Draft Comprehensive Conservation Plan and Environmental Assessment

Lee Metcalf National Wildlife Refuge

Montana

March 2012

Prepared by

Lee Metcalf National Wildlife Refuge
4567 Wildfowl Lane
Stevensville, Montana 59870
406/777 5552

U.S. Fish and Wildlife Service
Region 6, Mountain–Prairie Region
Division of Refuge Planning
134 Union Boulevard, Suite 300
Lakewood, Colorado 80228
303/236 8145

Contents

Summary . . . VII
Abbreviations . . . XIII

CHAPTER 1—Introduction . . . 1

1.1 Purpose and Need for the Plan . . . 2

1.2 North American Model of Wildlife Conservation . . . 2

1.3 The U.S. Fish and Wildlife Service and the Refuge System . . . 4
U.S. Fish and Wildlife Service . . . 4
Service Activities in Montana . . . 4
National Wildlife Refuge System . . . 5
People and the Refuge System . . . 5

1.3 National and Regional Mandates . . . 6

1.4 Contributions to National and Regional Plans . . . 6
Fulfilling the Promise . . . 6
Partners in Flight . . . 6
North American Waterbird Conservation Plan . . . 7
North American Waterfowl Management Plan . . . 8
Intermountain West Regional Shorebird Plan . . . 9
State Comprehensive Fish and Wildlife Conservation Strategy . . . 9

1.5 Strategic Habitat Conservation . . . 10
Climate Change . . . 10

1.6 Planning Process . . . 11
Coordination with the Public . . . 12
State Coordination . . . 12
Tribal Coordination . . . 14
Results of Scoping . . . 14
Selecting an Alternative . . . 14

CHAPTER 2—The Refuge . . . 15

2.1 Establishment, Acquisition, and Management History . . . 15
Lee Metcalf National Wildlife Refuge . . . 15
Summary of Land Acquisition History . . . 17

2.2 Purposes . . . 17

2.3 Vision . . . 19

2.4 Goals . . . 19
Bitterroot River Floodplain and Associated Wildlife . . . 19
Wetland Impoundment Habitat and Associated Wildlife . . . 19
Grassland and Shrubland Habitat and Associated Wildlife . . . 19
Invasive and Nonnative Species . . . 19
Research . . . 19
Cultural Resources . . . 19
Visitor Services . . . 19
Partnerships . . . 20
Operations and Facilities . . . 20

2.5 Special Values 20

2.6 Planning Issues 21
Bitterroot River Migration 21
Wetland Impoundments (or Ponds) 21
Upland Habitat and Associated Wildlife 23
Water 23
Invasive and Noxious Species 23
Research, Inventory, and Monitoring 24
Visitor Services 24
Staffing 24

CHAPTER 3— Alternatives and Environmental Consequences 25

3.1 Alternatives Development 25
Alternatives Considered but Eliminated 25
Elements Common to All Alternatives 25

3.2 Description of Alternatives 26
Alternative A (Current Management–No Action) 26
Alternative B (Proposed Action) 26
Alternative C 28

3.3 Summary of Environmental Consequences 28
Effects Common to All Alternatives 28

3.4 Detailed Descriptions of Alternatives and Consequences 29
Socioeconomics 29
Cumulative Impacts 29

CHAPTER 4— Affected Environment 53

4.1 Physical Environment 53
Climate and Hydrology 53
Climate Change 55
Physiography and Geology 58
Soils 59
Topography and Elevation 59
Water Rights 62
Hydrogeomorphic Changes 62
Air Quality 67

4.2 Biological Resources 67
Land Cover and Vegetation Communities 68
Habitat Modifications since Establishment 71
Changes to the Vegetation Communities 72
Changes to Fish and Wildlife Populations 73
Upland Habitat 75
Riparian Habitat 76
Wetland Impoundment Habitat 77
Remaining Refuge Acres 78
Invasive Species 78
Wildlife Diseases and Contaminants 78

4.3 State and Federally Listed Species 80
Species of Concern 80

4.4 Cultural Resources and History 83
Prehistoric Occupation 83
History of the Salish 84
Euro-American Settlement and Land Use Changes 84

4.5 Special Management Areas 87
Wilderness Review 87
Important Bird Area 89

4.6 Visitor Services 89
Hunting and Fishing 89
Wildlife Observation and Photography 90
Environmental Education 91
Interpretation 93

4.7 Management Tools 93
Water Level Manipulation 93
Prescribed Burning 94
Prescriptive Grazing or mowing 94
Cooperative Farming 94

4.8 Socioeconomic Environment 94
Population and Demographics 94
Employment 95
Public Use of the Refuge 95
Baseline Economic Activity 95
U.S. Fish and Wildlife Service Employment 96
Visitor Spending 96

4.9 Partnerships 96

4.10 Operations 96
Staff 96
Facilities 97

CHAPTER 5— Implementation of the Proposed Action (Draft CCP) 99

5.1 Summary of the Draft CCP 99
Target species Selection Process 100

5.2 Goal for the Bitterroot River Floodplain and Associated Wildlife 100
Target species for the Bitterroot River Floodplain 100
Floodplain Objective 1 102
Floodplain Objective 2 103
North Burnt Fork Creek Objective (Including Francois Slough) 104
Three Mile Creek Objective 105
Riverfront Forest Habitat Objective 106
Gallery Forest Habitat Objective 106

5.3 Goal for Wetland Impoundment Habitat and Associated Wildlife 108
Target Wetland Habitat Species 108
Wetland Impoundment Habitat Objective 1 108
Wetland Impoundment Habitat Objective 2 109
Gravel Pits Objective 110

5.4 Goal for Grassland and Shrubland Habitat and Associated Wildlife 111
Target Grassland and Shrubland Species 111
Grassland and Shrubland Habitat Objective 111

5.5 Goal for Invasive and Nonnative Species 113
New Invasive Species Objective 114
Established Invasive Species Objective 114

5.6 Goal for Research 115
Research Objective 115

5.7 Goal for Cultural Resources 116
Cultural Resources Objective 1 (Protection) 116
Cultural Resources Objective 2 (Interpretation) 117

5.8 Goal for Visitor Services 118
Hunting Objective 118
Fishing Objective 1 119
Fishing Objective 2 119
Wildlife Observation and Photography Objective 120
Environmental Education Objective 121
Interpretation Objective 123
Signage Objective 124

5.9 Goal for Partnerships 125
Partnership Objective 125

5.10 Goal for Operations and Facilities 125
Staff Objective 125
Facilities, Equipment, and Supplies Objective 126

5.11 Stepdown Management Plans 127

5.12 Research, Monitoring, and Evaluation 127

5.13 Plan Amendment and Revision 128

Glossary 129

Appendixes
Appendix A—Key Legislation and Policy 135
Appendix B—List of Preparers, Consultation, and Coordination 139
Appendix C—Public Involvement 141
Appendix D—Draft Compatibility Determinations 143
Appendix E—Species Lists 155
Appendix F—Fire Management Program 181

Bibliography 185

FIGURES

1 Location map for Lee Metcalf National Wildlife Refuge, Montana x
2 Area map for Lee Metcalf National Wildlife Refuge, Montana 3
3 Process steps for comprehensive conservation planning and associated environmental analysis 11
4 Approved acquisition boundary of Lee Metcalf National Wildlife Refuge, Montana 16
5 Composite vegetation community models Lee Metcalf National Wildlife Refuge for 1964 and 2005 (Heitmeyer et al. 2010) 22
6 Public use map for Lee Metcalf National Wildlife Refuge, Montana 41
7 Ponds and upland fields in Lee Metcalf National Wildlife Refuge, Montana 43
8 Roads within Lee Metcalf National Wildlife Refuge, Montana 47
9 Ravalli County average annual precipitation (inches) 54
10 Channels and sloughs of the Bitterroot River in the 1940s (Heitmeyer et al 2010) 56
11 Flooding of the Bitterroot River on Lee Metcalf National Wildlife Refuge in 1974 57
12 Bitterroot River streamflow near Darby, Montana—USGS 12344000 57
13 Network of minor channels occurring in the valley floor on Lee Metcalf National Wildlife Refuge, Montana (Heitmeyer et. al. 2010) 60
14 Map of Lee Metcalf National Wildlife Refuge showing 1-foot contour intervals (Heitmeyer et al. 2010) 61
15 Car bodies along the Bitterroot River at the north end of Lee Metcalf National Wildlife Refuge, Montana 64
16 Bank and levee erosion along the Bitterroot River on the west side of Lee Metcalf National Wildlife Refuge, Montana (Heitmeyer et al. 2010) 64
17 Maps showing the changes in the main channel of the Bitterroot River (Heitmeyer et al. 2010) 65

18 Hydrogeomorphic-derived map of potential vegetation communities on Lee Metcalf National Wildlife Refuge prior to European settlement in the mid-1800s (Heitmeyer et al. 2010) 69
19 Existing habitat and vegetation communities on Lee Metcalf National Wildlife Refuge, Montana 70
20 Field planted as dense nesting cover on Lee Metcalf National Wildlife Refuge, Montana 73
21 Osprey production on Lee Metcalf National Wildlife Refuge, Montana, 1964–2007. 74
22 Mercury concentration in fish from Montana refuges (Heitmeyer et al. 2010). 75
23 Proposed land use and drainage and irrigation infrastructure on Lee Metcalf National Wildlife Refuge in the 1960s (Heitmeyer et al. 2010). 86
24 Location of residential structures near Lee Metcalf National Wildlife Refuge, Montana (Heitmeyer et al. 2010) . 88
25 Adaptive management process 128

TABLES

1 Summary of the CCP planning process for Lee Metcalf National Wildlife Refuge, Stevensville, Montana 12
2 Habitat type and associated acreages found on Lee Metcalf National Wildlife Refuge, Montana. 17
3 Land acquisition history for Lee Metcalf National Wildlife Refuge, Montana (1964–2009) 18
4 Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana. 30
5 Water rights summary for Lee Metcalf National Wildlife Refuge, Montana 63
6 Hydrogeomorphic matrix of historical distribution of vegetation communities and habitat types on Lee Metcalf National Wildlife Refuge 68
7 Documented invasive and nonnative species on Lee Metcalf National Wildlife Refuge as of 2010 and the degree of infestation, priority for treatment, and State noxious status. 79
8 Montana listed species of concern and Federal birds of conservation concern recorded in the Bitterroot Valley and on Lee Metcalf National Wildlife Refuge, Montana 81
9 Target species for the Bitterroot floodplain and their habitat needs. 101
10 Wetland impoundment target species and their habitat needs 108
11 Target species for the grassland and shrubland areas and their habitat needs 112
12 Current and proposed staff for Lee Metcalf National Wildlife Refuge, Montana 126
13 Stepdown management plans for Lee Metcalf National Wildlife Refuge, Montana 128

Summary

Bob Danley/USFWS

View of the Lee Metcalf National Wildlife Refuge from the Bitterroot Mountains.

This is a summary of the draft comprehensive conservation plan and environmental assessment for the U.S. Fish and Wildlife Service's Lee Metcalf National Wildlife Refuge. The National Wildlife Refuge System Improvement Act of 1997 requires the U.S. Fish and Wildlife Service to develop a comprehensive conservation plan by 2012 for each national wildlife refuge. Chapter 5 contains the draft plan for the refuge; the final plan is scheduled for completion in 2012 and would guide the management of the refuge for the next 15 years.

The Refuge

Lee Metcalf National Wildlife Refuge, established on February 4, 1964, is a 2,800-acre refuge located in the Bitterroot River Valley of southwest Montana (figure 1). The refuge encompasses a portion of the Bitterroot River and is located between the scenic Bitterroot and Sapphire Mountains. The channel of the Bitterroot River has been altered from levees, bank stabilization, and some channelization; nevertheless, this floodplain refuge provides a diverse mosaic of western mountain valley habitats including gallery and riverfront forest, wet meadow, wetlands, and grassland benches.

The refuge provides opportunities for the public to enjoy compatible wildlife-dependent public use activities including hunting, fishing, wildlife observation and photography, environmental education, and interpretation. The refuge is a very popular community and tourist destination with more than 143,000 visitors annually.

The Planning Process

The planning process for a comprehensive conservation plan consists of a series of steps including environmental analysis. Public and partner involvement is encouraged and valued throughout the process. The Service's planning team compiled a list of issues to consider and analyzed management alternatives for the comprehensive conservation plan that would not only address these issues but meet the purposes, vision, and goals of the refuge.

After the public reviews and provides comments on the draft plan and environmental assessment, the Regional Director will consider the environmental effects of each alternative including information gathered during public review. The Regional Director will select a preferred alternative. After the planning team prepares the final comprehensive conservation plan for publication, a notice of availability will be published in the Federal Register, and copies of the final document or accompanying summary will be sent to individuals on the mailing list. Subsequently, the Service will implement the comprehensive conservation plan with help from partner agencies, organizations, and the public.

