscience, Incorporated, Billings Montana. Report produced for the U.S. Corps of Engineers, Omaha.

FaunaWest Wildlife Consultants. 1996. An analysis of riparian habitat on the Charles M. Russell National Wildlife Refuge in relation to birds and small mammals. Report prepared for CMR.

Fernandez-Cornejo, J. 2007. Off-Farm Income, Technology Adoption, and Farm Economic Performance. Economic Research Service, U.S. Department of Agriculture, Economic Research Report No. 36, http://www.ers.usda.gov/publications/err36/err36.pdf, retrieved September 24, 2008.

Fire Executive Council. 2009. Guidance for Implementation of Federal Wildland Fire Management Policy. Washington D.C.: U.S. Department of Agriculture and U.S. Department of the Interior. 20 p. <http://www.nifc.gov/policies/guidance/GIF-WFMP.pdf> Accessed February 3, 2010.

Fitch, L; Adams, B.W. 1998. Can Cows and Fish Coexist? Canadian Journal of Plant Sciences. 78:191–8.

Fleischner, Thomas L. 1994. Ecological Costs of Livestock Grazing in Western North America. Conservation Biology 8(3):629–44.

Foreman, Richard T. T.; Alexander, Lauren E. 1998. Roads and their major ecological effect. Annual Review of Ecology and Systematics. 29:207–31 (C2).

Foresman, Kerry R. 2001. The Wild Mammals of Montana. Special Publication 12. The American Society of Mammalogists. 278 p.

Forest Encyclopedia Network. 2009. Direct Effects of Fire and Immediate Animal Responses. Downloaded from <http://www.forestencylopedia.net/p/p700/view> accessed February 2010.

Frank, D.A.; McNaughton, S.J. 1991. Stability increases with diversity in plant communities: empirical evidence from the 1988 Yellowstone drought. Oikos 1(3):360–2.

Freese, C.; Montanye D.; Dabrowska, K. 2009. New Directions for the Prairie Economy: Connecting Conservation and Rural Development in the northern Great Plains. World Wildlife Fund, August.

Frost, Cecil. 1998. Presettlement fire frequency regimes of the United States: a first approximation. Pages 70–81 in Teresa L. Pruden and Leonard A. Brennan (eds.). Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceeding, No. 20. Tall Timbers Research Station, Tallahassee, FL.

Frost, Cecil. 2008. Natural Fire Regimes and Pre-European Settlement Vegetation of the Charles M. Russell National Wildlife Refuge. Report prepared for Charles M. Russell NWR. 87 p.

Fuhlendorf, Samuel D.; Engle, David M. 2001. Restoring Heterogeneity on Rangelands: Ecosystem Management Based on Evolutionary Grazing Patters. Bioscience 51(8):625–32.

Fuhlendorf, S. D.; Engle, D. M. 2004. Application of the fire-grazing interaction to restore a shifting mosaic on tallgrass prairie. Journal of Applied Ecology 41:604–14.

Fuhlendorf, Samuel D; Harrell, Wade C.; Engle, David M. [et al.] 2006. Should heterogeneity be the basis for conservation? Grassland bird response to fire and grazing. Ecological Applications 16(5):1706–16.

Fuhlendorf, Samuel D.; Engle, David M.; Kerby, Jay; Hamilton, Robert. 2008. Pyric herbivory: rewilding landscapes through the recoupling of fire and grazing. Conservation Biology. 23(3):588–98.

Gaines, M.S.; Diffendorfer, J.E.; Tamarin, R.H.; Whittam, T.S. 1997. The effect of habitat fragmentation on the genetic structure of small mammal populations. Journal of Heredity 88:294–304.

Gardner, William M. 1996. Missouri River pallid sturgeon inventory. Montana Fish Wildlife and Parks. Report F–78–R–2. Helena. 25 p.

———. 2003. Statewide Fisheries Investigations. Middle Missouri River Fisheries Evaluations.

Project Number F–113–R5. Montana Fish Wildlife and Parks. 58 p.

Gerrity, P. C.; Guy, C. S.; Gardner, W. M. 2006. Juvenile pallid sturgeon are piscivorous: a call for conserving native cyprinids. Transactions of the American Fisheries Society 135:604–9.

Gerrity, Paul C.; Guy, C.S., Christopher S.; Gardner, William M. 2008. Habitat Use of Juvenile Pallid Sturgeon and Shovelnose Sturgeon with Implications for Water-Level Management in a Downstream Reservoir. North American Journal of Fisheries Management 28:832–43.

Gibson, R.S.; Bosch, O.J.H. 1996. Indicator species for the interpretation of vegetation condition in the St. Bathans area, Central Otago, New Zealand. New Zealand Journal of Ecology. 20(2):163–72.

Gould, William. 1998. Sturgeon chub. American Fisheries Society website.

Grace, James B., Smith, M.D.; Grace, S.L.; Collins, S.L.; Stohlgren, T.J. 2001. Interactions between fire and invasive plants in temperate grasslands of North America. K.E.M. Gallery and T.P. Wilson (eds). Proceedings of the Invasive Species Workshop: the role of fire in the control and spread of invasive species. Fire Conference 2000: the first national conference on fire ecology, prevention and management. Misc. Publication No. 11, Tall Timbers Research Station, Tallahassee, FL: 40–65.

Graetz, Rick and Suzanne. 2003. Charles M. Russell National Wildlife Refuge. Booklet prepared by Northern Rockies Publishing. Prepared for the National Wildlife Refuge Centennial. On file at the refuge headquarters, Lewistown, Montana.

Great Falls Tribune. 2009a. Wildlife refuge grazing deal sought. By Karl Puckett. July 8, 2009.

———. 2009b. Bids received for groups‘ offer of money for grazing land. By Karl Puckett. August 21, 2009.

Grisak, Grant. 1998. Sicklefin chub. Montana Cooperative Fisheries Research Unit, American Fisheries Society website.

Gruell, George E. 1983. Fire and vegetative trends in the Northern Rockies: interpretations from 1871–1982 photographs. Gen. Tech. Rep. INT–158. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 117 p.

Gruenert, J.C. 1999. Second Job Entrepreneurs. Occupational Outlook Quarterly, Fall.

Guliano, William. M; Homyack, Joshua D. 2004. Short-term grazing exclusion effects on riparian small mammal communities. J. Range Management. 57:346–50.

Gunderson, Lance C. 2000. Ecological resilience—in theory and application. Annu. Rev. Ecol. Syst. 31:425–39.

Gunderson, Lance H.; Holling, C.S. (editors). 2002. Panarchy. Island Press. 507 p.

Hamann, B.; Johnston, H.; McClelland, P.; Johnson, S.; Kelly, L.; Gobielle, J. 1999. Birds. In: Joslin, G., Youmans, H. (coordinators), Effects of Recreation on Rocky Mountain Wildlife, A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society, Montana, USA, pp. 3.1–3.34.

Hansen, L.J.; Biringer, J.L.; Hoffman, J.R. (editors). 2003. Buying Time: A User's Manual for Building Resistance and Resilience to Climate Change in Natural Systems. 246 pages. Downloaded from http://www.panda.org/about_our_earth/all_publications/?8678/BUYING-TIME-A-Users-Manual-for-Building-Resistance-and-Resilience-to-Climate-Change-in-Natural-Systems Accessed March 17, 2010.

Hansen, Paul L. 1992. Developing a riparian-wetland grazing management plan. Montana Riparian and Wetland Association, Montana Forestry And Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana. 10 p.

Hansen, Paul. 1989. Inventory Classification and Management of Riparian Sites in the Upper Missouri National Wild and Scenic River. Montana Riparian Association, School of Forestry, University of Montana. Missoula, Montana.

Hansen, P.L; Chadde, S.W.; Pfister, R.D. 1988. Riparian Dominance Types of Montana. Miscellaneous Publication No. 49, Montana Forest and Conservation Experiment Stations School of Forestry, University of Montana, Missoula, Montana.

Hansen, Paul; Cook, Brad; Ehrhart, Robert; Thompson, Bill. 1993. The development of a riparian and wetland ecological health evaluation form for Charles M. Russell National Wildlife Refuge–its applicability for Montana. Presented at the 1993 Annual Montana Riparian and Wetland Association Workshop. Montana Riparian-Wetland Association Draft Report. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana. 147 p.

Hansen, Paul; Pfister, Robert; Boggs, Keith; Cook, Brad; Joy, John; Hinckley, Dan. 1995. Classification and management of Montana's riparian and wetland sites. Montana Riparian and Wetland Association, Montana Forestry and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana. 646 p.

Hansen, Paul L.; Thompson, William H.; Ehrhart, Robert C.; Hinckley, Dan K.; Haglan, Bill; Rice, Karen. 2000. Development of methodologies to evaluate the health of riparian and wetland area. In: Proceedings of the Fifth International Symposium of Fish Physiology, Toxicology, and Water Quality, November 10–13, 1998, Hong Kong, China. Vance Thurston, Editor. EPA/6000/R–00/015. United States Environmental Protection Agency,

Office of Research and Development, Washington, D.C., USA. 300 p.

Harmon, Will. [ed]. 1999. Best Management Practices for Grazing Montana. Environmental Protection Agency R6 and Department of Natural Resources and Conservation. 28 p.

Havlick, David G. 2002. No place distant: roads and motorized recreation on America's public lands. Island Press, Washington D.C. 297 p.

Heller, Nicole E.; Zavaleta, E.S. 2009. Biodiversity management in the face of climate change: A review of 22 years of recommendations. Biological Conservation 142:14–32.

Hendricks, P., S.; Currier, Lenard, C.; Maxell, B. 2007. Filling the distribution gaps for small mammals in Montana. A report to the USDI Bureau of Land Management, Montana State Office. Montana Natural Heritage Program, Helena, Montana. 17 p.

Hendricks, Paul, S. Lenard, C. Currier, J. Johnson. 2005. Bat Use of Highway Bridges in South-Central Montana. Report to Montana Department of Transportation. Montana Natural Heritage Program, Helena. 31 p.

Hendricks, Paul, B.A. Maxell S. Lenard. 2006. Land Mollusk Surveys on USFS Northern Region Lands. A report to the USDA Forest Service, Northern Region. Montana Natural Heritage Program, Helena, Montana. 11 p.

Higgins, K. F. 1986. Interpretation and compendium of historical fire accounts in the northern Great Plains. U.S. Fish and Wildlife Service, Resource Publication 161.

Hoff, v. S.K.; Blaustein, A.R.; McDiarmid, R.W.; Altig, R. 1999. Behavior: interactions and their consequences. Pages 215–39 in R.W. McDiarmid and R. Altig, editors. Tadpoles: the biology of anuran larvae. University of Chicago Press, Chicago.

Hoffman and Pattie. A Guide To Montana Mammals.

Hoffmann, Robert S.; Wright, Phillip L.; Newby, Fletcher E. 1969. Distribution of some mammals in Montana. I. Mammals other than bats. Journal of Mammalogy. 50(3):579–604.

Holling, C.S. 1973. Resilience and stability of ecological systems. Annual Review of Ecology and Systematics. 4:1–23.

Hollow, O'Brien; Chadwick, Amy; Hansen, Paul L. 2001. Lower Musselshell River Study. Environmental Protection Agency/Montana Department of Environmental Quality 319 grant project June 1999–May 2001. Riparian and Wetland Research Program, School of Forestry, University of Montana, Missoula, Montana.

Holloway, Gillian L; Barclay, Robert M.R. 2000. Importance of prairie riparian zones to bats in Southeastern Alberta. Ecoscience 7(2):115–22.

Holmes, Brian E.; Foresman, Kerry, R.; Matchett, Marc.R. 2006. No evidence of persistent Yersinia pestis infection at prairie dog colonies in north-central Montana. Journal of Wildlife Diseases 42:164–9.

Hoogland, John L. 1995. The black-tailed prairie dog: social life of a burrowing mammal. Wildlife behavior and ecology. 562 p.

Hoitsma Ecological, Inc. 2006. Telegraph Creek riparian habitat restoration project: phase III–final report and recommendations. Prepared for U.S. Fish and Wildlife Service, World Wildlife Fund, and American Prairie Foundation. 43 p.

Howe, Henry F. 1994. Managing Species Diversity in Tallgrass prairie: Assumptions and Implications. Conservation Biology 8(3):691–704.

Howe, Marshall; Bart, J.; Brown S.; Elphick, C.; Gill, R.; Harrington, B.; Hickey, C.; Morrison, G.; Skagen, S.; Wamock, N. eds. 2000. A Comprehensive Monitoring Program for North American Shorebirds. Manomet Center for Conservation Sciences. http://www.Manomet.org/USSCP/files.htm.

Hubbard, John P. 1977. Importance of riparian ecosystems: biotic considerations. In importance, preservation and management of riparian habitat: A symposium. Tucson, Arizona. General Technical Report RM–43. USDA Forest Service Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado pp. 49–51.

Hurteau, M., North, M. 2009. Fuel treatment effects on tree-based forest carbon storage and emissions under modeled wildfire scenarios. Frontiers in Ecology and the Environment 7(8):409–14.

Johnson, Douglas H. 2001. Habitat fragmentation effects on birds in grasslands and wetlands: a critique of our knowledge. [Internet] Jamestown, ND: Great Plains Research 11(2):211–213. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/birds/habfrag/index.htm > [accessed January 15, 2010].

Johnson, J. 2004. The State of the Land—Analysis of Land Use Change in Montana and the Three Regions. www.mt.gov, last accessed October 2009.

Johnson, Douglas.H.; Igl, Lawerence .D. 2001. Area requirements of grassland birds: a regional perspective. The Auk 118:24–34.

Johnson, Laura C; Wallace, George N.; Mitchell, John E. 1997. Visitor perception of livestock grazing in five U.S. Wilderness Areas. A preliminary assessment. International Journal of Wilderness. 3(2):14–20.

Johnson, R. Roy; Haight, Lois T.; Simpson, James M. 1977. Endangered Species vs. endangered habitats: A Concept. In importance, preservation and management of riparian habitat: a symposium. Tucson, Arizona. General Technical Report RM–43.

Joslin, G.; Youmans, H. coordinators. 1999. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307 p.

Kantrud, H.A.; Higgins, K.F. 1992. Nest and nest site characteristics of some ground-nesting nonpasserine birds of northern grasslands. Prairie Naturalist 24:67–84.

Karl, Thomas R.; Jerry M. Melillo, and Thomas Peterson, (eds.). 2009. Global Climate Change Impacts in the United States. U.S. Global Change Research Program. Cambridge University Press. 196 p. http://www.globalchange.gov/

Kauffman, J. Boone; Krueger, W.C. 1984. Livestock impacts on riparian ecosystems and streamside management implications. Journal of Range Management 37(5):430–38.

Kauffman, J. Boone; Beschta, R.L.; Otting, N.; Lytjen, D. 1997. An Ecological Perspective of Riparian and Stream Restoration in the Western United States. Fisheries 22(5):12–24.

Keane, R.E.; Arno, S.F.; Brown, J.K. 1990. Simulating Cumulative Fire Effects in Ponderosa Pine/Douglas-Fir Forests. Ecology 71(1):189–203.

Kemmimck, E. 2002. Our way of life special report: We are three. Montana Standard, November 17, 2002. Accessed July 18, 2008. <http://www.mtstandard.com/articles/2002/11/17/specialreports/export47716.txt>

Kennedy, Theodore A.; Naeem, Shahid; Howe, Katherine M.; Knops, Johannes M.H.; Tilman, David; Reich, Peter. 2002. Biodiversity as a barrier to ecological invasion. Nature 417:636–8.

Kerkvliet, J. 2008. An Economic Profile of Montana in 2008. The Wilderness Society, November.

Knopf, Fritz L. 1994. Avian Assemblages on Altered Grasslands. Studies in Avian Biology 15:247–57.

Knowles, Pamela. R. 1981. Habitat selection, home range size, and movements of bobcats in north-central Montana. M.S. Thesis, University of Montana, Missoula.

Knowles, Craig; Knowles, Pamela. 1994. Bird species composition and abundance in two riparian areas with differing grazing histories on the Charles M. Russell National Wildlife Refuge. 26 p.

Knowles, Craig J. 1985. Observations on prairie dog dispersal in Montana. Prairie Nat. 17(1):33–40.

Knowles, Craig J.; Knowles, P.R. 1994. A review of black-tailed prairie dog literature in relation to rangelands administered by the Custer National Forest. 98 p.

Knowles, Craig J.; Knowles, Pamela R. 1995. Presettlement wildlife and habitat of Montana: An overview. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/habitat/presettl/index.htm (Version 16JUL97).

Knowles, Craig; Campbell, Bruce R. 1982. Distribution of elk and cattle in a rest-rotation grazing system. Pages 47–60 in J. M. Peek and P. D. Dalke, eds. Proc. wildlife-livestock relationships symposium. Univ. Idaho For., Wildlife and Range Experimental Station., Moscow, Idaho.

Kotliar, Natasha B. 2000. Application of the New Keystone-Species Concept to Prairie Dogs: How well Does It work? Conservation Biology 14(6): 1715–21.