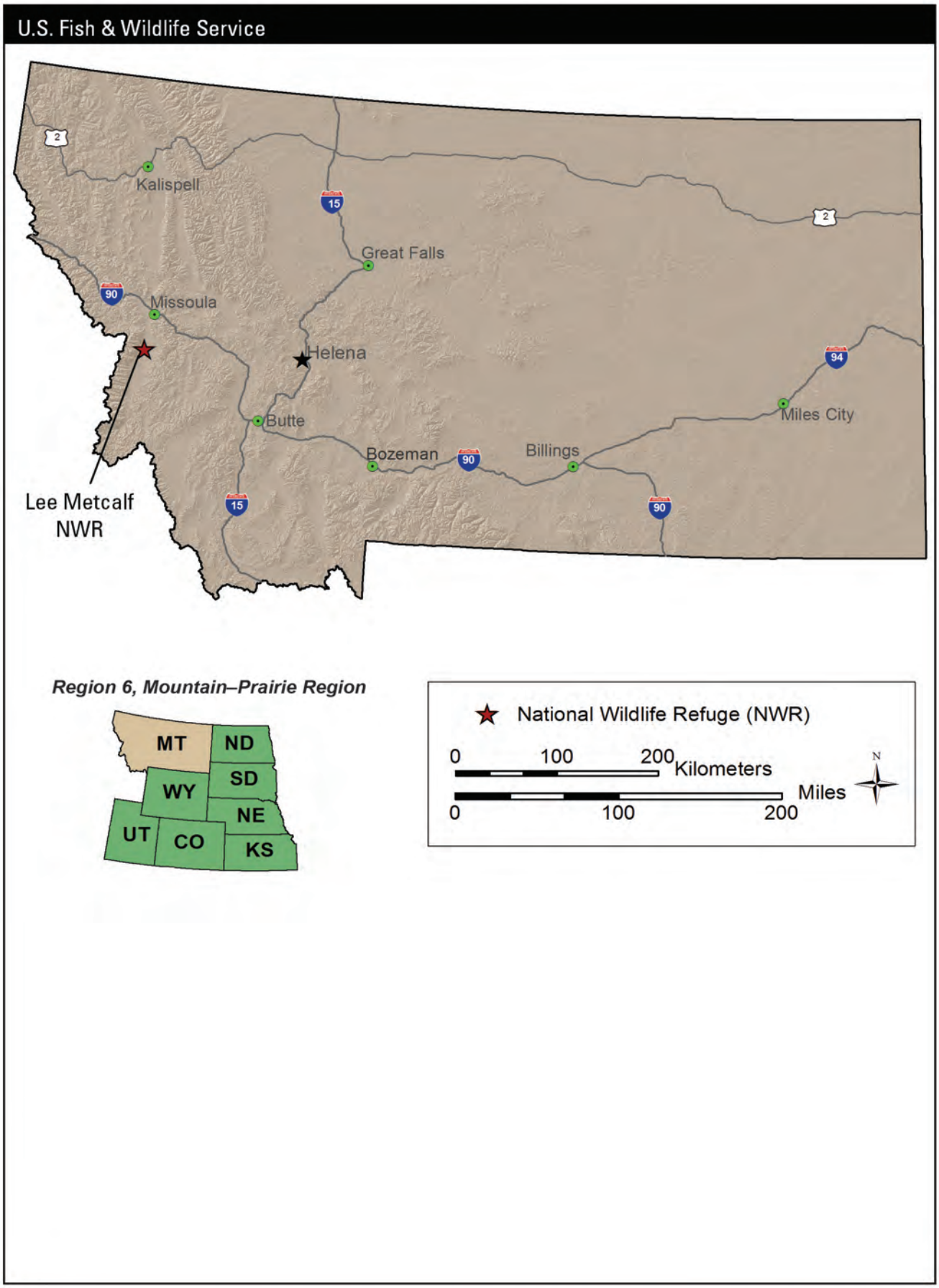


Figure 1. Location map for Lee Metcalf National Wildlife Refuge, Montana.

Steve Hillebrand/USFWS

The refuge encompasses a portion of the Bitterroot River and is located between the scenic Bitterroot and Sapphire Mountains in the heart of the Bitterroot Valley.

Issues

Substantive issues were identified following an internal review of refuge information and through public scoping, which began in 2009. The following issues are detailed in chapter 2:

- riparian habitat loss and fragmentation caused by the migration of the Bitterroot River
- overgrown emergent vegetation and eroded levees and water management structures that have compromised the ability to properly manage wetland impoundments
- reduction in the quality and diversity of upland habitats due to invasive plants and lack of native species
- algal blooms that have diminished clarity and quality of refuge waters
- inefficient water supply due to silted and overgrown supply ditches
- invasive species that have become widespread and difficult to control
- lack of baseline research, inventory, and monitoring data to guide research
- small visitor contact area, outdated displays, and inadequate public access by trails
- inadequate staff to manage and enhance refuge habitats and visitor services

The Future of the Refuge

The vision for Lee Metcalf National Wildlife Refuge is based on the establishing purposes of the refuge, resource conditions and potential, and the issues identified during the planning process. The goals were developed to meet the vision for the refuge.

Vision for the Refuge

Lee Metcalf National Wildlife Refuge is a representation of the diverse native wildlife habitat once found abundantly between the Bitterroot and Sapphire Mountains and along the ever-changing Bitterroot River. This floodplain refuge, fed by mountain snow, is a diverse mosaic of forest, grassland, and riparian habitat that provides protected lands and waters for migratory and resident wildlife.

The refuge, in partnership with its neighbors, friends, and the community, is a conservation leader in the valley, ensuring that the biological integrity of this refuge and other valley habitats remains intact or, where appropriate, is restored.

These protected lands and waters are a place of discovery for visitors to experience fish and wildlife firsthand and where children can experience nature with all their senses. Visitors to the refuge can appreciate the beauty of the setting and experience a sense of wonder and pride to be preserving this part of the Bitterroot Valley and the National Wildlife Refuge System.

Goal for the Bitterroot River Floodplain and Associated Wildlife

Manage and, where appropriate, restore the natural topography, water movements, and physical integrity of surface water flow patterns across the Bitterroot River floodplain to provide healthy riparian habitats for target native species and to educate visitors about the benefits of sustaining a more natural floodplain.

Steve Hillebrand/USFWS

Consistent with the guiding principals of all units in the Refuge System, wildlife is prioritized first on the refuge.

Goal for wetland impoundment habitat and associated wildlife

Where appropriate, manage wetland impoundments to create a diversity of habitats for target waterfowl, shorebirds, and other associated native wetland-dependent species.

Goal for grassland and shrubland habitat and associated wildlife

Create the conditions that will allow for the restoration, maintenance, and distribution of native grassland and shrubland species (such as rabbitbrush, needle and thread grass, Junegrass, and hairy golden aster) to provide healthy lands for a diverse group of target native resident and migratory wildlife species and to educate visitors about the historical plant and animal diversity of the valley.

Goal for invasive and nonnative species

Prevent, reduce, and contain the invasion and spread of noxious, invasive, and harmful nonnative species within the refuge while working with partners to address off-refuge infestations within the surrounding landscape.

Goal for research

Pursue and maintain compatible research projects that would provide information on refuge resources and address refuge issues to assist management in making decisions based on the best available information and science.

Goal for cultural resources

Provide opportunities for visitors to learn about the unique glacial, Native American, and Euro-American history of the Bitterroot Valley while maintaining and protecting the integrity of the refuge's cultural and historical resources.

Goal for visitor services

Provide visitors of all abilities with opportunities to participate in and enjoy quality, compatible wildlife-dependent recreation, environmental education, and interpretation programs that foster an awareness and appreciation of the importance of protecting the natural and cultural resources of the refuge, the Bitterroot Valley, and the National Wildlife Refuge System.

Goal for partnerships

Maintain and cultivate partnerships that help achieve the vision and supporting goals and objectives of the Lee Metcalf National Wildlife Refuge Comprehensive Conservation Plan and support other initiatives designed to protect and restore habitats for Federal trust species within the Bitterroot River Valley.

Goal for operations and facilities

Prioritize wildlife first and emphasize the protection of trust resources in the utilization of staff, volunteers, funding, and facilities.

Target species selection process

Early in the planning process, the Service selected three groups of target species that will be supported by the objectives and strategies described under the habitat goals for the Bitterroot River floodplain, wetland impoundment habitat, and grassland and shrubland habitat. The initial suite of birds, amphibians, or mammals was selected after Service staff reviewed three documents focused on sustaining or recovering species in Montana:

- "Montana Intermountain West Joint Venture Plan"
- "Montana State Conservation Plan"
- "Bitterroot River Subbasin Plan"

The criteria for this species list were based on whether a species either occurred on Lee Metcalf Refuge or could occur on the refuge if its preferred habitat was expanded or restored, as indicated under each goal. The life history needs of over 100 species were examined for similarities and relevance to the proposed goals. Ultimately, 16 species (tables 9, 10, and 11 in chapter 5) were selected based on their ability to represent guilds or because they were good indicators of the quality of a specific habitat type. The habitats that support the migration, foraging, nesting, and migration needs of these selected species should benefit a much broader group of secondary bird species as well as a variety of other wildlife, both migratory and resident.

These target species would be monitored for trends in abundance and distribution to evaluate the effectiveness of proposed actions. The actions described in these the alternatives, below, were evaluated based on their abilities to support these target species.

Alternatives

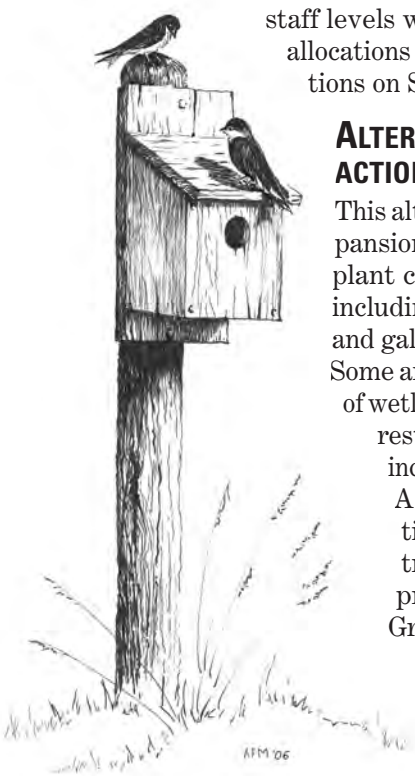
The Service developed and analyzed three alternatives for managing habitats and public use at Lee Metcalf National Wildlife Refuge. These alternatives and the consequences of implementing them are further described in chapter 3.

Alternative A—Current Management (No Action)

Alternative A is the no-action alternative, which represents the current management of the refuge. This alternative provides the baseline against which to compare the other alternatives. It also fulfills the requirement in the National Environmental Policy Act that a no-action alternative be addressed in the analysis process.

Under alternative A, management activity currently conducted by the Service would remain the same. The Service would continue to manage and monitor refuge habitats at current levels. The Bitterroot River would continue to migrate through the refuge, eroding some levees and trails. Invasive species would be treated primarily with mechanical and chemical methods as resources become available. Water supply and management structures would be inadequate to properly manage many of the wetland impoundments. Cattail monocultures would be treated.

The current staff of five would perform issue-driven research and monitor only long-term wildlife and vegetation changes. Visitor services programs and facilities would be maintained or expanded as resources become available. Funding and staff levels would follow annual budget allocations provided for refuge operations on Service lands.



Alternative B (Proposed Action)

This alternative focuses on the expansion and restoration of native plant communities on the refuge including grasslands, shrublands, and gallery and riverfront forests. Some areas that are currently part of wetland impoundments would be restored to native communities including forest and shrubland. A significant focus of restoration proposals would be controlling invasive species and preventing further spread. Grasses and shrubs native to the uplands, including the alluvial fans (that is, areas of sedimentary deposits where fast-flowing streams have flown into flatter plains), would begin to be restored to provide habitat for native wildlife including grassland-dependent migratory birds. Some wetland impoundments and Service (nonpublic) roads would be removed or reduced in size to allow for river migration and to restore native gallery and riverfront forest for riparian-dependent wildlife. The remaining impoundments would be managed to mimic natural conditions for wetland-dependent migratory birds.

Bob Danley/USFWS

Environmental education is one of several visitor services offered at the refuge.

The Service would expand and improve the refuge's compatible wildlife-dependent public use programs, in particular the wildlife observation, environmental education, and interpretation programs. The visitor contact area would be expanded into a visitor center with new displays and a combination conference room and environmental education classroom. New displays would be professionally planned and produced. The refuge would work with Ravalli County staff to designate the county road in the refuge as an auto tour route, which would include pulloffs and some form of interpretation. A seasonal hiking trail would be added, and current trails would be improved for wildlife observation and photography. Interpretation and environmental education programs would be expanded using added staff and volunteers. All public use programs would provide visitors a consistent message about the purposes and values of the refuge and the mission of the Refuge System.

The refuge staff would be expanded by 3.5 individuals to include an assistant refuge manager (one full-time equivalent), a full-time and a career-seasonal biological science technician (1.5 full-time equivalents), and a visitor services specialist (one full-time equivalent) who would serve as a visitor center manager and volunteer coordinator.

Increased research and monitoring, staff, funding, infrastructure, and partnerships would be required to accomplish the goals, objectives, and strategies associated with this alternative. Additional staff and funding

Bob Danley/USFWS

A fish trap is used to capture and identify fish species on the refuge.

would be added depending on the regional priorities for those funds allocated to the Service for management of lands and waters within the Refuge System.

Alternative C

Alternative C contains many of the elements found in alternative B related to expanding visitor service programs and facilities. However, habitat management would be focused on maintaining the wetland impoundments and attempting to restrict the movements of the Bitterroot River throughout the refuge. Habitat efforts would be primarily focused on providing waterfowl and other waterbird habitat.