Krueper, D.J. 1993. Effects of land use practices on Western riparian ecosystems. Pages 321–330 in Status and management of Neotropical migratory birds, D. M. Finch and P. W. Stangel (Eds). Gen. Tech. Rep. RM–229, Fort Collins, Colorado. USDA Forest Service, Rocky Mountain Forest and Range Experiment station. 422 p.

Lambert, J. Daniel.; Hodgman, Thomas .P.; Laurent, Edward, J.; Brewer, Gwenda L.; Iliff, Marshall J.; Dettmers, Randy. 2009. The Northeast Bird Monitoring Handbook. American Bird Conservancy. The Plains, Virginia. 32 p.

Landsberg, Jill.; Crowley, Gabriel. 2004. Monitoring rangeland biodiversity: plants as indicators. Austral Ecology 29:59–77.

Larson, Diane L.; Anderson, Patrick J.; Newton, Wesley. 2001. Alien Plant Invasion in Mixed-grass Prairie: Effects of Vegetation Type and Anthropogenic Disturbance. Ecological Applications 11(1):128–41.

Lausen, Cori L.; Barclay, Robert M. R.; 2002. Roosting behavior and roost selection of female big brow bats (*Eptesicus fuscus*) roosting in rock crevices in southeastern Alberta. Canadian Journal of Zoology 80(6):1069–76.

Leonard, Steve; Kinch, Gene; Elsbernd, Van; Borman, Mike Dr.; Swanson, Sherman. 1997. Riparian Area Management. Grazing Management for Riparian-Wetland Areas. Technical Reference 1737–14. U.S. Dept of the Interior, Bureau of Land Management, Natural Applied Resource Sciences Center.

Leopold, Aldo; Sowls, Lyle K.; Spencer, David L. 1947. A survey of over-populated deer ranges in the United States. Journal of Wildlife Management 11(2):162–77.

Leopold, A.S.; Cain, S.A.; Cottam, C.M.; Gabrielson, I.N. Kimball, T.L. 1963. Wildlife Management in the National Parks: The Leopold Report. Advisory board on wildlife management appoint by Secretary of the Interior Udall. Downloaded from <http://www.nps.gov/history/history/online_books/leopold/leopold.htm> accessed March 2010.

Lesica, Peter; Miles, Scott. 2004. Ecological strategies for managing tamarisk on the C.M. Russell

National Wildlife Refuge, Montana, USA. Biological Conservation 119(4):535–43.

Leung, Yu-Fai; Marion, Jeffery L. 2000. Recreation Impacts and Management in Wilderness: A State-of-Knowledge Review. USDA Forest Service Proceedings RMRS–P–15–Vol–5.

Lewistown Area Chamber of Commerce, http://www.lewistownchamber.com/. Accessed October 2009.

Licht, Daniel S.; Millspaugh, Joshua J.; Kunkel, Kyran, E. [et al]. 2010. Using small populations of wolves for ecosystem restoration and stewardship. Bioscience 60(2):147–53.

Liljeblad, Adam; Borrie, William T. 2006. Trust in wildland fire and fuel management systems. International Journal of Wilderness 12(1):39–43

Lindmeier, John P. 1960. Plover, Rail and Godwit Nesting on Study Area in Mahnomen County, Minnesota. The Flicker 32(1):5–9.

Loflin, Brant. 2008. Site form for site 24PH1015. On file at the Montana Historical Society, Helena, Montana.

Logan, Brian D. 2001. Avian Community Composition and Nesting Productivity Relative to Cattle Grazing in North-central Montana. 66 p.

Louv, Richard. 2005. Last child in the woods: saving our children from nature deficit disorder. Chapel Hill, NC: Aloquin. 323 p.

Luna, Carmen. 2002. Bowdoin National Wildlife Refuge. Site Description, What Species, Research and Management Activities, Information Relating to WHSRN, Locally Involved Communities, Bibliography. 11 p.

Lyon L.J.; Huff, Mark H.; Hooper, Robert G.; Telfer, Edmund S.; Schreiner, David Scott; Smith, Jane Kapler. 2000 Wildland Fire in Ecosystems. Effects of Fire on Fauna. downloaded from <www.fs.fed.us/rmrs/pubs/rmrs_gtr042_6.pdf> Accessed March 2010.

Mackey, Dennis. 1992. Planting shrubs and trees along the South Fork of Rock Creek. U. S. Fish and Wildlife Service internal memo. Unpublished.

Mackie, Richard J. 1970. Range Ecology and Relations of Mule Deer, Elk, and Cattle in the Missouri River Breaks, Montana. Wildlife Monographs 20:3–79.

Maestas, J.D.; Knight, R.L.; Gilgert, W.C. 2001. Biodiversity and Land-Use Change in the American Mountain West. The Geographical Review, 91(3):509–24.

Maher, William, J. 1974. Ecology of Pomarine, Parasitic and Long-tailed Jaegers in northern Alaska. Pac. Coast Avifauna 37.

Malone, Michael; Roeder, Richard; Lang, William. 1976. Montana A History of Two Centuries. University of Washington Press.

Manfredo, Michael J. 2002. editor. Wildlife viewing: a management handbook. In: Manfredo, Michael J., Pierce, Cynthia, Vaske, Jerry J., and Whittaker, Doug; An experience-based approach to planning and management for wildlife-viewing recreation. Oregon State University Press. 70–91, chapter 5.

Markitecture. 2007. A Disciplined Approach to Developing Agritourism and Marketing the Consumer Opportunities: Initial Research Findings. Prepared for The Rural Landscape Institute, July.

Matchett, M.R.; Biggins, D.E.; Carlson, V.; Powell, B.; Rocke, T. 2009. Enzootic plague reduces black-footed ferret (*Mustela nigripes*) survival in Montana. J Vector-borne Zoonotic Dis.; (in press).

Maxell, Bryce; Hokit, Grant. 1999. Amphibians and Reptiles. In: Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana, coord. G. Joslin and J. Youmans 2:1–29. Montana Chapter of The Wildlife Society, Committee on Effects of Recreation on Wildlife.

Meehan, Wiliam R.; Platts, William S. 1978. Livestock grazing and the aquatic environment. Journal of Soil and Water Conservation. 33(6):274–78.

Merrell, D.J. 1970. Migration and gene dispersal in *Rana pipiens*. American Zoologist 10:47–52.

Merrell, D. J. 1977. Life history of the leopard frog, *Rana pipiens*, in Minnesota. Occasional Paper Number 15. Bell Museum of Natural History. University of Minnesota, Minneapolis, Minnesota, USA.

Milchunas, D.G.; Noy-Meir, I. 2002. Grazing refuges: external avoidance of herbivory and plant diversity. Oikos. 99:113–30.

Miles, Scott. 1996. Rock Creek and Siparyann Creek Woody Riparian Vegetation and Cross Section Monitoring. USDI Fish and Wildlife Service and USDOI Bureau of Land Management.

Miller, Scott; Knight, Richard. 1998. Influence of recreational trails on breeding bird communities. Downloaded from <www.bouldercolorado.gov/files/.../pdf.../4428_Miller_Scott_Influence.pdf> accessed February 2010.

Mills, L. Scott. 2007. Conservation of wildlife populations: demography, genetics, and management. Blackwell Publishing Company.

Minnesota IMPLAN Group, Inc. 2007, IMPLAN data files: www.implan.com.

Mitchell John E.; Wallace, George N.; Wells, Marcella D. 1996. Visitor perceptions about cattle grazing on National Forest land. Journal of Range Management. 49:81–86.

Moehrenschlager, A.; Moehrenschlager, C. 2001. Census of Swift Fox (*Vulpes velox*) in Canada and Northern Montana: 2000–2001. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 24. Edmonton, AB. 21 p.

Montana Department of Commerce. 2008. Census and Economic Resources, <http://commerce.mt.

gov/censusresources.asp>. Accessed December 2009.

Montana Dept of Environmental Quality. 2001. Lower Musselshell TMDL Planning Area Decision Document.

Montana Department of Labor and Industry. 2009. State and County Economic Fliers. <http://www.ourfactsyourfuture.org/cgi/databrowsing/?PAGEID=4&SUBID=273>. Accessed December 2009.

Montana Department of Natural Resources and Conservation. 2007. Annual Review 2007. Oil and Gas Conservation Division.

[MFWP] Montana Fish, Wildlife and Parks. 1979. Northeast Montana fisheries study: Inventory and survey of waters of the project area. Montana Fish, Wildlife and Park, Helena. 18 p.

———. 1981. Northeast Montana fisheries study: Inventory and survey of waters of the project area. Montana Fish, Wildlife and Parks, Helena.

———. 2001. Adaptive Harvest Management.