Abbreviations

A.D.	Anno Domini or "year of our Lord"
Administration Act	National Wildlife Refuge System Administration Act of 1966
amsl	Above mean sea level
B.C.	before Christ
B.P.	before present
CCP	comprehensive conservation plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO_2	carbon dioxide
CWD	chronic wasting disease
EA	environmental assessment
FMP	fire management plan
FONSI	Finding of No Significant Impact
GIS	geographic information system
GS	General Schedule
HGM	hydrogeomorphic
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
IPM	integrated pest management
IWJV	Intermountain West Joint Venture
MFWP	Montana Fish, Wildlife & Parks
mg/L	milligrams per liter
n/a	not applicable
NEPA	National Environmental Policy Act of 1969
$PM_{2.5}$	particulate matter less than 2.5 microns in size
POD	points of diversion
refuge	Lee Metcalf National Wildlife Refuge
Refuge System	National Wildlife Refuge System
RLGIS	Refuge Lands Geographic Information Systems database
Service	U.S. Fish and Wildlife Service
SHPO	State Historic Preservation Office
U.S.C.	United States Code
U.S.	United States
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WG	Wage Grade Schedule
WVA	wildlife viewing area

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

CHAPTER 1—Introduction

Bob Danley/USFWS

Lee Metcalf Refuge is a 2,800-acre refuge located in the Bitterroot River Valley of southwest Montana.

This chapter provides an introduction to the process for development of a comprehensive conservation plan (CCP), including environmental analysis, for the Lee Metcalf National Wildlife Refuge (Lee Metcalf Refuge, or refuge) in Montana. Chapter 1 describes the involvement of the U.S. Fish and Wildlife Service (Service), the State of Montana, Native American tribes, the public, and others, and it describes conservation issues and plans that affect the refuge. The remaining chapters provide more specific information on the refuge and planning issues (chapter 2), alternatives and consequences (chapter 3), and related resources (chapter 4). Chapter 5 describes the proposed action (identified by the planning team) and constitutes the draft CCP, with detailed objectives and strategies to carry out the plan.

Lee Metcalf Refuge is a 2,800-acre refuge located in the Bitterroot River Valley of southwest Montana (figure 2). The refuge encompasses a portion of the Bitterroot River and is located between the scenic ranges of the Bitterroot and Sapphire Mountains. This unique location includes a diverse mosaic of western mountain valley ecosystem types and provides many public use opportunities including recreation, education and discovery, and research. The recreational opportunities and natural beauty of this valley have made it one of the most rapidly expanding human population areas of Montana. This refuge is surrounded by development, including agriculture and housing. The nearby Bitterroot National Forest is visited by thousands of people each year, and annually the refuge has more than 143,000 visitors, including 2,000 hunters. The refuge was authorized primarily for management of migratory birds and incidental fish- and wildlife-oriented recreation.

This document presents an environmental assessment (EA) that evaluates three alternatives for, and expected consequences of, managing the Lee Metcalf Refuge. The Service's planning team has identified alternative B as its proposed action, which is fully described in chapter 5.

The Service and other Federal, State, and tribal partners have developed this draft CCP to provide a foundation for the management and use of the Lee Metcalf Refuge. The CCP specifies the necessary actions to achieve the vision and purposes of the refuge. Wildlife is the first priority in refuge management, and public use (wildlife-dependent recreation) is allowed and encouraged as long as it is compatible with the purposes of the refuge. When completed, the CCP will serve as a working guide for management programs and activities over the next 15 years. Although this document contains management direction for the refuge, greater detail will be provided in stepdown management plans as part of implementing the final CCP. (Refer to table 13 in chapter 5.)

1.1 Purpose and Need for the Plan

The purpose of this draft CCP is to identify the role that the Lee Metcalf Refuge would play in supporting the mission of the National Wildlife Refuge System (Refuge System) and to provide long-term guidance for managing 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;
- provide a clear statement of direction for managing the refuge;
- provide neighbors, visitors, and government officials with an understanding of the Service's management actions on and around the refuge;
- ensure that the Service's management actions are consistent with the mandates of the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act);
- ensure that management supports other Federal, State, and county plans, as appropriate;
- provide a basis for development of budget requests for the refuge's operation, maintenance, and capital improvement needs.

Sustaining the Nation's fish and wildlife resources is a task that can be accomplished only through the combined efforts of governments, businesses, and private citizens.

1.2 North American Model of Wildlife Conservation

Wildlife conservation in North America evolved to take on a form unique in the world; in recent years, it has come to be known as the North American Model of Wildlife Conservation (Geist et al. 2001). The wildlife conservation movement arose out of the conflict between market hunters and sport hunters in the mid- to late-nineteenth century. Market hunting increased in response to the growth in urban population fueled by the Industrial Revolution. Between 1820 and 1860, the percentage of Americans who lived in cities increased from 5 percent to 20 percent; this fourfold increase is the greatest proportional increase in urban population that ever occurred in the United States (Reiss 1995). The demand for meat and hides—along with feathers for the millinery trade—led to exploitation of game animals by market hunters. Along with the increase in the urban population came a new breed of hunter—one who hunted for the chase and the challenge it provided. These sport hunters valued game animals more when they were alive; market hunters, however, placed value on dead animals they could bring to market. The growing legion of sport hunters started a national movement that resulted in Federal and State governments taking responsibility for regulating the take of wildlife.

The keystone concept of the North American Model of Wildlife Conservation, and the bedrock that allowed government to exercise control, is the public trust doctrine (Geist and Organ 2004). With origins in Greek and Roman law, the Magna Carta, and the 1842 Martin v. Waddell U.S. Supreme Court decision, the public trust doctrine as it applies to wildlife conservation is the principle that wildlife belongs to no one; it is held in trust for all by government.

The seven pillars of the North American Model of Wildlife Conservation follow:

- wildlife as a public trust resource
- elimination of markets for game
- allocation of wildlife by law
- wildlife only killed for a legitimate purpose
- wildlife considered an international resource
- science as the proper tool to discharge wildlife policy
- democracy of hunting

For more than 100 years, these pillars have stood the test of time despite significant changes in approaches to wildlife conservation. The original conservation movement championed by Theodore Roosevelt, George Bird Grinnell, and others emphasized stemming wildlife population declines through implementing programs that restricted take and protected lands. During the 1920s, conservationists realized that more was needed, and a committee including Aldo Leopold, A. Willis Robertson, and other leading conservationists of the time authored the 1930 American Game Policy. This policy called for a restoration program for habitats and populations based on scientific research and supported with stable, equitable funding. Within a decade, many needs of this program were fulfilled through landmark legislation, including the Duck Stamp Act to fund land acquisition for national wildlife refuges. In addition, the Pittman–Robertson Wildlife Restoration Act shifted excise taxes imposed on firearms and ammunition to fund wildlife restoration through cooperation between the Service and State fish and wildlife agencies. To use this money, States were required to pass laws that prevented diversion of hunting license revenues to any purpose other than administration of the State fish and wildlife agency.

In recent decades, wildlife management has placed greater emphasis on overall wildlife diversity. All wildlife species have benefited from the North American

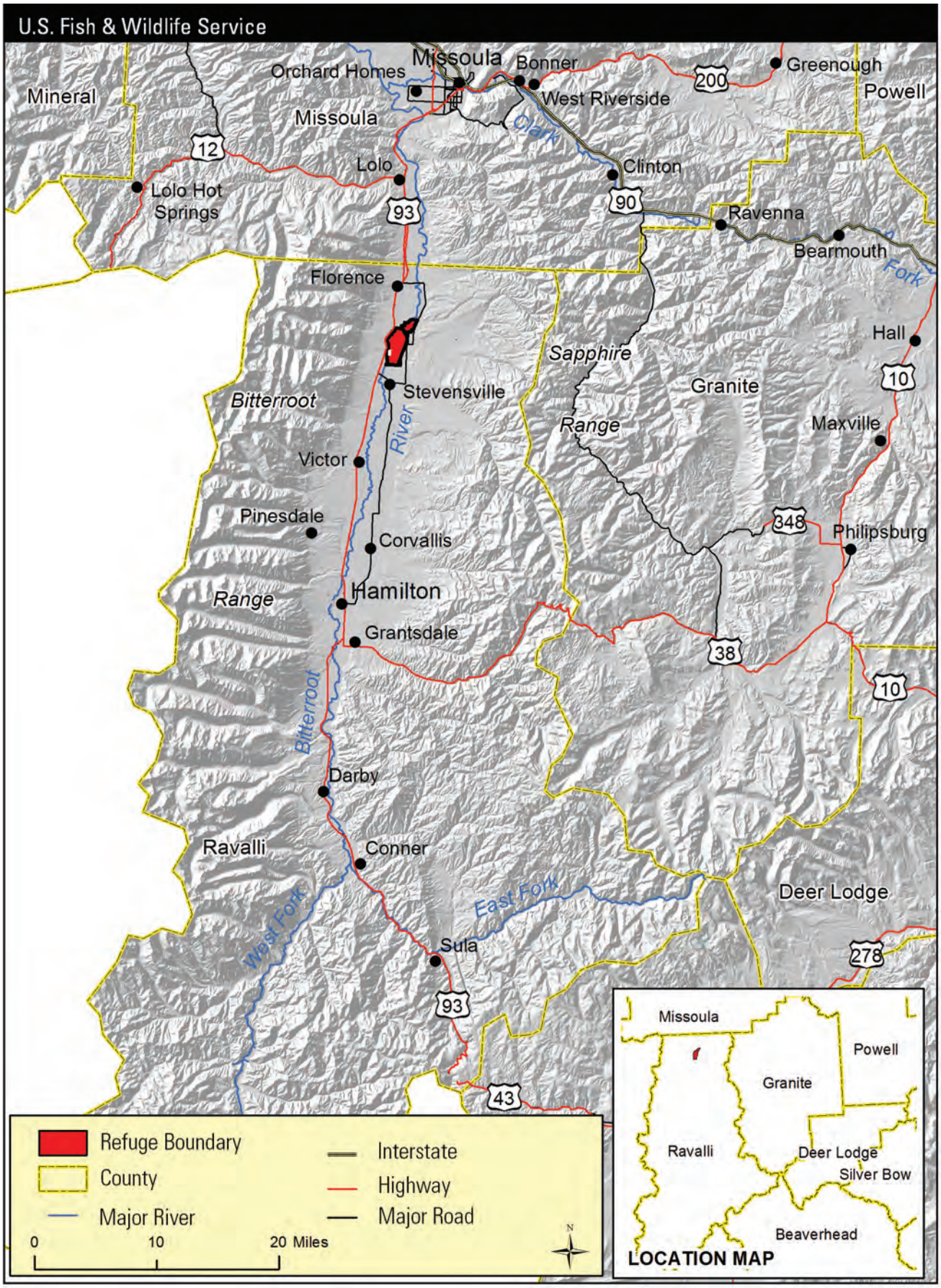


Figure 2. Area map for Lee Metcalf National Wildlife Refuge, Montana.

Model of Wildlife Conservation pillars, not just game animals. The Refuge System has evolved along with the North American Model of Wildlife Conservation—it today provides refuge for virtually all species found in the United States and recreation for all Americans.

It is a realization of the North American Model of Wildlife Conservation to provide for science-based management of international wildlife resources held in trust for all. The importance of this system to American society can best be appreciated if we were to contemplate its loss. Wildlife connects us to the heritage of this country and our ancestors who built our society. It connects us as well to the natural world of which we are a part, but from which we have become so disconnected. To lose this connection is to lose the basis of our humanity.

1.3 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 mission of the U.S. Fish and Wildlife Service, working with others, is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

In the late 19th and early 20th centuries, America's fish and wildlife resources were declining at an alarming rate, largely due to unrestricted market hunting. Concerned citizens, scientists, and hunting and angling groups joined together and generated the political will for the first significant conservation measures taken by the Federal Government. These actions included the establishment of the Bureau of Fisheries in the 1870s and, in 1900, passage of the first Federal wildlife law—the Lacey Act—which prohibited interstate transportation of wildlife taken in violation of State laws. Beginning in 1903, President Theodore Roosevelt established more than 50 wildlife refuges across the Nation.

Over the next three decades, the United States ratified the Migratory Bird Treaty with Great Britain, and Congress passed laws to protect migratory birds, establish new refuges, and create a funding source for refuge land acquisition. In 1940, the U. S. Fish and Wildlife Service was created within the Department of the Interior, and existing Federal wildlife functions including law enforcement, fish management, animal damage control, and wildlife refuge management were combined into a single organization for the first time.

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 across the United States.

SERVICE ACTIVITIES IN MONTANA

Service activities in Montana contribute to the State's economy, ecosystems, and education programs. The following list highlights the Service's presence and activities in 2009:

- employed 220 people in Montana
- coordinated 446 volunteers who donated more than 21,780 hours to Service projects on refuge and district lands
- managed two national fish hatcheries, one fish and wildlife management assistance office, six coordination areas, one fish health center, four ecological services offices, and one fish technology center
- managed 23 national wildlife refuges encompassing 1,217,617 acres (1.29 percent of the State)
- managed five wetland management districts
  - 48,026 acres of fee-title waterfowl production areas
  - 146,816 acres under leases or easements
- hosted 690,173 annual visitors to Service-managed lands
  - 96,866 hunting visits
  - 80,370 fishing visits
  - 506,632 wildlife observation, photography, and interpretation visits
  - 6,305 visits from students participating in environmental education programs

- provided $9.6 million to Montana Fish, Wildlife & Parks (MFWP) for sport fish restoration and $17.4 million for wildlife restoration and hunter education
- paid Montana counties $394,799 under the Refuge Revenue Sharing Act (money used for schools, roads, and any other public purpose)

Additionally, since 1988 the Service's Partners for Fish and Wildlife Program has helped private landowners restore more than 31,759 wetland acres, 360,826 upland acres, and 1,263 miles of river habitat as well as install 45 structures to open 502 river miles for fish passage.

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 native nesting birds. This was the first time the Federal Government 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 150 million acres within 553 refuges and more than 3,000 waterfowl production areas providing breeding and nesting habitat for migratory birds. Today, there is at least one refuge in every State as well as in Puerto Rico and the U.S. Virgin Islands.

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 states that each national wildlife refuge (that is, every unit of the Refuge System, which includes wetland management districts) shall be managed to accomplish the following:

- Fulfill the mission of the Refuge System.
- Fulfill the individual purposes of each refuge and district.
- Consider the needs of fish and wildlife first.
- Fulfill the requirement of developing a CCP for each unit of the Refuge System and fully involve the public in preparation of these plans.
- Maintain the biological integrity, diversity, and environmental health of the Refuge System.
- Recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, photography, environmental education, and interpretation are legitimate and priority public uses.
- Retain the authority of refuge managers to determine compatible public uses.

In addition to the mission for the Refuge System, the wildlife and habitat vision for each unit of the Refuge System maintains the following principles:

- Wildlife comes first.
- Ecosystems, biodiversity, and wilderness are vital concepts in refuge and district management.
- Habitats must be healthy.
- Growth of refuges and districts must be strategic.
- The Refuge System serves as a model for habitat management with broad participation from others.

Following passage of the Improvement Act, the Service immediately began to carry out the direction of the new legislation including 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 each district is required to complete its 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.

Whether through bird watching, fishing, hunting, photography, or other wildlife pursuits, wildlife recreation contributes billions of dollars to local economies. In particular, money generated from the taxing of sporting arms and ammunition and of fishing equipment that is authorized by the Pittman–Robertson and Dingell–Johnson Acts, respectively, has generated tens of billions of dollars. Distributed by the Service, this money has been used by States to increase wildlife and fish populations, expand habitat, and train hunters across the Nation. Approximately 35 million people visited the Refuge System in 2006, mostly to observe fish and wildlife in their natural habitats (Caudill and Henderson 2006). Visitors are most often accommodated through nature trails, auto tours, interpretive programs, and hunting and fishing opportunities. Local communities that surround the refuges and wetland management districts derive significant economic benefits. Economists report that Refuge System visitors contribute more than $1.7 billion annually to local economies (Carver and Caudhill 2007).

1.3 National and Regional Mandates

Refuge System units are managed to achieve the mission and goals of the Refuge System along with the designated purpose of the refuges and districts (as described in establishing legislation, Executive orders, or other establishing documents). The key concepts and guidance for the Refuge System are in the National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd–668ee) (Administration Act), Title 50 of the Code of Federal Regulations (CFR), "The Fish and Wildlife Service Manual," and the Improvement Act (an amendment of the Administration Act).

The Improvement Act amends the Administration Act by providing a unifying mission for the Refuge System, a new process for determining compatible public uses on refuges and districts, and a requirement that each refuge and district be managed under a CCP. The Improvement Act states that wildlife conservation is the priority of Refuge System lands and that the Secretary of the Interior will make sure that the biological integrity, diversity, and environmental health of refuge lands are maintained. Each refuge and district must be managed to fulfill the Refuge System's mission and the specific purposes for which the unit was established. The Improvement Act requires the Service to monitor the status and trends of fish, wildlife, and plants in each national wildlife refuge and wetland management district.

A detailed description of these and other laws and Executive orders that may affect the CCP or the Service's implementation of the CCP is in appendix A. Service policies for planning and day-to-day management of refuges and districts are in the "Refuge System Manual" and "The Fish and Wildlife Service Manual."

1.4 Contributions to National and Regional Plans

Lee Metcalf Refuge contributes to the conservation efforts outlined in the various State and national plans described below.

Fulfilling the Promise

A 1999 report, "Fulfilling the Promise, The National Wildlife Refuge System" (USFWS 1999), is 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), which was attended by refuge managers, other Service employees, and representatives from leading conservation organizations.

The report contains 42 recommendations packaged with three vision statements for wildlife and habitat, people, and leadership—all three of these major topics are included in this CCP.

Partners in Flight

The Partners in Flight program began in 1990 with the recognition of declining population levels of many migratory landbird species. The challenge is to manage avian population growth while maintaining functional natural ecosystems in the face of human population growth. To meet this challenge, Partners in Flight worked to identify priorities for landbird species and habitat types. Partners in Flight activities have resulted in 52 bird conservation plans covering the continental United States. Partners in Flight is a cooperative effort involving partnerships among Federal, State, and local government agencies, philanthropic foundations, professional organizations, conservation groups, industries, the academic community, and private individuals.

The Partners in Flight program was initiated to provide for the long-term health of landbird life of this continent. Its mission can be expressed in three related priorities: helping species at risk, keeping common birds common, and forming voluntary partnerships benefiting birds, habitat, and people. The three goals developed in support of this mission are as follows:

- Ensure an active, scientifically-based conservation design process that identifies and develops solutions to threats and risks to landbird populations.
- Create a coordinated network of conservation partners to implement the objectives of the landbird conservation plans at multiple scales.
- Secure sufficient commitment and resources to support vigorous implementation of landbird conservation objectives (Rich et al. 2004).

Montana Partners in Flight considered 141 species for priority status. It identified 14 high-priority species (priority I) in need of immediate conservation action, 43 moderate-priority species with lesser threats but in need of better monitoring and conservation (priority II) consideration, and 51 species of local interest whose habitat needs may influence design and selection of conservation strategies (priority III). The highest priority species are common loon, trumpeter swan, harlequin duck, greater sage-grouse, piping plover, mountain plover, interior least tern, flammulated owl, burrowing owl, black-backed woodpecker, olive-sided flycatcher, brown creeper, Sprague's pipit, and Baird's sparrow (Casey 2000).

The highest priority habitats in Montana are mixed grassland, sagebrush steppe, dry forest (ponderosa pine and Douglas-fir), riparian deciduous forest, and

prairie pothole wetlands, some of which occur on the refuge. The primary objectives in each priority habitat are to restore ecological processes necessary to provide suitable habitat for priority (target) species, identify and protect those remaining blocks of habitats that have undergone drastic declines, and develop management prescriptions that can be applied at all geographic scales.

To fully implement the goals of the international Partners in Flight plan, a series of scientifically based landbird conservation plans with long-term strategies for bird conservation have been developed. The geographical context of these plans is composed of 58 physiographic regions, each defined by similar physical geographic features and wholly or partially contained within the continental United States and Alaska. Lee Metcalf Refuge lies within the physiographic area known as the Central Rocky Mountain Physiographic Region.

Central Rocky Mountain Physiographic Region

The Central Rocky Mountain Physiographic Region is a huge physiographic area, extending from northwest Wyoming to all of western Montana, the northern two-thirds of Idaho, large areas of eastern Oregon and Washington, much of southeast British Columbia, and a sliver of west Alberta. It is an area of high mountains, with elevations exceeding 10,000 feet. Glaciation has left broad, flat valleys between mountain ranges.

Elevation determines the dominant vegetation. The highest areas are alpine tundra. The subalpine zone is dominated by Engelmann spruce and subalpine fir, with ponderosa pine and Douglas-fir in the montane zone below. Stand-replacing fire can change forests in either of these zones to lodgepole pine or aspen. Fire in higher-elevation coniferous forests of the central Rocky Mountains tends to be of high intensity and low frequency. Grass and sagebrush occur under open pine forests that grade downslope into grasslands, wetlands, woodlands, or shrub-steppe. Approximately 28 species of birds have a higher population in the central Rocky Mountains than in any other physiographic area. This is the highest such number in any physiographic area in the contiguous United States, and it seems to represent the huge size of the area and the vast amount of quality bird habitat that still exists.

A huge percentage of the central Rocky Mountains in the United States are in public ownership, mostly managed by the U.S. Department of Agriculture (USDA) Forest Service. Maintenance or restoration of healthy forest ecosystems on public and private industrial lands will be the most important factor in keeping the central Rocky Mountains a healthy ecosystem for so many forest birds.

There are currently 141 species identified for special consideration within the Central Rocky Mountain Physiographic Region. Generally, priority 1 species are the highest priority and are the focus of proposed conservation actions. The priority 1 species identified for this physiographic region are common loon, trumpeter swan, harlequin duck, sage-grouse, piping plover, mountain plover, (interior) least tern, flammulated owl, burrowing owl, black-backed woodpecker, olive-sided flycatcher, brown creeper, Sprague's pipit, and Baird's sparrow. The common loon, trumpeter swan, olive-sided flycatcher, and the brown creeper have been documented on the refuge, primarily using the refuge for resting and feeding. No nesting has been recorded.

Donna Dewhurt/USFWS

A priority 1 species of the Central Rocky Mountain Physiographic Region, the brown creeper has been documented on Lee Metcalf Refuge.

North American Waterbird Conservation Plan

The North American Waterbird Conservation Plan provides a contiguous framework for conserving and managing colonial-nesting waterbirds including 209 species of seabirds, coastal waterbirds (gulls, terns, and pelicans), wading birds (herons and ibises), and marshbirds (certain grebes and bitterns). The overall goal of this conservation plan is to make sure that the following are sustained or restored throughout the waterbirds' ranges in North America: (1) the distribution, diversity, and abundance of waterbird populations; (2) waterbird habitats (breeding, migratory, and nonbreeding); and (3) important sites for waterbirds. The geographic scope of the plan covers 28 countries from Canada to Panama as well as islands and nearshore areas of the Atlantic and Pacific Oceans, the Gulf of Mexico, and the Caribbean Sea. This waterbird partnership consists of Federal, State, and Provincial wildlife agencies; individuals; and nonprofit conservation organizations.

Waterbird planning regions were identified to allow for planning at a practical, landscape-level scale. Planning region boundaries are based on a combination of political considerations and ecological factors. Sixteen planning regions were identified within North and South Americas. Lee Metcalf Refuge is located

within the Intermountain West Waterbird Conservation Region. This is a vast inland area stretching from the Rocky Mountains on the east to the Sierra Nevada and Cascades on the west. The Intermountain West's dispersed high-mountain lakes, large terminal hypersaline lakes, marshes, playas, rivers, streams, riparian zones, and fresh and brackish wetlands host about 40 waterbird species, including many or most of the world's California gulls, eared grebes, white-faced ibises, and American white pelicans. Eleven waterbirds are identified as species of high concern in one or more of the four Bird Conservation Regions within the planning area: yellow rail, Franklin's gull, black tern, eared grebe, western grebe, Clark's grebe, snowy egret, American white pelican, common loon, American bittern, and certain managed populations of the greater and lesser sandhill crane. The Franklin's gull, black tern, western grebe, American white pelican, bittern, loon, and sandhill crane have all been documented using the refuge, primarily for resting and feeding. However, recent years have seen the sandhill cranes nesting with at least two to five successful nests per season.

Waterbirds using this region are highly adaptable to constantly changing wetland conditions and depend on a regional-scale association of wetlands to meet habitat and forage requirements during stages of their annual life cycle. The competing demands for water from agriculture, development, and recreation pose the greatest threats to regional waterbird populations. Also, contaminants such as mercury and dichlorodiphenyltrichloroethane (known as DDT) and its breakdown products significantly threaten the region's waterbirds. Because of the west's feast-or-famine water regime, the "Intermountain West Joint Venture Conservation Plan" stresses the necessity of conserving a network of high-quality wetland habitats with secure water sources to provide options for waterbirds during drought and flood cycles (Kushlan et al. 2002).

North American Waterfowl Management Plan

Written in 1986, the "North American Waterfowl Management Plan" envisioned a 15-year effort to achieve landscape conditions that could sustain waterfowl populations. Specific plan objectives 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 (USFWS and Canadian Wildlife Service 1986). The plan is innovative because of its international partnerships and its implementation at the local level. Its success depends on the strength of the 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 a wide array of community participation. Joint ventures develop implementation plans that focus on areas of concern identified in the plan. Lee Metcalf Refuge lies within the Intermountain West Joint Venture.

Bob Danley/USFWS

Waterfowl use the ponds of Lee Metcalf Refuge for foraging, nesting, and cover.

Intermountain West Joint Venture

The Intermountain West Joint Venture (IWJV) was established in June 1994 to serve as the implementation arm of the "North American Waterfowl Management Plan" (IWJV 2005a) in the Intermountain West region. The focus of the IWJV is conservation of wetland and associated habitats. The IWJV comprises multi-level partnerships between diverse public and private organizations who share common interests in the conservation, maintenance, and management of key ecosystems in the Intermountain West region.

The IWJV encompasses much of the Intermountain West region, from the Sierra Nevada and Cascades on the west to just east of the Rocky Mountains, and from the Mexican border on the south to the Canadian border on the north. This extensive geographic region encompasses portions of eleven western states and includes an enormous diversity of avian habitat.

In 2005 the IWJV Montana steering committee developed a "Coordinated Implementation Plan for Bird Conservation in Western Montana" (IWJV 2005b). This team divided the State of Montana into Bird Habitat Conservation Areas to be used for all bird conservation projects over the next 5–7 years. Lee Metcalf Refuge is located in the Bitterroot Valley Bird Habitat Conservation Area. The priority habitat types for this area include dry forest (ponderosa pine and Douglas-fir), riparian (such as cottonwood),

wetland (reservoirs, lakes, and marshes), and burned forest (recent fires). The refuge has two of these high-priority habitat types, the riparian and the wetland.