———. 2002. Helena Montana: Fort Peck Reservoir fisheries management plan 2002–2012. 21 p. Downloaded from <http:fwp.mt.gov/content/getItem.aspx?id=31385> accessed 30 October 2009.

———. 2004. Montana Statewide elk management plan. Helena, Montana. 404 p. Downloaded from <http://fwp.mt.gov/hunting/elkplan.html. Accessed 27 November, 2009>.

———. 2005. Montana comprehensive fish and wildlife conservation strategy, 2005. Helena Montana: Montana Fish, Wildlife, and Parks. 658 p. Downloaded from <http://fwp.mt.gov/specieshabitat/strategy/default.html> accessed 21 September 2009.

———. 2006a. A guide to building and managing private fish ponds in Montana. Helena Montana: 34p. Downloaded from http://fwp.mt.gov/content/getItem.aspx?id=19293> accessed 30 October 2009.

———. 2006b. Final Fish, Wildlife and Parks Region 6 Prairie Dog Abundance and Distribution Objectives Plan. Region 6 Prairie Dog Advisory Board. 20 p.

———. 2008a. The road ahead: Strategic plans. [Internet] <http://fwp.mt.gov/doingBusiness/insidefwp/aboutUs.html> accessed 21 October 2009.

———. 2008b. Montana Statewide Comprehensive Outdoor Recreation Plan, 2008 to 2012. January.

———. 2009a. Bighorn sheep conservation strategy. [Internet]. Downloaded from <http://fwp.mt.gov/wildlife/conservation/bighorn.html> accessed 15 October 2009.

———. 2009b. Harvest and Hunting Reports. [Internet] Downloaded from <http://fwp.mt.gov/hunting/planahunt/harvestReports.html>

———. 2009c. Paddlefishing. [Internet]. <http://fwp.mt.gov/fishingmontana/brochure_paddlefish.html> accessed 22 October 2009.

———. 2009d. Recreation and Tourism. [Internet]. http://fwp.mt.gov/doingBusiness/reference/montanaChallenge/reports/tourism.html> accessed 1 January 2010.

———. 2009e. Wolf conservation program. [Internet]. Downloaded from <http://fwp.mt.gov/wildthings/wolf/default.html> Accessed October 2009.

———. 2005–2006. Statewide Fisheries Investigations. Middle Missouri River Fisheries Evaluations. Project Number F–113–R7 & R8. Montana Fish Wildlife and Parks. 65 p.

———. 2009. Pallid Sturgeon recovery program for the Upper Missouri River. Montana Fish Wildlife and Parks. September 2009. 2 p.

———. Prairie dog conservation plan.

Montana Forest and Conservation Experiment Station. 1996a. Appendix A: Key to riparian and wetland sites of the Charles M. Russell National Wildlife Refuge (Descriptions of habitat types and major seral community types of the CMR NWR, Montana). In: Riparian and wetland ecological health evaluation of selected streams on the Charles M. Russell National Wildlife Refuge. Riparian and Wetland Research Program. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana.

Montana Natural Heritage Program. 2008. Species Of Concern. Location: http://nhp.nris.mt.gov/SpeciesOfConcern/Default.aspx.

Montana Natural Heritage Program and Montana Fish Wildlife and Parks. 2009. Montana Animal Species of Concern. Helena, Montana: Montana Natural Heritage Program and Montana Department of Fish Wildlife and Parks. 17 p.

Montana Partners In Flight. Draft 2000. Montana Bird Conservation Plan Version 1.0. Location: http://www.partnersinflight.org/bcps/plan/pl_mt_10.pdf. 288 p.

Montana Prairie Dog Working Group. 2002. Conservation Plan for Black-tailed and White-tailed prairie dogs in Montana. January 2002. 51 p.

Montana Steering Committee Intermountain West Joint Venture. 2005. Coordinated Implementation Plan for Bird Conservation in the Western Montana Location: http://iwjv.org/Images/MTPlan2005.pdf. 58 p.

More, Thomas A., J.R. Averill, T.H. Stevens. 1996. Values and Economics in Environmental Management: A Perspective and Critique. Journal of Environmental Management 48:397–406.

Moulton, Gary E. 2002. The definitive journals of Lewis and Clark. 3404 p. Downloaded from <http://lewisandclarkjournals.unl.edu/index.html> accessed 6 October 2009.

Moynahan, B.J. 2004. Landscape-scale factors affecting population dynamics of greater sage-grouse (*Centrocercus urophasianus*) in north-central Montana, 2001–2004. Dissertation. University of Montana, Missoula, USA.

Moynahan, B.J.; Lindberg, C.; Thomas, J.W. 2006a. Factors contributing to process variance in annual survival of female greater sage-grouse in North-central Montana. Ecol. App. 16(44):1529–38.

Moynahan, B.J.; Lindberg, M.S., Rotella, J.J.; Thomas, J.W. 2006b. Factors affecting nest survival of greater sage-grouse in North-central Montana. J. Wildl. Manage. 71(6):1773–83.

mt.gov (Montana's Official State Website). 2008a. Montana Field Guide. Baird's Sparrow–*Ammodramus bairdii*. Retrieved on September 19, 2008 from http://FieldGuide.mt.gov/detail_ABPBXA0010.aspx.

———. 2008b. Montana Field Guide. Brewers Sparrow–*Spizella breweri*. Retrieved on September 19, 2008 from http://fieldguide.mt.gov/detail_ABPBX94040.aspx.

———. 2008c. Montana Field Guide. Lark Bunting–*Calamospiza melanocorys*. Retrieved on September 19,2008, from http://FieldGuide.mt.gov/detail_ABPBX98010.aspx.

———. 2008d. Montana Field Guide. Burrowing Owl–*Athene cunicularia*. Retrieved on September 19,2008,from http://FieldGuide.mt.gov/detail_ABNSB10010.aspx.

———. [year unknown]. Montana Animal Field Guide Species Ranking Status. Accessed 9/19/2008 http://fieldguide.mt.gov/statusCodes.aspx.

———. 2010. Montana Field Guide. Greater Sage-Grouse—*Centrocercus urophasianus*. Retrieved on January 26, 2010, from http://FieldGuide.mt.gov/detail_ABNLC12010.aspx.

Murie, O. J. 1935. Report on the Fort Peck migratory bird refuge. Report on file at Charles M. Russell National Wildlife Refuge Headquarters, Lewistown, Montana.

Murphy, Robert. 2008. Fire is for the birds in Northern Mixed-grass Prairie. Fire Science Brief 9:1–6 (www.firescience.gov)

Myers, L. H. 1981. Grazing on Stream Riparian Habitats in Southwestern Montana. Proceedings of the Montana Chapter of The Wildlife Society, Great Falls, Montana.

Mysterud, Atle. 2006. The concept of overgrazing and its role in management of large herbivores. Wildlife Biology 12:129–41.

National Association of Counties, <www.naco.org>, last accessed October 2009.

National Audubon Society. 2009 Important Bird Areas. <http://iba.audubon.org/iba/profileReport.do?siteId=2934&navSite=search&pagerOffset=0&page=1>

National Park Service. 2008. Glacier National Park fact sheet. Downloaded from<http://www.nps.gov/glac/parknews/fact-sheet.htm> accessed January 2010.

National Wildlife Federation. 2010. Fact Sheet: Grazing Retirement Auction on the C.M. Russell National Wildlife Refuge. <http://www.nwf-wcr.org/PDFs/NWF-CMR-FactSheet.pdf>. Accessed February 22, 2010.

The Nature Conservancy. 2007. Prairie Birds in Peril: Nature Conservancy launches major effort to protect prairie bird habitat. Location: <http://www.nature.org/wherewework/northamerica/states/montana/news/news620.html>

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0 NatureServe, Arlington, Virginia. Available: <http://www.natureserve.org/explorer> Accessed September 19, 2008).

Naugle, David.E.; Aldridge, Cameron.L.; Walker, Brett L. [et al.] 2004. West Nile virus: pending crisis for greater sage-grouse. Ecology Letters 7:704–13.

Naugle, David, E.; Aldridge, Cameron L.; Walker, Brett L. [et al.] 2005. West Nile virus and sage-grouse: What more have we learned? Wildlife Society Bulletin 33(2):616–23.

Needham, Robert G. 1978. Northeastern Montana Fisheries Investigation. Montana Department of Fish and Game Fisheries Division. Project No. F–11–R–25, Job No. I–a. 12 p.

Needham, Robert G.; Gilge, Kent W. 1980. Northeast Montana fisheries study: Inventory and survey of waters of the project area. Montana Fish, Wildlife and Parks, Helena.

Neppl, Travis. 1997. Riparian and wetland ecological health evaluations for Duck Creek and Brown Pass Coulee, Charles M. Russell National Wildlife Refuge. 15 p.