Intermountain West Regional Shorebird Plan

As noted above, the Intermountain West is a huge region, stretching from Canada to Mexico and from the Rocky Mountains to the Sierras and Cascades. The six Bird Conservation Regions of the Intermountain West include an array of habitats from saline sinks to alpine streams (Oring et al. 2010). The refuge is located in the Northern Rocky Mountain Bird Conservation Region, an area characterized by low lying desert flats surrounded by rugged, boreal mountain ranges. Stream and river valleys occur in the mountains along with many small wetlands and natural and constructed lakes. Sewage lagoons near many urban areas also host numerous shorebirds. The area is of some importance for breeding of several shorebird species and of modest importance to many species of transients. Eleven species of shorebirds regularly breed in the Intermountain West, and 23 additional species are annual migrants.

The most important issue facing shorebird conservation in the Intermountain West is the very great human-driven competition for water. Finding ample high quality fresh water will be the greatest challenge faced by future shorebird conservation interests.

The "Intermountain West Regional Shorebird Plan" recognizes the Lee Metcalf Refuge as one of 79 managed shorebird sites in the nation, one of only 3 identified in Montana (Oring et al. 2010).

State Comprehensive Fish and Wildlife Conservation Strategy

"Montana's Comprehensive Fish and Wildlife Conservation Strategy" (MFWP 2005) is for all vertebrate species known to exist in Montana including both game and nongame species, as well as some invertebrate species such as freshwater mussels and crayfish.

Although game species are included in Montana's conservation strategy, the priority is those species and their habitats "in greatest conservation need"—that is, focus areas, community types, and species that are significantly degraded, declining, federally listed, or for which important distribution and occurrence information is lacking. The conservation strategy uses five ecotypes to describe the broad areas of Montana's landscape that have similar characteristics. Lee Metcalf Refuge is located in the intermountain/foothill grassland ecotype. The intermountain/foothill grassland ecotype is a mosaic of private and public land that extends from the glaciated Flathead River Valley to the north, south to the Centennial Valley, and east to the Little Belt Foothills, where there remain some of Montana's most diverse fish and wildlife habitats. This western Montana ecotype harbors more wildlife communities than any other in Montana. It also harbors Montana's largest human population concentration in and near the towns of Kalispell, Missoula, Helena, and Bozeman. The attraction for wildlife and people is western Montana's broad, lush, and sweeping valleys cradled by the peaks of the Rocky Mountains. The intermountain/foothill grasslands are cut and formed by meandering rivers that create core riparian zones and wetland areas that often include glacial lakes and potholes that attract nesting waterbirds. Addressing the challenges that accompany the interface between human settlement and fish and wildlife and their habitats will be critical to the conservation of these areas.

Within each of the ecotypes, tier 1 geographic focus areas (that is, those in greatest need of conservation) were identified for all terrestrial and aquatic areas of the State. Lee Metcalf Refuge is located within the Bitterroot/Frenchtown Valleys focus area, which is dominated by views of the jagged peaks of the Bitterroot Range to the west and the lower Sapphire Mountains to the east. The Bitterroot River bisects the valley floor north to Missoula. The valley is arid, flat, or gently rolling landscapes between 2 and 15 miles wide. While the valley supports many habitats—from grassland and riparian to forest and sagebrush—most of the area is now in subdivided for home sites interspersed with some agricultural production. The rolling mountain foothills at the valley edges are important elk, white-tailed deer, and mule deer winter ranges. In the valley bottoms, the cottonwood riparian habitats are some of the most productive wildlife habitats in the State and are home to a wide variety of birds, mammals, reptiles, and amphibians. Of the 16 tier 1 priority (target) species for this area, 8 have been documented on the refuge: boreal toad, long-billed curlew, black tern, olive-sided flycatcher, common loon, trumpeter swan, bald eagle, and Townsend's big-eared bat. The target species for this area that have not been documented on the refuge are the Coeur d' Alene salamander, northern leopard frog, harlequin duck, flammulated owl, black-backed woodpecker, northern bog lemming, gray wolf, and grizzly bear.

The "Montana Comprehensive Fish and Wildlife Conservation Strategy" (MFWP 2005) outlines five conservation concerns and strategies for the Bitterroot/Frenchtown Valleys focus area. The key concerns are:

- habitat loss, degradation, and fragmentation, especially as a result of human population growth and development of transportation infrastructure;
- invasive and exotic plant and animal species;
- range and forest management practices;
- streamside residential development.

All of these conservation concerns identified in this State plan for the Bitterroot/Frenchtown focus area are affecting the management and future protection of the Lee Metcalf Refuge.

1.5 Strategic Habitat Conservation

In the face of escalating challenges such as land use conversion, invasive species, water scarcity, and refuge 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 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 target species or a suite (or guild) of species. This approach is strategic habitat conservation—a structured, science-driven approach for making efficient, transparent decisions about where and how to expend Service resources for species, or groups of species, that are limited by the amount or quality of habitat. It is an adaptive management framework integrating planning, design, delivery and evaluation.

Since 2006, the Service has taken significant steps to turn this vision into reality and has defined a framework of 21 geographic areas. Experts from the Service and U.S. Geological Survey developed this framework through an aggregation of bird conservation regions. Lee Metcalf Refuge lands and waters lie in geographic area 6—the great northern. This geographic area is unique in social values, natural resources, and managerial challenges. The great northern geographic area includes one of the largest surface areas of all of the geographic areas in North America and spans more than 447,000 square miles in the United States (57 percent) and Canada (43 percent). Ecologically, this area represents one of the most relatively intact and functional ecosystems in the United States with diverse groups of species and important conservation and restoration opportunities. Habitats support plant and animal species with cultural significance to multiple Native American tribes and important societal and conservation value to the United States, Canada, and the world. Cultural traditions are tied closely to the land's natural resources as are contemporary ways of life, such as ranching, logging, and recreational and subsistence hunting and fishing. The Nation's largest communities of free-roaming bison, elk, deer and other ungulates, wolves, and bears as well as diverse salmon and trout populations are hallmarks of the great northern geographic area.

The Service is using this framework of geographic areas 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 other entities. 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, land use conversion, invasive species, water scarcity, and a host of other challenges.

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 2010, the Service drafted a strategic plan to address climate change for the next 50 years entitled "Rising to the Challenge—Strategic Plan for Responding to Accelerating Climate Change" (USFWS 2010). The 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 across the Nation and around the world (USFWS 2010). This draft plan is an integral part of the Department of the Interior's strategy for addressing climate change as expressed in Secretarial Order 3289 (September 14, 2009).

The Service will use the following guiding principles from the draft strategic plan (USFWS 2010) in responding to climate change:

- priorities setting—continually evaluate priorities and approaches, make difficult choices, take calculated risks, and adapt to climate change
- 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
- technical 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

Scientific information suggests that the great northern landscape has already undergone observable environmental and ecological changes as a result of climate change trends. Current patterns in climate change are expected to affect high-mountain ecotypes and

lower-elevation, snow-melt-dependent watersheds more acutely than it will affect some other geographic areas. In consideration of anticipated climatic changes and the resulting potential ecological impacts, the following 12 species are currently considered to be focal species for the great northern geographic area: bull trout, pacific lamprey, salmon, steelhead, greater sage-grouse, Lewis's woodpecker, trumpeter swans, willow flycatcher, Columbia spotted frog, cutthroat trout subspecies, Arctic grayling, and wolverine. Four of these focal species have been documented on Lee Metcalf Refuge: Lewis's woodpecker, trumpeter swan, willow flycatcher, Columbia spotted frog, and westslope cutthroat trout (in the Bitterroot River). To address the ongoing effects of climate change, any proposed management changes must continue to adapt to a changing environment.

1.6 Planning Process

The Service prepared this draft CCP and EA in compliance with the National Wildlife Refuge System Improvement Act and Part 602 (National Wildlife Refuge System Planning) of "The Fish and Wildlife Service Manual." The actions described in this draft CCP and EA meet the requirements of the Council on Environmental Quality regulations that implement the National Environmental Policy Act of 1969 (NEPA). Additional requirements and guidance are contained in the Refuge System's planning policy, issued in 2000. This policy established requirements and guidance for refuge and district plans—including CCPs and stepdown management plans—to make sure that planning efforts follow the Improvement Act. The planning policy identified several steps of the CCP and environmental analysis process (figure 3).

The Service began the preplanning process in July 2009 by establishing a planning team composed primarily of Service staff from the refuge. Additional contributors included staff from other Service divisions; MFWP; Bitterroot National Forest; Confederated Salish and Kootenai Tribes; local schools; and Greenbrier Wetland Services, as well as several other partners (appendix B). During preplanning, the team developed a mailing list, identified internal issues, and identified the unique qualities of the refuge. (Refer to section 2.5, "Special Values," in chapter 2.)

During planning, the team identified and reviewed current programs, compiled and analyzed relevant data, and determined the purposes of the refuge. An additional part of this process was the preparation of

Figure 3. Process steps for comprehensive conservation planning and associated environmental analysis.

a habitat analysis report by Greenbrier Wetland Services, a company that focuses on wetland conservation and management. Its report entitled, "An Evaluation of Ecosystem Restoration and Management Options for Lee Metcalf National Wildlife Refuge," took more than 2 years to research and prepare and resulted in some sound recommendations for the restoration and future management of the refuge.

Table 1 lists the specific steps in the planning process to date for the preparation of this draft CCP and EA.

Coordination with the Public

During preplanning, a mailing list of more than 270 names was prepared that included private citizens; local, regional, and State government representatives and legislators; other Federal agencies; and interested organizations (appendix C).

A notice of intent was published in the Federal Register on September 30, 2009 (volume 74, Number 188, pages 50235–50236). It informed the public that the planning process for the Lee Metcalf Refuge had begun and invited all to share their ideas, issues, and other comments within 30 days. Additionally, in September 2009 the first planning update was sent to mailing list recipients; it provided information on the history of the refuge, an overview of the CCP process, and invitations to two public scoping meetings. The planning update included a form for providing written comments. Emails were also accepted at the refuge's email address: leemetcalf@fws.gov.

In addition to the update, public scoping meetings were announced statewide in the media. Two public meetings were held in the communities of Stevensville and Missoula, Montana on September 29 and October 1, 2009, respectively. During these meetings, a presentation was given detailing what a CCP is, the purposes of the refuge, and information on planning limitations, primarily based on compatibility. There were 12 attendees at both meetings, including the field representative for Senator Max Baucus. All were invited to speak, and comments were recorded. In addition to the comments submitted at these meetings, 20 emails and letters were received during the scoping process.

Many of the comments were related to the refuge's very popular visitor services programs (the refuge receives more than 143,000 visitors each year who view wildlife, hunt, and participate in educational and interpretive programs). Most individuals asked the refuge to consider expanding these programs, particularly the staff-led programs, along with associated trails and other visitor services facilities. Other comments were related to invasive species. While commending the refuge on controlling these invasive plants, the public requested even more effort to reduce impacts on wildlife and neighboring landowners. Other comments concerned buffering the refuge from extensive surrounding development, addressing climate change impacts including ensuring adequate water supplies for management, and offering access and additional interpretation of the historical Whaley Homestead.

Public scoping concluded on November 13, 2009, when the comment period closed. This project complies with public involvement requirements of NEPA, and the planning team incorporated public input throughout the planning process.

State Coordination

At the start of the planning process, the Service's Regional Director (Region 6) sent a letter to MFWP, inviting its staff to participate in the planning process. State biologists and outdoor recreation specialists have since been involved in the planning process, offering input on current and future biological and visitor services programs. At the start of the process, each office of Montana's U.S. congressional delegation—Senator Jon Tester, Senator Max Baucus, and Representative Dennis Rehberg—were sent letters that notified them of the planning process and invited their comments. Five Montana State senators and representatives and Governor Brian Schweitzer were sent similar letters.

The State has been most concerned with the visitor services programs, and State staff participated in

Table 1. Summary of the CCP planning process for Lee Metcalf National Wildlife Refuge, Stevensville, Montana.

Date	*Event*	*Outcome*
July 13, 2009	Kickoff meeting	The planning team learned about the CCP process; discussed the initial planning team list; developed a mailing list, planning schedule, and the first draft of internal issues and qualities list; and reviewed biological data needs.
July 14, 2009	Vision statement development	The planning team developed a proposed vision statement for the draft CCP.
August 11, 2009	Public scoping planning	The planning team discussed an effective outreach plan for public scoping.
September 9, 2009	Planning update mailing	The first planning update was sent to mailing list recipients. This update described the planning process and announced upcoming public scoping meetings.

Table 1. Summary of the CCP planning process for Lee Metcalf National Wildlife Refuge, Stevensville, Montana.

Date	*Event*	*Outcome*
September 29, 2009	Public scoping meeting	Public attendees learned about the CCP process and discussed issues and ideas for future management.
September 30, 2009	Notice of intent publication	A notice of intent to prepare the CCP was published in the Federal Register.
October 1, 2009	Public scoping meeting	Public attendees learned about the CCP process and discussed issues and ideas for future management.
November 17, 2009	Visitor services workshop	A panel of visitor services experts from State, tribal, and Federal agencies gathered to discuss and propose options for managing the refuge's visitor services programs and facilities.
January 26–27, 2010	Review of draft habitat analysis report	Service staff reviewed the draft analysis and recommendations (prepared by Greenbrier Wetland Services) that described the proposed future ecological restoration and management of the refuge's wetland and floodplain complex.
January 27, 2010	Review of draft grasslands restoration and management report	Service staff reviewed the draft analysis and recommendations (prepared by Aeroscene Land Logic) that described proposed future ecological restoration and management of the refuge's grassland areas.
March 3, 2010	Goals workshop	The planning team prepared draft goal statements in support of the proposed vision statement.
April 7, 2010	Alternatives development	The planning team began developing and evaluating three alternatives for managing visitor services.
April 20, 2010	Target species determination	The planning team determined CCP target species by reviewing State and national priorities species lists for the Service, the State of Montana, and the Bitterroot Valley.
May 26–27, 2010	Alternatives development and evaluation	The planning team began developing alternatives for biological programs and continued evaluating alternatives for managing visitor services.
June 23–24, 2010	Alternatives review and consequences development	The planning team reviewed the alternatives table and discussed environmental consequences.
July 8, 2010	Environmental consequences review	The planning team continued to review the alternatives table and discussed environmental consequences.
July 20–22, 2010	Alternatives and consequences workshop	An expanded team of partners from the Service and other Federal, tribal, and State agencies assembled to review three alternatives and determine the environmental consequences of each. Alternative B was selected as the proposed action.
November 16, 2010	North Burnt Fork Creek meeting	The planning team met with scientists from other Service divisions and State and Federal agencies to discuss options for reconnecting North Burnt Fork Creek to the Bitterroot River.
November 17, 2010	Objectives and strategies workshop	The planning team drafted objectives and strategies for the proposed action.
January 13, 2011	Map and figure review	The planning team developed a list of needed maps and figures for draft CCP and EA.
January 25 and February 2–3, 2011	Proposed alternatives review	Refuge staff met to review and revise the list of proposed alternatives.
March 21–22, 2011	Proposed action review	The planning team reviewed the list of objectives, strategies, and rationale for the proposed action (chapter 5 of this draft CCP).
February 2011–September 2011	Internal draft plan preparation	The planning team prepared the draft CCP and EA, including maps. The document was edited and prepared for internal review.
September 12–30, 2011	Internal review of draft plan	The draft CCP and EA was sent to a list of internal reviewers consisting of Service, State, tribal, and other Federal staff. Comments were collected and resulted in several modifications to this public draft.

the planning meetings to discuss the proposed future management of these programs. The State has been supportive of the planning process to date.

Tribal coordination

Early in the planning process, the Service's Regional Director (Region 6) sent a letter to tribes with potential cultural and historical connections to the area in which the refuge is located. Tribes contacted were the Confederated Salish and Kootenai and Nez Perce tribal councils and culture committees. A staff person and tribal member from the Confederated Salish and Kootenai Natural Resources Division offered her assistance in developing and reviewing the alternatives for the visitor services and cultural resources programs.

Results of scoping

Comments collected from scoping meetings and correspondence were used in the development of a final list of issues to be addressed in this draft CCP and EA. The Service determined which alternatives could best address these issues. The planning process ensures that issues with the greatest effect on refuge resources and programs are resolved or prioritized over the life of the final CCP. Identified issues, along with a discussion of effects on resources, are summarized in chapter 2. In addition, the Service considered refuge management changes that were suggested by the public and other groups.

Selecting an alternative

Following the public review and comment period for the draft CCP and EA, the planning team will present this document along with a summary of all substantive public comments to the Service's Regional Director (Region 6). The Regional Director will consider the environmental effects of all three alternatives including information gathered during public review. If the analysis has not identified any significant issues that warrant an environmental impact statement or other additional analysis, the Regional Director will select a preferred alternative. The Regional Director's decision will be disclosed in a NEPA decision document—a finding of no significant impact or FONSI—and included in the final CCP. Once approved, the actions in the preferred alternatives will compose the final CCP.

After the planning team prepares the final CCP for publication, a notice of availability will be published in the Federal Register, and copies of the final CCP and accompanying summary will be sent to individuals on the mailing list. Subsequently, the Service will implement the CCP with help from partner agencies, organizations, and the public.

The CCP will provide long-term guidance for management decisions; support achievement of the goals, objectives, and strategies needed to accomplish the purposes of the Lee Metcalf Refuge; and identify the Service's best estimate of future needs. The CCP will detail program planning levels that may be substantially above budget allocations and as such would be primarily for strategic planning purposes. The CCP does not constitute a commitment for staff increases, operation and maintenance increases, or funding for future land acquisitions.

© Allan F. Meyers

CHAPTER 2— The Refuge

Bob Danley/USFWS

Nearly 1,000 acres of Lee Metcalf National Wildlife Refuge consist of open water.

Lee Metcalf National Wildlife Refuge consists of 2,800 acres of lands and waters all located within Ravalli County near Stevensville, Montana. This chapter discusses the refuge's establishment, management history, purposes, and special values as well as its proposed vision, goals, and planning issues.

2.1 Establishment, Acquisition, and Management History

The following section describes the establishment, acquisition, and management history of the Lee Metcalf Refuge.

LEE METCALF NATIONAL WILDLIFE REFUGE

Lee Metcalf Refuge is approximately 2 miles north of Stevensville and 25 miles south of Missoula in Ravalli County, Montana. The refuge lies in the heart of the Bitterroot Valley, cradled between two mountain ranges: the Bitterroot Mountains to the west and the Sapphire Mountains to the east. Today, the refuge boundary encompasses 2,800 acres (figure 4). Elevation ranges from about 3, 225 feet on the north end of the refuge to about 3, 314 feet on the south.

The refuge contains upland habitat composed of floodplain and terrace grasslands, shrublands, or a combination of both. The refuge also has riparian habitat consisting of woodlands, wetlands, and wetland impoundments that have open water and persistent emergent vegetation. Other habitats include the river channel and areas of either bare or very sparse vegetation such as gravel bars, parking lots, and roads (table 2).

The refuge serves as a staging and nesting area for migrating waterfowl, shorebirds, sandhill cranes, and other migratory birds. A variety of refuge habitats are home for native resident wildlife such as bats, white-tailed deer, porcupines, and beaver.

The refuge is located in the Bitterroot River floodplain, and the river runs through or alongside refuge lands for approximately 5 miles. The Bitterroot River has two forks with headwaters in the Anaconda-Pintler Mountains and in the Bitterroot Mountains at the Idaho and Montana stateline. The river flows north and has areas of inherently unstable channel configurations until its confluence with the Clark Fork River near Missoula. The floodplain at the refuge is characterized by multiple abandoned channels, backwater flooding, and entrances of two tributaries (North Burnt Fork Creek and Three Mile Creek).

After establishment of the refuge in 1964, an extensive system of levees, ditches, and water control structures were constructed to capture and manage the available water supply with a primary purpose of providing migration and nesting habitat for waterfowl. By the late 1980s, more than 1,000 acres had been partially or completely impounded in 14 ponds for managed wetland units. Today, these ponds range in size from 8 acres to more than 200 acres, and their water levels are seasonally managed for waterfowl and shorebirds. Additionally, tributaries and natural springs have been altered by dams or weirs that have allowed the direction or level of surface waterflow to

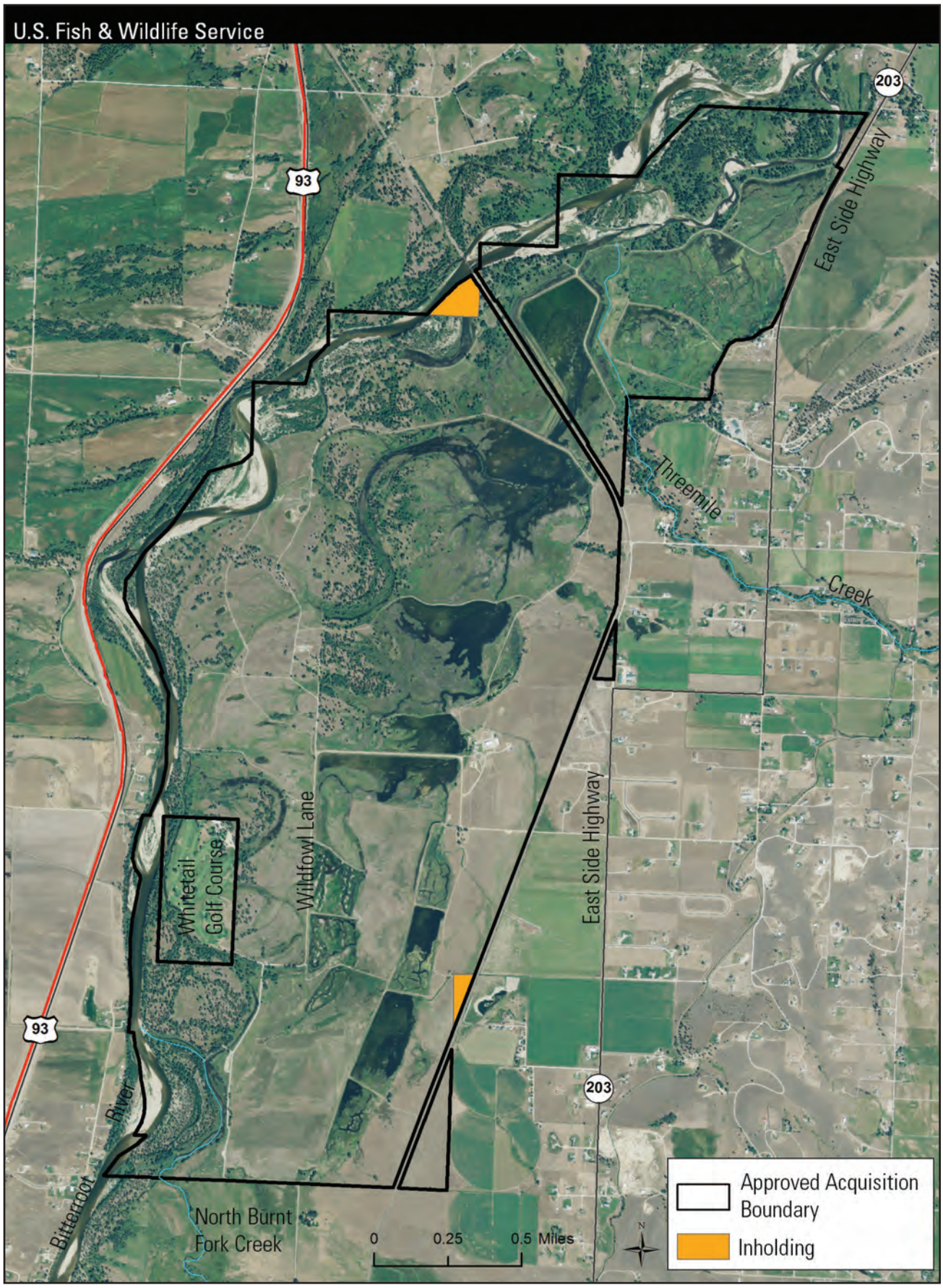


Figure 4. Approved acquisition boundary of Lee Metcalf National Wildlife Refuge, Montana.

Table 2. Habitat type and associated acreages found on Lee Metcalf National Wildlife Refuge, Montana.

Habitat type	*Acres*
Uplands (primarily tame grasses)	1,186.43
Woodlands and wetlands near woodlands	502.58
Wetland impoundments (open water, emergent vegetation)	958.19
River channel	62.73
Bare or sparse vegetation	89.59
Total	2,799.52

be manipulated. With 24 water claims and one water permit, the refuge has the right to 34,209.38 acre-feet of water per year to use for habitat management purposes. The diverted water provides feeding, resting, and nesting habitat for migratory birds, wetland-related wildlife, and resident wildlife.

Remnants of gallery and riverfront forest can be found in the refuge. Although this habitat is still present, soil types and historical vegetation data suggest that several of the impoundments or ponds were once forested or consisted of native grasslands.

Summary of Land Acquisition History

On December 10, 1963, the Migratory Bird Conservation Commission used the authority of the 1929 Migratory Bird Conservation Act (16 United States Code [U.S.C.] 715–715d, 715e, 715f–715r) (45 Stat 1222) to approve the acquisition of 2,700 acres in 18 tracts of land to establish the Ravalli National Wildlife Refuge. In 1978, the refuge was renamed to honor the late Senator Lee Metcalf, who was instrumental in establishing this refuge, and to recognize his lifelong commitment to conservation. On February 4, 1964, the first purchase was made, Tract 21, consisting of 408.05 acres. Over the next 25 years, the Service purchased an additional 23 tracts for a total of 2,799.52 refuge acres (table 3). There were also two permits acquired from the Northern Pacific Railroad Company to access a pumping station and to cross the railroad tracks to access refuge lands. In 2009, a facilitation easement was recorded for an irrigation ditch that traverses through a subdivision.

2.2 Purposes

Every national wildlife 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. The refuge purposes are found in the legislative acts or Executive actions that provide the authorities to either transfer or acquire a piece of land. Over time, an individual refuge may contain lands that have been acquired under various transfer and acquisition authorities, giving the unit more than one purpose. The goals, objectives, and strategies proposed in the draft CCP (chapter 5) are intended to support the individual purposes for which the refuge was established.

The Migratory Bird Conservation Commission justification for establishing the Lee Metcalf Refuge was to provide a feeding and resting area for migrating waterfowl in a locality where some sanctuary is needed.

The legislative purposes of the Lee Metcalf Refuge are as follows:

> *For "use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act 16 U.S.C. 715–715d, 715e, 715f–715r, 45 Stat. 1222, as amended)*
>
> *As "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 ..."*
>
> *"the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." (Refuge Recreation Act 16 U.S.C. 460k–460k–4)*

Bob Danley/USFWS

In 1978, the refuge was renamed to honor the late Senator Lee Metcalf, who was instrumental in establishing this refuge, and to recognize his commitment to conservation.

Table 3. Land acquisition history for Lee Metcalf National Wildlife Refuge, Montana (1964–2009).