Nolt, D. 2008. Revamping the Charles M. Russell Wildlife Refuge Conservation Plan. New West Bozeman. February 22.

Norberg, Jon; Cumming, Graeme S. (editors). 2008. Complexity theory for a sustainable future. Columbia University Press. 315 p.

Norman C. Wheeler and Associates. 2008. Newsletter. www.ncwheeler.com, accessed October 2008.

North American Bird Conservation Initiative, U.S. Committee, 2009. The State of the Birds, United States of America, 2009. U.S. Department of Interior: Washington, D.C. 36 p.

Noss, Reed F. 1991. Sustainability and Wilderness. Conservation Biology 5(1):120–2.

[NRCG] Northern Rockies Coordinating Group. 2008. [Internet]. Appropriate management response summary for the northern Rockies.

[NRCS] U.S. Department of Agriculture. Natural Resource Conservation Service. October 1999. Grassland Birds. Fish and Wildlife Habitat Management Leaflet Number 8.

———. 2003 edition. Grazing Lands Technology Institute: National range and pasture handbook. Downloaded from <http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17734.wba>. accessed 23 October, 2009.

———. 2005. Farm Pond Ecosystem. May 2005. Fish and Wildlife Habitat Management Leaflet Number 29.

———. 2009. Ecological Site Descriptions. [Internet]. Downloaded from <http://www.mt.nrcs.usda.gov> accessed October 2009.

NPA Data Services, Inc. 2007. 2007 Regional Economic Projections Series. Census and Economic Information Center, Montana Dept. of Commerce.

Ohmart, Robert, D. 1996. Historical and present impacts of livestock grazing on fish and wildlife resource in Western riparian habitats. In: PR Krausman (ed.), Rangeland Wildlife Soc. For Range Manage., Denver Colorado. 245–79.

Olson, D.; Lindall. S. 2000. IMPLAN Professional. Version 2.0 MIG, Inc., Stillwater, Minnesota.

Olson, R.; Hansen, J.; Whitson, T.; Johnson, K. 1994. Tebuthiuron to enhance rangeland diversity. Rangelands 16(5):197–201.

Oring, Lew; Harrington, J.W.; Brown, S.; Hickey, C. eds. 2000. National Shorebird Research Needs: A Proposal for a National Research Program and Example High Priority Research Topics. Manomet Center for Conservation Sciences. <http://www.Manomet.org/USSCP/files.htm>

Oschell, C.; Nickerson, N. 2006a. Niche News: Missouri River Country Traveler Characteristics, <http://www.itrr.umt.edu/NicheNews06/MissouriRiverCountryChar.pdf> Accessed December 2009.

———. 2006b. Niche News: Russell Country Traveler Characteristics. <http://www.itrr.umt.edu/NicheNews06/RussellCountryChar.pdf> Accessed December 2009.

Owens, R.A.; Myres, M.T. 1973. Effects of agriculture upon populations of native passerine birds of an Alberta fescue grassland. Canadian Journal of Zoology 51:697–713.

Paige, Christine. 2008. A landowner's guide to wildlife friendly fences. Landowner/Wildlife Resource Program, Montana Fish, Wildlife and Parks, Helena, Montana. 44 p.

Park, John A. 1998. Site form for 24GF419. Produced by the Bureau of Land Management Lewistown. Available from the Montana Historical Society, Helena, Montana.

Parker, Thomas G.; Hansen, Paul L. 1996. Riparian and Wetland Ecological Health Evaluation of East Slippery Ann Habitat Unit (#2) and Germaine Coulee Habitat Unit (#55) Charles M. Russell National Wildlife Refuge. Contract Completion Report for USDOI Fish and Wildlife Service, Cooperative Agreement Number 14–48–0006–95–939, Modification No. 2. Riparian and Wetland Research Program. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana. 96 p.

Parrett, Charles; Johnson, D.R. 2004. Methods for estimating flood frequency in Montana based on data through water year 1998: U.S. Geological Survey Water-Resources Investigations Report 03–4308. 101 p.

Parrett, Charles; Omang, R.J.; Hull, J.A. 1983. Mean annual runoff and peak flow estimates based on channel geometry of streams in northeastern and western Montana: U.S. Geological Survey Water-Resources Investigations Report 83–4046. 53 p.

Pauli, Jonathan N.; Buskirk, Steven W. 2007. Risk-disturbance overrides density dependence in a hunted colonial rodent, the black tailed prairie dog Cynomys ludovicianus. Journal of Applied Ecology 44:1219–30.

Pearman, Myrna. 2005. Mountain bluebird trail monitoring guide. Red Deer River Naturalists. Alberta, Canada.

Pilliod, D.S.; Wind, Elke (editors). 2008. Habitat management guidelines for amphibians and reptiles of the Northwestern United States and Western Canada. Partners in amphibian and reptile conservation, Technical Publication HMG–4, Birmingham, AL. 139 p.

Platts, William S.; Wagstaff, Fred J. 1984. Fencing to Control Livestock Grazing on Riparian Habitats Along Streams: Is It a Viable Alternative? North American Journal of Fisheries Management 4:266–72.

Poff, N. Leroy; Allan, J.D.; Bain, M.B.; Karr, J.R.; Prestegaard, K.L.; Richter, B.D.; Sparks, R.E.; Stromberg, J.C. 1997. BioScience 47(11):769–84.

Pool, Duane B.; Austin, J.E. 2006. Migratory Bird Management for the Northern Great Plains Joint Venture: Implementation Plan. Gen. Tech. Rep, TC–01. Bismarck, ND: Northern Great Plains Joint Venture. 171 p.

Price, Jeff; Glick, Patricia. 2002. The bird watchers guide to global warming. National Wildlife Federation and American Bird Conservancy. 34 p.

Rademaker, L.; Nickerson, N. 2006. Niche News: 2005 Nonresident Traveler Characteristics, Institute for Tourism and Recreation Research, The University of Montana: Missoula, Montana, <http://www.itrr.umt.edu/NicheNews06/2005TravChar.pdf>, last accessed December 2009.

Ranchers Stewardship Alliance. 2008. <http://www.ranchersstewardshipalliance.org/index.asp>.

Rasker, R. 2006. An Exploration into the Impact of Industrial Development versus Conservation on Western Public Lands. Society and Natural Resources 19:191–207.

Rasker, R.; Hansen, A. 2000. Natural Amenities and Population Growth in the Greater Yellowstone Region. Human Ecology Review (2):30–40.

Red Lodge Clearinghouse. 2008. Matador Ranch Grass Bank. retrieved July 15, 2008. <http://rlch.org/index2.php?option=com_content&do_pdf=1&id=223>.

Resilience Alliance. 2007. Assessing and managing resilience in social-ecological systems: a practioners workbook. http://resiliencealliance.com/ 84 p.

Riley, Scott A.; Wilkinson, Kim M. 2007. Roadside Revegetation: A New Frontier for Native Plant Growers. National proceedings: Forest and Conservation Nursery Associations—2006. Proc. RMRS–P–50. In: Riley, L.E.; Dumroese, R.K.; Landis, T.D., tech. coords. 2007. National proceedings: Forest and Conservation Nursery Associations—2006. Proc. RMRS–P–50. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. <http://www.rngr.net/nurseries/publications/proceedings>

Rorabaugh, J.C. 2005. *Rana pipiens* Schreber, 1782, Northern leopard frog. Pages 570–7 in M.J. Lannoo (ed), Amphibian Declines: The Conservation Status of United States Species. University of California Press, Berkeley.

Rosgen, Dave. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rossenberg, Daniel, K.; Noon, Barry, R.; Meslow, E.Charles. 1997. Biological corridors: form, function, and efficancy. BioScience 47:677–87.

Rowe, H. I.; Bartlett, E. T. 2001. Development and Federal grazing policy impacts on two Colorado counties: A comparative study. in A.L. Torell, E.T. Bartlett, and R. Larranaga, editors. New Mexico State University Agricultural Experiment Station, Las Cruces, NM.

Rudzitis, G. 1999. Amenities Increasingly Draw People to the Rural West. Rural Development Perspectives 14(2):9–13.

Rudzitis, G.; Johansen, H. 1989. Migration to Western Wilderness Counties: Causes and Consequences. Western Wildlands 15:19–23.

Ruebelmann, George, N. 1982. An archaeological study of the Lewistown BLM District. Report produced by BLM staff. On file at the BLM Headquarters, Lewistown, Montana.

Salant, P.; Dillman, D.; Carley, L. 1997. Who's Moving into the Nonmetropolitan Counties? Evidence from Washington State. Pullman, WA: Social and Economic Sciences Research Center, Washington State University.