Tract number	*Acres*	*Date acquired*	*Means of acquisition*
21	408.05	02/04/1964	Fee
21a	25.39	02/04/1964	Fee
19	305.93	04/10/1964	Fee
25	167.10	06/09/1964	Fee
25a	90.86	06/09/1964	Fee
12	298.11	06/11/1964	Fee
24	9.47	06/12/1964	Fee
13	160	08/24/1964	Fee
11	309.32	05/21/1965	Fee
11a	4.27	05/21/1965	Fee
20	175.89	01/03/1966	Fee
15	2.23	06/14/1966	Fee
14a	5.13	06/15/1966	Fee
23	2.60	01/25/1967	Fee
10	26.48	06/12/1967	Fee
10a	292.53	06/12/1967	Fee
22	8.13	08/14/1967	Fee
27	336.31	12/06/1968	Fee
27-I	0.31	12/06/1968	Fee
19a	63.78	11/13/1974	Fee
29	4.4	06/12/1978	Fee
16	80	03/23/1988	Fee
17	16.23	05/23/1988	Fee
19b	0[1]	10/01/1989	Fee—life estate
28M	0[1]	12/01/1967	Permit from railroad company—pump station
28R	0[1]	02/01/1970	Permit from railroad company—crossing
30D	7	01/09/2009	Easement
Total	2,799.52		

[1]*Acreage figure is minimal.*

Bob Danley/USFWS

The refuge includes 1,218 acres of upland habitat that consist of grassland, shrubland, and a combination of both.

2.3 Vision

A vision is a concept, including desired conditions for the future, that describes the essence of what the Service is trying to accomplish. The following vision for the Lee Metcalf Refuge is a future-oriented statement and is to be achieved through refuge management throughout the life of this CCP and beyond.

Lee Metcalf National Wildlife Refuge is a representation of the diverse native wildlife habitat once found abundantly between the Bitterroot and Sapphire Mountains and along the ever-changing Bitterroot River. This floodplain refuge, fed by mountain snow, is a diverse mosaic of forest, grassland, and riparian habitat that provides protected lands and waters for migratory and resident wildlife.

The refuge, in partnership with its neighbors, friends, and the community, is a conservation leader in the valley, ensuring that the biological integrity of this refuge and other valley habitats remains intact or, where appropriate, is restored.

These protected lands and waters are a place of discovery for visitors to experience fish and wildlife firsthand and where children can experience nature with all their senses. Visitors to the refuge can appreciate the beauty of the setting and experience a sense of wonder and pride to be preserving this part of the Bitterroot Valley and the National Wildlife Refuge System.

2.4 Goals

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

Bitterroot river floodplain and associated wildlife

Manage and, where appropriate, restore the natural topography, water movements, and physical integrity of surface water flow patterns across the Bitterroot River floodplain to provide healthy riparian habitats for target native species and to educate visitors about the benefits of sustaining a more natural floodplain.

Wetland impoundment habitat and associated wildlife

Where appropriate, manage wetland impoundments to create a diversity of habitats for target waterfowl, shorebirds, and other associated native wetland-dependent species.

Grassland and shrubland habitat and associated wildlife

Create the conditions that will allow for the restoration, maintenance, and distribution of native grassland and shrubland species (such as rabbitbrush, needle and thread grass, Junegrass, and hairy golden aster) to provide healthy lands for a diverse group of target native resident and migratory wildlife species and to educate visitors about the historical plant and animal diversity of the Bitterroot Valley.

Invasive and nonnative species

Prevent, reduce, and contain the invasion and spread of noxious, invasive, and harmful nonnative species within the refuge while working with partners to address off-refuge infestations within the surrounding landscape.

Research

Pursue and maintain compatible research projects that would provide information on refuge resources and address refuge issues to assist management in making decisions based on the best available information and science.

Cultural resources

Provide opportunities for visitors to learn about the unique glacial, Native American, and Euro-American history of the Bitterroot Valley while maintaining and protecting the integrity of the refuge's cultural and historical resources.

Visitor services

Provide visitors of all abilities with opportunities to participate in and enjoy quality, compatible wildlife-dependent recreation, environmental education, and interpretation programs that foster an awareness and appreciation of the importance of protecting the natural and cultural resources of the refuge, the Bitterroot Valley, and the National Wildlife Refuge System.

Partnerships

Maintain and cultivate partnerships that help achieve the vision and supporting goals and objectives of the Lee Metcalf National Wildlife Refuge Comprehensive Conservation Plan and support other initiatives designed to protect and restore habitats for Federal trust species within the Bitterroot River Valley.

Operations and facilities

Prioritize wildlife first and emphasize the protection of trust resources in the utilization of staff, volunteers, funding, and facilities.

2.5 Special Values

Early in the planning process, the planning team and public identified the refuge's unique qualities or special values—characteristics and features of the refuge that make it special, valuable for wildlife, and an integral part of the Refuge System. It was important to identify the special attributes of the refuge to recognize its value and to make sure that these attributes are conserved, protected, and enhanced through the planning process. These special values can be unique biological values as well as simple values like providing a quiet place to see a variety of birds and enjoy nature. The following list summarizes many of the qualities that make the refuge unique and valued:

- protects 2,800 acres of diverse habitats—riparian, wetland, and upland—in a rapidly growing county
- supports a healthy riparian corridor used by breeding neotropical songbirds
- contains gallery forest along the Bitterroot River
- provides a wildlife corridor that runs north to south along the Bitterroot River and east to west from North Burnt Fork Creek to Kootenai Creek
- contains the largest montane wetland complex in the Bitterroot Valley on which many migratory bird species are dependent for breeding and migration stopovers
- provides resting habitat for trumpeter swans primarily during migration
- provides habitat for a great blue heron rookery containing 12–18 nests
- provides habitat for one bald eagle nest and foraging habitat for one additional nest less than 0.5 mile from the refuge
- provides exceptional viewing opportunities for nesting osprey and maintains the longest running dataset for nesting osprey in Montana
- lies within the Bitterroot River Important Bird Area, as designated by the National Audubon Society
- provides habitat for 242 bird species, 40 mammal species, and 11 species of reptiles and amphibians
- contains 45 documented species of concern (38 birds, 3 mammals, 2 plants, 1 aquatic insect, and 1 amphibian) listed in Montana
- provides habitat for moose, black bear, and (occasionally) elk on the valley floor
- includes designated critical habitat for endangered bull trout
- includes a portion of the Bitterroot River, which is considered a blue ribbon trout fishery
- lies within the Bitterroot Valley, the traditional homeland of the Salish, Nez Perce, and Pend d'Oreilles native peoples
- located a few miles from Stevensville, the oldest continuous Euro-American settlement in Montana
- contains the historic Whaley Homestead, which was built in 1885 and is listed on the National Register of Historic Places
- offers one of the few places to hunt waterfowl on public land in Ravalli County and the entire Bitterroot Valley
- provides environmental education and research opportunities for more than 16,000 area students of all ages (Missoula to Hamilton)
- serves as a "window" on the Refuge System for its 143,000 annual visitors, providing the public with a multitude of wildlife-dependent recreational activities in a peaceful and beautiful setting
- provides a visitor contact area staffed by volunteers and an outdoor amphitheater with vistas of refuge wetlands, the heron rookery, and the Bitterroot Mountains
- provides universally accessible nature trails with views of multiple habitat types and opportunities to view a variety of wetland, grassland, and forest bird species
- contains a 2.5-mile-long designated National Recreation Trail
- contains portions of the Ice Age Trail, Nez Perce Trail, and the actual (not officially designated) Lewis and Clark Trail
- collaborates with a wide variety of area organizations to carry out the refuge mission (that is, land management, visitor service, historic restoration, and research)
- provides close-up wildlife viewing opportunities
- serves as a point of pride for area citizens
- provides research opportunities for dozens of wildlife and environmental researchers
- attracts dozens of volunteers who annually donate 8,500 work hours

2.6 Planning Issues

Several key issues were identified following the analysis of comments collected from refuge staff and the public and a review of the requirements of the Improvement Act and NEPA. Two public meetings, news releases in the local and regional press, an announcement in the Federal Register, and planning updates were used to solicit public input on which issues the CCP should address. Substantive comments (those that could be addressed within the authority and management capabilities of the Service) were considered during formulation of the alternatives for future management. These key issues are summarized below.

Bob Danley/USFWS

Flooding of the Bitterroot River is a common occurrence on the refuge.

Bitterroot river migration

The Bitterroot River traverses the Bitterroot Valley floor and is characterized by a constantly migrating stream channel that flows through extensive cottonwood and ponderosa pine bottomland forest. Naturally, the river fluctuates in water volume depending on winter snowpack and spring precipitation. These fluctuations regularly flood braided river channels and may create new ones. Much of this flooding and migration is natural and can be beneficial. However, as development increases, many more landowners are installing riprap along their properties in an attempt to prevent riverbank erosion; this directs the river (and its energy and increased velocity) to unprotected areas and increases the rate of erosion above natural levels. Such erosion has occurred in the refuge's wildlife viewing area (WVA), where erosion has exceeded 100 feet in one area, partially destroyed a universally accessible paved trail, removed many large ponderosa pine and black cottonwood trees, and left a steep bank next to the education shelter and terminus of the Lee Metcalf accessible trail, a National Recreation Trail.

Additionally, increased erosion from upstream bank stabilization also contributes to a loss of riparian habitat, including both types of woodlands (riverfront and gallery forest) and wetlands (streams and sloughs). Woodlands provide a migration corridor for birds, a home to several bat species of State concern, and shade and habitat structure for terrestrial and aquatic species. The refuge faces challenges and uncertainty in managing riparian habitat in the face of intensified bank erosion, increased river velocities, and shorter and more dramatic flood frequencies due to upstream channel alterations and bank stabilization.

Wetland impoundments (or ponds)

Shortly after acquiring the first tract of refuge land, the Service constructed several impoundments (commonly referred to as ponds) to hold water for migratory waterfowl. These impoundments were mostly built atop agricultural fields. Prior to 1873, these lands consisted of native grassland and shrubland habitats, gallery forests, and some natural streams (as identified in a 1964 habitat map, figure 5). Currently, there are approximately 960 acres of wetland impoundments.

Some impoundments are surrounded by persistent emergent wetland vegetation like cattail. Cattail is an aggressive emergent plant that can completely fill wetland areas; once established, it is extremely difficult to control and can limit habitat value for waterfowl and other migratory birds. However, a balanced mosaic of open water, cattail, and other emergent vegetation usually benefits nesting habitat for diving ducks; brood habitat for diving and dabbling ducks; and nesting and roosting habitat for rails, American bitterns, and red-winged and yellow-headed blackbirds.

The constantly migrating Bitterroot River has started to erode some levees on the north end of the refuge, making Pond 13 susceptible to river movements and leaving refuge staff with little control over its water level. The structures and levees on one other impoundment in the refuge's north end are threatened by erosion as well. Maintaining these impoundments may be costly and ecologically unsound, depending on the river's future channel migration.

Management of impoundments depends on a consistent water source and the ability to manage and drain wetlands. Refuge impoundments receive water from irrigation water diverted from the Bitterroot River, tributary creeks, natural springs, tile drainage of agricultural fields, and subsurface groundwater. Drainage and irrigation ditches may receive outflow from adjacent agricultural operations and residential and industrial septic systems, and such impacts on water quality could in turn pose a threat to refuge wildlife.

Also of concern is the spread of nonnative aquatic predators. In the early 1990s, MFWP and the refuge released 10,000 bass fingerlings into Otter Pond to promote recreational fishing; as a result, largemouth bass have spread to most ponds (Ponds 5–13). Largemouth bass can be voracious predators on fish, frogs, and aquatic insects and have been known to consume