Samson, Fred; Knopf, Frtiz. 1994. Prairie Conservation in North America. BioScience 44 (6):418–421

Sanderson, H. Reed; Meganck, Richard A.; Gibbs, Kenneth C. 1986. Range management and scenic beauty as perceived by dispersed recreationists. Journal of Range Management 39(5):464–9.

Sando, Steven, K.; Morgan, Timothy, J.; Dutton, DeAnn, M.; McCarthy, Peter, M. 2009. Estimation of streamflow characteristics for Charles M. Russell National Wildlife Refuge, northeastern Montana: U.S. Geological Survey Scientific Investigations Report. 2009–5009. 60 p.

Sauls, H.S. 2006. The role of selective foraging and cecal microflora in sage-grouse nutritional ecology. M.S. Thesis. University of Montana, Missoula.

Scott, Michael L.; Auble, Gregor T.; Friedman, Jonathan M. [et al.]. 1993. Flow Recommendations for Maintaining Riparian Vegetation Along the Upper Missouri River, Montana. Prepared for Montana Power Co. and US Bureau of Reclamation. National Biological Survey. National Ecology Research Center. Fort Collins, Colorado. 43 p.

Scott, Michael L.; Auble, Gregor T.; Friedman, Jonathan M. 1994. Impacts of Dams and High Flows Along the Upper Missouri River, Montana. Prepared for Montana Power Co. Inc. National Biological Survery. Midcontinent Ecological Science Center. Fort Collins, Colorado. 19 p.

Scott, M. L.; Auble, G.T.; Friedman, J.M. 1997. Flood dependency of cottonwood establishment along the Missouri River, Montana, USA. Ecological Applications 7:677–90.

Scott, M. L.; Auble, G.T. 2002. Conservation and restoration of semi-arid riparian forests: a case study from the upper Missouri River, Montana, USA. Pages 145–90 in Flood Pulsing and Wetland Restoration in North America, B. Middleton, (ed.), John Wiley and Sons, Inc.

Shackford, John S. 1996. The importance of shade to breeding Mountain Plovers. Bulletin of the Oklahoma Ornithological Society 29(3):17–24.

Schultz, James Willard. 1902. Floating on the Missouri. Riverbend Publishing, Helena Montana. 135 p.

Sheley, R.L.; Svejcar, T.J.; Maxwell, B.D. 1996. A theoretical framework for developing successional weed management strategies on rangeland. Weed Technology 7:766–73.

Short, Jeffrey J.; Knight, J.E. 2003. Fall grazing affects big game forage on rough fescue grasslands. Journal of Range Management 28(3):213–7.

Silva, M. 2001. Abundance, diversity, and community structure of small mammals in forest fragments in Prince Edward Island National Park, Canada. Canadian Journal Of Zoology 79:2063–71.

Sipe, Gene. 1993. Tree and Shrub Planting–1993. U.S. Fish and Wildlife Service internal memo. Unpublished.

Skaar, P.D.; (revised by: D Skaar, D. Flath, L.S. Thompson). 1985. Montana Bird Distribution. Montana Academy of Sciences Supplement to the Proceedings Volume 44.

Skagen, Susan K.; Knopf, F.L. 1994. Migrating Shorebirds and Habitat Dynamics at a Prairie Wetland Complex. Wilson Bul. 106 (1):91–105.

Smith, B.E. 2003. Conservation Assessment for the Northern Leopard Frog in the Black Hills National Forest, South Dakota and Wyoming.

Smucker, Kristina M.; Hutto, Richard L.; Steele, Brian M. 2005. Changes in bird abundance after wildfire: importance of fire severity and time since fire. Ecological Applications 15(5):1535–49.

Stewart, E. Ray; Reese, Scott A.; Ultsch, Gordon R. 2004. The physiology of Hibernation in Canadian Leopard Frogs (*Rana pipiens*) and Bullfrogs (*Rana catesbeiana*). Physiological and Biochemical Zoology 77 (1):65–73.

Stewart, I.T., D.R. Cayan, and M.D. Dettinger. 2004. Changes in snowmelt runoff timing in western North America under a "business as usual" climate change scenario. Climate Change 62:217–32.

Stewart, Joanne, E. 2007. An analysis of Bat Activity Patterns Along a Prairie Riparian Corridor in Eastern Montana at Multiple Spatial Scales. MS Thesis. University of Denver. 148 p.

Stewart, Kelley M., R. Terry Bowyer, John G. Kie, Norman J. Cimon, and Bruce K. Johnson. 2002. Temporospatial Distributions of Elk, Mule Deer, and Cattle: Resource Partitioning and Competi tive Displacement. Journal of Mammalogy 83(1): 229–44.

Stewart, Robert E. 1975. Breeding birds of North Dakota. [Internet]. Version 06JUL2000. Fargo, ND: Tri-College Center for Environmental Studies. Jamestown, ND: Northern Prairie Wildlife Research Center online. <http://www.npwrc.usgs.gov/resource/ birds/bbofnd/biog.htm> 295 p.

Stynes, D. 1998. Guidelines for Measuring Visitor Spending. Department of Park, Recreation and Tourism Resources, Michigan State University.

Swetnam, T.W.; Betancourt, J.L. 1990. Fire-Southern sscillation relations in the southwestern United States. Science 249:1017–20.

Takats, Lisa D.; Francis, Charles M.; Holroyd, Geoffrey L. [et al]. 2001 Guidelines for Nocturnal Owl Monitoring in North America. Beaverhill Bird Observatory and Bird Studies Canada, Edmonton, Alberta. 32 p.

Taylor, Audrey R.; Knight, R.L. 2003. Wildlife Responses to Recreation and Associated Visitor Perceptions. Ecological Applications 13(4):951–963.

Taylor, D.; Coupal, R.; Foulke, T.; Rashford, B.; Olson D. 2008. An economic profile of the Bridger-Teton National Forest. Univesity of Wyoming, Department of Agricultural and Applied Economics.

Taylor, Daniel, A.R.; Tuttle, Merlin D. 2007. "Water For Wildlife". A Handbook for Ranchers and Range Managers. Bat Conservation International <http://www.batcon.org/pdfs/water/bciwaterforwildlife.pdf> 20 p.

Teel, T. L.; Dayer, A.A.; Manfredo, M.J.; Bright, A.D. 2005. Wildlife Values in the West. Project Report No. 58 for the Western Association of Fish and Wildlife Agencies, Department of Human Dimensions in Natural Resources, Colorado State University.

Tewksbury, Joshua J.; Black, Anne E.; Nur, Nadav [et al.]. 2002. Effects of Anthropogenic fragmentation and livestock grazing on western riparian bird communities. Studies in Avian Biology 25: 158–202.

Thackeray, L. 2006. Land buys by nonprofit conservation groups concern locals. Billings Gazette, February 27, 2006. Accessed July 29, 2008, www.billingsgazette.net/articles/2006/02/27/news/state/50-locals.tx.

Thomas, Jack W.; Maser, Chris; Rodiek, John E. 1979. Wildlife habitats in managed rangelands–The Great Basin of Southeastern Oregon riparian zones. USDA Forest Service General Technical Report PNW–80, 18 pp. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Thompson, William H.; Ehart, Robert C.; Hansen, Paul L.; Parker, Thomas G.; Haglan, William C. 1998. Assessing health of a Riparian Site. American Water Resources Association. Proceedings: Specialty Conference on Rangeland Management and Water Resources. 13 p.

Thompson, William H.; Hansen, Paul L. 1999. Lotic Health Assessment of Selected Streams on the Charles M. Russell National Wildlife Refuge. Contract Completion Report for USDI Fish and Wildlife Service, Cooperative Agreement Number 14–48–0006–95–939, Modification No. 2. Riparian and Wetland Research Program. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana. 35 p.

Tilden, Freeman. 1957. Interpreting our heritage. Chapel Hill NC: University of North Carolina Press. 3–10. Chapter 1.

Travel Montana. http://www.travelmt.com/. Accessed December 2009.

Truett, Joe C; Dullum, Jo Ann L.D.; Matchett, Marc R; Owens, Edward; Seery, David. 2001. Translocating prairie dogs: A Review. Wildlife Society Bulletin 29(3):863–72.

U.S. Bureau of Reclamation, Montana Department of Natural Resources and Conservation, Upper Musselshell Water Users Association, and Deadmans Basin Water Users Association, 1998, Musselshell River Basin Water Management Study: Lewistown, Montana, Department of Natural Resources and Conservation.

U.S. Census Bureau. 2007. State and County QuickFacts. U.S. Census Bureau, http://quickfacts.census.gov/qfd/index.html. Accessed October 2009.

———. 2009. USA Counties. U.S. Census Bureau, http://censtats.census.gov/usa/usa.shtml. Accessed October 2009.

[USDA] U.S. Department of Agriculture, National Agricultural Statistics Service Statistics Board. 2008. Grazing Fee Rates for Cattle by Selected States and Regions for 2008. <http://usda.mann-lib.cornell.edu/usda/nass/AgriPric//2000s/2008/AgriPric-01-31-2008_revision.pdf>

[USFS] U.S Department of Agriculture. U.S. Forest Service. 2003. Missoula Montana: Backcountry road maintenance and weed management. 26 p. <http://www.fs.fed.us/invasivespecies/document/BackcountryRdMtceWeed.pdf> accessed 28 October 2009.

———. 2009. Fire and Aviation Management. Fire Management. [Internet] <http://www.fs.fed.us/fire/management/index.html> Accessed March 2010.

[USACE] U.S. Department of Army. Army Corps of Engineers. 1987. A half century and holding. District News volume 11, no. 2, summer 1987, special edition. On file with the U.S. Corps of Engineers, Fort Peck, Montana.

———. 1995. Seaplane landing plan. <https://www.nwo.usace.army.mil/html/Lake_Proj/Seaplane/SeaplanePlan.htm> Accessed 13 November 2009.

———. 2004. Environmental Assessment Implementation of the Charles M. Russell National Wildlife Refuge Enhancement Act of 2000. US Army Corps of Engineers, Omaha District. US Fish and Wildlife Service, Mountain-Prairie Region September 2004. 60 p.

———. 2008. Fort Peck Dam/Fort Peck Lake Master Plan. Northwestern Division. Downloaded from <https://www.nwo.usace.army.mil/masterplans/> accessed 2 December 2009.

———. 2009a. Fort Peck brochure. [Internet]. 4 p. Downloaded from <https://www.nwo.usace.army.mil/html/Lake_Proj/brochures/FP_brochure.pdf> accessed 3 February 2010.

———. 2009b. Missouri River Recovery Program. Missouri River ecosystem restoration plan and environmental impact statement (in draft). [Internet]. <http://www.moriverrecovery.org>

———. 2009c. September 2009 monthly visitation data for Fort Peck Dam and Lake. Internal report provided by Darin McMurry June 2010.

U.S. Department of Energy. 1999. Office of Fossil Energy and Office of Science Report. Carbon Sequestration Research and Development. <http://www.fossil.energy.gov/programs/sequestration/publications/1999_rdreport/>

[DOI] U.S. Department of the Interior. 1974a. U.S. Department of Interior. Bureau of Sport Fisheries and Wildlife and Bureau of Land Management. Washington, D.C.: Draft Environmental Impact Statement. DES 74–54. Proposed Charles M. Russell National Wildlife Range Wilderness Area. 136 p.

———. 1974b. Washington, D.C.: Report on proposed recommendations from Draft Environmental Impact Statement as forwarded to Congress. DES 74–54. Proposed Charles M. Russell National Wildlife Range Wilderness Area. 65 p.

———. 1974c. Washington, D.C.: Charles M. Russell National Wildlife Range, Montana. Wilderness study summary. 21 p.

———. 2001. Secretarial Order 3226. Evaluating Climate change impacts in Management Planning. 1 p.

———. 2008a. Bison conservation initiative. Downloaded from<http://www.doi.gov/initiatives/bison/Bison%20Bridge%20Page%20DOI%20Bison%20Conservation%20Initiative%20framework.pdf>. accessed October 2009.

———. 2008b. An Analysis of Climate Change Impacts and Options Relevant to the Department of the Interior's Managed Lands and Waters. Department of the Interior Task Force on Climate Change. Report of the Subcommittee on Land and Water Management. http://www.usgs.gov/global_change/doi_taskforce.asp.

———. 2009. Secretarial Order 3289. Addressing the impacts of climate change on America's water, land, and other natural and cultural resources. 4 p. Downloaded from <http://www.doi.gov/climatechange/SecOrder3289.pdf> accessed 22 September 2009.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

U.S. Department of State. 2010. Draft Environmental Impact Statement for the Keystone XL Oil Pipeline Project. Applicant for a Presidential Permit: TransCanada Keystone Pipeline, LP. <http://www.keystonepipeline-xl.state.gov/clientsite/keystonexl.nsf?Open> April 16, 2010.

[FWS] United States Fish and Wildlife Service, Department of the Interior. 1982. Washington, D.C.: 6 RM 9. Grazing and haying management. In Fish and Wildlife Service Policy Manual.

———. 1985. Final Environmental Impact Statement. Washington D.C.: Management of Charles M. Russell National Wildlife Refuge. 453 p.

———. 1986. Record of Decision on Final Environmental Impact Statement. Management of Charles M. Russell National Wildlife Refuge. 5 p.

———. 1994. Stocking Guidelines and Management Strategies for Ponds and Small Impoundments. Prepared by the U. S. Fish and Wildlife Service, Office of Fisheries and Wildlife Assistance. Valentine, Nebraska. March, 1994. 5 p.

———. 1996. A History. Charles M. Russell National Wildlife Refuge Montana. U.S. Department of the Interior. United States Fish and Wildlife Service. On file at the Charles M. Russell NWR, Lewistown, Montana.

———. 1999a. Fulfilling the promise: the National Wildlife Refuge System. Arlington, VA. 94 p.

———. 1999b. National Policy Issuance #99–01, June 15, 1999. http://www.fws.gov/policy/npi99_01.html accessed 1/25/10.

———. 1994. Stocking Guidelines and Management Strategies for Ponds and Small Impoundments. Prepared by the U.S. Fish and Wildlife Service, Office of Fisheries and Wildlife Assistance. Valentine, Nebraska. March, 1994. 5 p.

———. 2000a. Compatibility. 603 FW2. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2000b. Prescribed Fire Management. 621FW3. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2000c. Refuge Planning Overview. 602 FW 1. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2001. Biological Integrity, Diversity, and Environmental Health. 601 FW 3. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. Location: <http://www.fws.gov/mountain-prairie/species/birds/>

———. 2004a. A Blueprint for the Future of Migratory Birds. Location: <http://migratorybirds.fws.gov/mbstratplan/mbstratplan.htm>

———. 2004b. National Wildlife Refuge System wildland fire management program strategic plan 2003–2010. 6 p. [Internet]. Downloaded from <http://www.fws.gov/fire/downloads/fwsfirestrategicplan.pdf> accessed October 2009.

———. 2004c. Environmental Assessment: Implementation of the Charles M. Russell National Wildlife Refuge Enhancement Act of 2000. September 2004.

———. 2005. Finding of No Significant Impact. Implementation of the Charles M. Russell National Wildlife Refuge Enhancement Act of 2000. July 25, 2005.

———. 2006a. Post 2005 hunting season mule deer and elk survey summary. Report on file at Refuge. 18 p.

———. 2006b. Service Responsibilities to Protect Migratory Birds. 720FW2 In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2006c. Wildlife-Dependent Recreation. 605FW1. In Fish and Wildlife Service Policy Manual. Washington D.C.

———. 2006d. Environmental Education. 605FW6. In Fish and Wildlife Service Policy Manual. Washington D.C.

———. 2006e. Recreational Fishing. 605FW3. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2006f. Hunting. 605FW2. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2006g. Interpretation. 605FW7. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2007a. Charles M. Russell National Wildlife Refuge planning website. [Intranet]. <http://www.fws.gov/cmr/planning> accessed February 10, 2010.

———. 2007b. Chronic wasting disease management on the Charles M. Russell National Wildlife Refuge Complex, Montana. Environmental Assessment. 13 p. Downloaded from <http://www.fws.gov/cmr/PDF_Files/CMRNWR_CWD_EA_061307.pdf> accessed 30 October 2009.

———. 2007c. Invasive Species Program. National Wildlife Refuge System Fiscal Year 2007 Update. Downloaded from http://www.fws.gov/invasives/pdfs/InvasiveSpeciesProgram_2007_revised.pdf accessed February 3, 2010.

———. 2007d. National Bald Eagle Management Guidelines. Helena, Montana Ecological Services, U.S. Fish and Wildlife Service.

———. 2008a. Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service as of September 30, 2008. Washington, D.C. 46 p.

———. 2008b. Partners for Fish and Wildlife Program in Montana. [Internet]. <http://www.fws.gov/mountain-prairie/pfw/montana/> accessed 27 August 2009.

———. 2008c. Scoping report for Charles M. Russell and UL Bend National Wildlife Refuges. Downloaded from <http:fws.gov/cmr/planning/Scopingrpt_4_18_08.pdf> Accessed 02 November 2009.

———. 2008d. Wilderness Stewardship Planning. 610 FW 3. In Fish and Wildlife Service Policy Manual. Washington, D.C.

———. 2008e. Volunteers. [Internet]. Downloaded from<http://www.fws.gov/volunteers/pdfs/2008_VolunteerAndFriendsReport_072909_Final.pdf>

———. 2008f. 2006 National Survey of Fishing, Hunting, and Wildlife Associated Recreation. March.

———. 2009a. Joint Ventures. [Internet]. Downloaded from <http://www.fws.gov/mountain-prairie/nawm/> accessed 22 September 2009.

———. 2009b. Let's Go Outside. [Internet]. http://www.fws.gov/letsgooutside accessed 30 October 2009.

———. 2009c. Mountain-Prairie. [Intranet]. <http://www.fws.gov/mountain-prairie/mt1.html> accessed 02 September 2009.

———. 2009d. Refuge Revenue Sharing Database. 2008. Realty Division. Downloaded from <http://www.fws.gov/refuges/realty/RRS/RevenueSharing_Index.cfm> accessed September 2009.

———. 2009e. Refuge System. [Internet]. <http://www.fws.gov/refuges> accessed 02 September 2009.

———. 2009f. Rising to the Challenge. Washington D.C.: Strategic plan for responding to accelerating climate change. In Draft September 2009. Downloaded from <http://www.fws.gov/home/cli-

matechange/pdf/CCDraftStratPlan92209.pdf> accessed 22 September 2009.

———. 2009g. Wildlife and Sport Fish Restoration Program. [Intranet]. <http://wsfrprograms.fws.gov/Subpages/GrantPrograms/SFR/SFR_Accomplishments.htm > Accessed 30 July 2009.

———. 2009h. Visitor Services Standards: A Handbook for evaluating visitor services programs. Draft. August 2009. 78 p.

———. 2009i. Charles M. Russell National Wildlife Refuge. www.fws.gov/cmr/, last accessed October 2009.

———. 2010. Timeline of the American Bison. www.fws.gov/bisonrange/timeline.htm/, Accessed June 2010.

U.S. Fish and Wildlife Service and Bureau of Land Management. 2005a. Rock Creek Cottonwood and Cross Section Monitoring. USDI Fish and Wildlife Service an USDOI Bureau of Land Management. 120 p.

———. 2005b. Supplement to Rock Creek Cottonwood and Cross Section Monitoring. USDI Fish and Wildlife Service an USDOI Bureau of Land Management. 50 p.

Van Dyke, F. 2003. Conservation Biology: foundations, concepts, applications (2nd Edition). McGraw-Hill. United States.

Van Tassell, Larry W.; Richardson, James W.1998. Impacts of Federal Grazing Reductions on Wyoming Ranches. In: Stubble Height and Utilization Measurements: Uses and Misuses. Western Regional Research Publication, Oregon State Agricultural Experiment Station, Oregon State Univ. Bull. 682, May 1998, 50–6.

Van Vuren, Dirk. Comparative ecology of Bison and Cattle in the Henry Mountains, Utah. Proceedings of the Wildlife-Livestock relationships symposium. Coeur d' Alene, Idaho April 20–22, 1981. Published by Forest, Wildlife and Range Experiment Station. University of Idaho, Moscow, Idaho, 449–57.

Vavra, Martin; Sheehy, D.P. 1996. Improving Elk Habitat Characteristics with Livestock Grazing. Rangelands 18(5):182–5.

Vias, A.C. 1999. Jobs Follow People in the Rural Rocky Mountain West. Rural Development Perspectives, 14(2):14–23.

Vickery, Peter D.; Herkert, James R.; Knopf, Fritz L. 1999. Grassland Birds:An Overview of Threats and Recommended Management Strategies. IN Bonney, Rick, David N. Pashley, Robert J. Cooper, and Larry Niles, eds. 1999. Strategies for Bird Conservation: The Partners in Flight Planning Process. Cornell Lab of Ornithology. <http://birds.cornell.edu/pifcapemay>

Vickery, P.D.; Blanco, D.E.; Lopez-Lanus, B. 2008. Conservation Plan for the Upland Sandpiper (*Bartramia longicauda*), Version 1.0. Manomet Center for Conservation Sciences, Manomet, Massachusetts.

Vinkey, Ray S.; Schwartz, M.K.; McKelvey, K.S. [et al] 2006. When Reintroductions are Augmentations: The Genetic Legacy of Fishers (*Martes pennanti*) in Montana. Journal of Mammalogy 87(2):265–71.

Vodehnal, W.L.; Haufler, J.B., Compilers. 2007. A grassland conservation plan for prairie grouse. North American Grouse Partnership. Fruita, Colorado.

Wagner, Robbin. 1996. Memorandum to Bill Haglan. Rock Creek Fish Collections. March 30,1999. 1 p.

Walcheck, Kenneth C. 1970. Nesting Bird Ecology of Four Plant Communities in the Missouri River Breaks, Montana. The Wilson Bulletin 82(4):370–382.

Walker, Brian; Salt, David. 2006. Resilience thinking. Island Press. 174 p.

Watts Robert C.; Eichhorn, L.C. 1981. Changes in the Birds of Central Montana. Proc. Montana Academy of Science 40:31–40.

Werner, J. Kirwin; Mawell, Bryce A.; Hendricks, Paul; Flath, Dennis L. 2004. Amphibians and Reptiles of Montana. Missoula, Montana: Mountain Press Publishing Company. 262 p.

Western Hemisphere Shorebird Reserve Network. 2007. U.S. Shorebird Conservation Plan. Loca tion: <http://www.whsrn.org/shorebirds/status.html>

The Wilderness Society. 2009. Evaluation of accessibility and visibility of roads on the Charles M. Russell NWR. On file at the Charles M. Russell NWR.

The WILD Foundation. 2006. Int. Journal of Wilderness 2006–Trust in Wildland Fire and fuel management Decisions–April 2006, vol. 12, no. 1, The WILD Foundation.

Wildland Fire Associates. 2005. Charles M. Russell National Wildlife Refuge Wildland Fuels Assessment. Prepared for the United States Fish and Wildlife Service, Mountain Prairie Region, Denver, Colorado. 40 p.

Willmore, Ille. 1990. Homesteading and Homesteaders. In: Homestead Shacks Over Buffalo Tracks: A History of Northeastern Fergus County By Roy History Committee. Color World Printer Bozeman Montana. 516 p.

Wilson, Don E.; Ruff, Sue. 1999. The Smithsonian Book of North American Mammals. Smithsonian Institute. American Society of Mammalogists. 750 p.

Wilson, S.D.; Belcher, J.W. 1989. Plant and bird communities of native prairie and introduced

Eurasian vegetation in Manitoba, Canada. Conservation Biology 3(1):39–44.

Williams, Eugene. 1991. Riparian Rehabilitation, UL Bend NWR. U.S. Fish and Wildlife Service internal report. Unpublished.

Williams, J. E.; Johnson, J.E.; Hendrickson, D.A. [et al]. 1989. Fishes of North America endangered, threatened, or of special concern: 1989. Fisheries 14(6):3–20.

Wood, Garvey. 1977. Wild and Scenic River historical archaeological investigation. Report submitted to the Bureau of Land Management, Lewistown Field Office. Gar Wood and Associates, Loma, Montana.

Wright, H.A.; Neuenschwander, L.F.; Britton, C.M. 1979. The role and use of fire in sagebrush-grass and pinyon-juniper plant communities. A state-of-the-art review. USDA Forest Service Intermountain Forest and Range Exp. Sta. General Tech Rep. INT–58.

Wright, Henry A.; Bailey, Arthur W. 1982. Fire Ecology. United States and Southern Canada. John Wiley and Sons, Inc.

Wyman, S.; Bailey, D.; Borman, M. [et al]. 2006. Riparian area management: Grazing management processes and strategies for riparian-wetland areas. Technical Reference 1737–20. BLM/ST/ST–06/002+1737. U.S. Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, Colorado. 105 p.

Young, D.J.; Martin, L. 2003. Moving In or Moving Out?: Migration Patterns Vary by Age and Region. Montana Business Quarterly, Winter.

Young, Jock A.; Hoffland, John R.; Hutto, Richard L. 2001. Birds and vegetation structure in tall-willow riparian communities of central Montana. Avian Science Center, Division of Biological Sciences, University of Montana, Missoula, Montana. downloaded from <http://avianscience.dbs.umt.edu/projects/documents/Willow2001_Report.pdf> accessed on February 16, 2010.

Young, Jock; Cilimburg, A.; Noson, A.; Hutto, R.; Casey, D. 2006. A Plan for Coordinated All-Bird Monitoring in Montana. Montana CBM Steering Committee. Missoula, Montana.