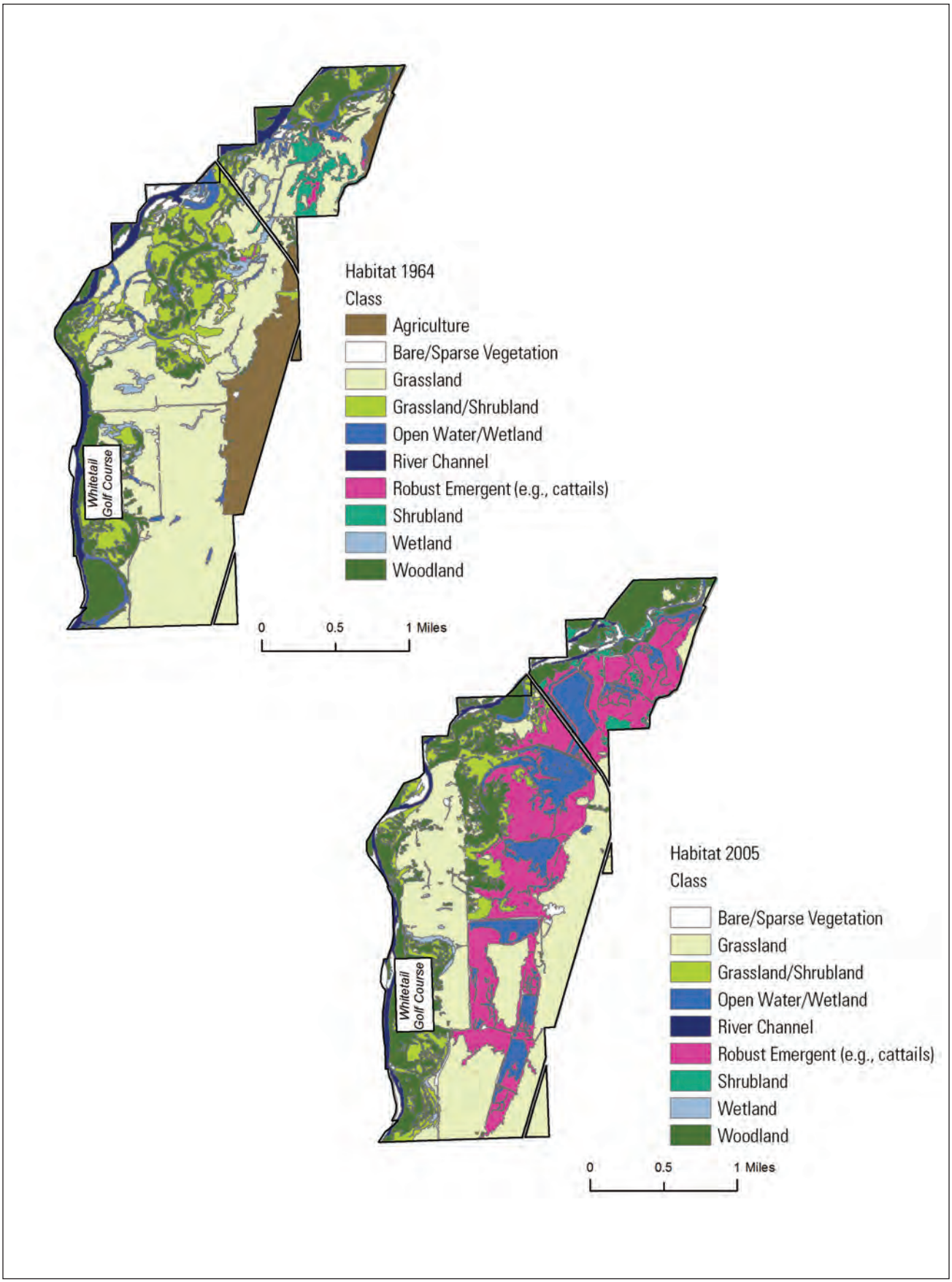


Figure 5. Composite vegetation community models Lee Metcalf National Wildlife Refuge for 1964 and 2005 (Heitmeyer et al. 2010).

ducklings. In addition, bullfrogs also inhabit most of the impoundments. This nonnative amphibian displaces and consumes not only native amphibians but avian chicks, small snakes, and small mammals as well.

Upland habitat and associated wildlife

The intermountain and foothill grassland ecotype, which is found in the Bitterroot Valley and other broad mountain valleys in western Montana, contains some of Montana's most diverse fish and wildlife habitats. These areas also contain some of the largest populations of humans in Montana. The Bitterroot Valley area is considered a terrestrial conservation focus area in greatest need due to the loss of this habitat to agricultural production (MFWP 2005).

The refuge has 1,218 acres of upland habitat that consists of grassland, shrubland, and a combination of both. Due to the retirement of agricultural crops, encroachment of development, and spread of invasive plants, few native plant species remain, and wildlife value has been degraded. In many uplands, the dominant plant species are nonnative bunch grasses and weeds such as smooth brome, crested wheatgrass, cheatgrass, knapweed, and thistle. A combination of management actions have been applied—prescribed fire, disking and seeding, herbicide application, and manual weed removal—with varying results.

Water

Lee Metcalf Refuge receives surface water from tile drain ditches, springs, ephemeral and perennial creeks and subsurface flow, and three lateral irrigation ditches: the North Lateral Ditch, Middle Lateral Ditch, and South Lateral Ditch. These lateral ditches are supplied by the Supply Ditch, a primary canal that carries diverted Bitterroot River water from Victor to just north of the refuge. Water entering the refuge from the east often has a high nutrient load as it traverses or drains out of grazed or farmed lands. As a result, the refuge receives nutrient-rich drainage water that results in abundant algal growth during summer months.

In the past 5 years, algal growth has increased in the impoundments, possibly in part due to the combination of increased nutrient loading in surface water and potentially in subsurface water. Algal growth results in diminished water clarity and subsequent reduction in light penetration and vegetative quality of refuge impoundments.

Currently, the Montana Bureau of Mines and Geology has established shallow wells to collect subsurface water quality data and is also evaluating surface water quality within the refuge boundary.

The North Lateral Ditch, also called the Alleman Ditch, flows through private land, traverses alongside Eastside Highway, and then enters the refuge on Rathbun Lane. In the last several years, the refuge has received water from this ditch, even though it has become silted and overgrown with vegetation. However, when the headgate is opened, the ditch tends to overflow and flood private lands.

East of the Eastside Highway, subdivisions have been developed along and over the Middle Lateral Ditch (also called the McElhaney Ditch) and affected the efficiency of flows leaving the Supply Ditch and reaching the refuge. Currently, refuge management is working with the Supply Ditch Association, landowners, and staff to replace this ditch with a pipeline. If successful, this effort could conserve water, provide a more reliable flow to the refuge, reduce noxious weed seed transfer from ditchbanks and adjacent lands, end periodic localized flooding, and possibly provide a gravity-flow water source into the refuge wheel lines, thereby saving thousands of dollars annually in pumping costs.

In recent years, much of the refuge water from the South Lateral Ditch (also called the Warburton Ditch) has not reached the refuge. Refuge law enforcement officers have monitored diversions along this ditch in the past.

Other historic ditches (now McPherson and Nickerson Creeks) remain on the refuge but have not been maintained in recent years.

Invasive and noxious species

The State of Montana has identified 32 noxious plant species, which are nonnative plants that must be treated by rule of the Montana County Weed Control Act. Fifteen of these species have been found on the refuge. Invasive species prevent desirable native vegetation growth and often severely degrade habitat for native wildlife by altering its structure and its species and ecosystem interactions. When invasive species become widespread, they often change the habitat structure and vegetative variability that wildlife need for food and cover. These nonnative plants often create monotypic stands, using up soil moisture and nutrients and outcompeting more desirable native species. This

Bob Danley/USFWS

Invasive and noxious species are a threat to native plants on the refuge, including velvet lupine.

change in plant species, structure, and diversity impacts habitat for migratory birds, a group of species for which this refuge was established.

Multiple factors have likely contributed to the noxious and invasive plant problem on the refuge. Historically, factors like soil type, flood frequency, topography, availability of irrigation, and dominant vegetation likely influenced how lands that now compose the refuge were used. Much of this land was managed for agriculture, including growing small grains and potatoes, haying, and grazing. It is also evident that croplands were leveled and parts of the refuge may have been drained. After refuge establishment, much of the agricultural land was developed into wetland impoundments or managed for migratory waterfowl food resources. Later, gravel levees were developed to protect refuge facilities from periodic flooding from the Bitterroot River. White-tailed deer move daily off the refuge and back from neighboring lands and potentially carry weed seeds in fur or scat. All of these actions—both before and after refuge establishment—disturbed the soil and created abundant opportunities for noxious and invasive plants to take root.

Land uses in and around the refuge also likely contribute to the invasive species problem. The Bitterroot River runs the length of the refuge, and the water current as well as recreationists often transport seed from one area to another. Montana Rail Link also traverses the width and length of the refuge and provides additional opportunity for weeds to spread on disturbed ground. Finally, Wildfowl Lane, a county road, runs west, north, and east through the south half of the refuge, providing abundant opportunities for noxious weed transport and establishment. Land use surrounding the refuge (subdivisions, irrigation laterals and tile drains, uncontrolled weed infestations on adjacent lands, Eastside Highway, and Rathbun Lane) also contributes to the challenge of managing invasive species, including treated areas, on the refuge.

Research, Inventory, and Monitoring

Over the years, research, inventory, and monitoring of refuge resources have been sporadic and minimal. In most cases, research is proposed by another agency or a university, not by refuge staff. Consequently, some management programs have not necessarily been designed from refuge-specific data or in response to critical refuge needs and issues. This had led in part to some of the habitat management difficulties described in this section.

Visitor Services

Each year, the refuge hosts more than 143,000 visitors from all over the country and the world. It is valued as a place to discover, enjoy the beautiful scenery, and be close to nature.

The refuge has always done well to accommodate visitors by providing facilities and programs intended for education and enjoyment. The refuge currently employs one outdoor recreation planner who manages and designs all programs. Dedicated volunteers assist with these programs and help greet visitors at the refuge headquarters. Nevertheless, there is tremendous potential for improvement, namely through providing new programs, tours, offsite programs, and interpretive displays and by expanding and improving current facilities, particularly the visitor contact area. Although the visitor contact area does allow for some interpretation, it is small (about 500 square feet) and inadequate for conducting tours, accommodating larger groups, or housing displays that could better interpret refuge resources and programs. The refuge is very popular with local schools and other groups; accordingly, there is a need for additional programs and an indoor classroom.

Many visitors have asked for additional trails and opportunities to explore more of the refuge. Requests were also made to afford all visitors the same access provided to refuge hunters. The refuge currently has 2.09 miles of trails in the WVA, some of which require improvement or relocation. One of these trails in the WVA is slowly eroding as a result of the migrating Bitterroot River. The Kenai Nature Trail, located north of the refuge headquarters, is also very popular with visitors, but it is surrounded by a closed area that does not allow visitors to leave this narrow trail. As part of the CCP development process, the refuge will evaluate these trails and determine if improvements are needed or if accommodations can be made in other refuge areas.

Hunting for waterfowl and white-tailed deer is very popular on the refuge. The refuge is located in a State management unit that only permits archery hunting for big game. The refuge suspects that the lack of regeneration in the understory of the forest is a direct result of overbrowsing by white-tailed deer. Should this be the case, the refuge may need to work with the State to find other methods to better disperse the deer or reduce the population on the refuge.

Staffing

Currently, the refuge employs eight full-time employees (three of whom are zone or state-wide support employees who do not exclusively support refuge operations). If the refuge is to accomplish the goals set forth in this CCP within the established timeframe, adequate staffing and resources will be needed.

CHAPTER 3—Alternatives and Environmental Consequences

Bob Danley/USFWS

Variegated meadowhawk is one of many dragonfly species found on Lee Metcalf Refuge.

The purpose of this chapter is to describe the management alternatives and associated environmental consequences considered for the Lee Metcalf National Wildlife Refuge. Alternatives are different approaches to unit management that are designed to achieve the refuge purposes, vision, and goals; the mission of the Refuge System; and the mission of the U.S. Fish and Wildlife Service. Alternatives are developed to address the substantive issues, concerns, and problems identified by the Service, the public, and other partners during public scoping and throughout the development of the draft CCP. This chapter contains the following:

- summary of alternatives (sections 3.1 and 3.2)
- summary of environmental consequences (section 3.3)
- detailed descriptions of alternatives and consequences (section 3.4)

3.1 Alternatives Development

The planning team assessed the planning issues identified in chapter 2, the existing biological conditions described in chapter 4, and external relationships affecting the refuge. This information contributed to the development of alternatives, each of which presents a distinct approach for meeting long-term goals. Each alternative was evaluated on the basis of its approach to addressing planning issues and its expected success in meeting the vision and goals of the refuge and the Refuge System.

Alternative A, the no-action alternative, describes the current, ongoing management activities. This alternative might not meet all the CCP goals. It is provided as a basis for comparison with the other alternatives.

Alternatives considered but eliminated

There were no alternatives considered but eliminated from detailed study.

Elements common to all alternatives

This section identifies the following key elements that will be included in the CCP regardless of the alternative selected:

- The Service would ensure that management of the refuge complies with all Federal laws, administrative orders, and policies that provide direction for managing units of the Refuge System. Among these mandates are the Improvement Act, the Endangered Species Act of 1973, the Clean Water Act of 1977, Executive Order 11990 ("Protection of Wetlands"), and Executive Order 11988 ("Floodplain Management"). The implementation of alternatives described in this draft CCP and EA would not lead to a violation of these or other mandates.

- Implementation of the management direction (goals, objectives, and strategies) would follow the refuge's best management practices.
- Each alternative would attempt to control invasive species through an integrated pest management approach that includes biological, chemical, and mechanical treatment methods followed by restoration and prevention of reinvasion.
- Through its actions the Service would not knowingly negatively affect an adjacent landowner without a mutual agreement and adequate compensation.
- Each alternative would provide equal protection and management of cultural resources.
- The refuge staff and its contractors, researchers, and other consultants would acquire all applicable permits, such as those for future construction activities.

3.2 Description of Alternatives

This section describes the alternatives considered by the planning team to achieve the proposed vision and goals and to address the issues. These alternatives include not only the current management (alternative A) but also the Service's proposed action (alternative B), which is incorporated into the draft CCP and further described in chapter 5. Table 4 in section 3.4 below provides a summary of the alternatives' actions with associated consequences.

These alternatives reflect options to address significant threats, problems, and issues raised not only by refuge staff but also public agencies, private citizens, other State, tribal, and Federal agencies, and other interested organizations.

Alternative A (Current Management–No Action)

Alternative A, the no-action alternative, represents the current management of the refuge. This alternative provides the baseline against which to compare the other alternatives. It also fulfills the NEPA requirement that a no-action alternative be addressed in the analysis process.

Under alternative A, the Service's management activities would remain the same. The staff would perform issue-driven research and monitor only long-term vegetation changes. Funding and staff levels would remain unchanged, and programs would have the same direction, emphasis, and intensity as they do at present. Key elements of alternative A follow:

- Habitat and wildlife management actions would continue at present levels unless funding or staffing levels changed. Refuge habitat would continue to be managed using existing water control structures, grazing, and prescribed fire. Results of management actions may or may not be able to be analyzed because monitoring would continue to be limited due to current funding levels. The refuge would continue to impound water in all refuge ponds.
- The Service would not take any actions to prohibit the migration of the Bitterroot River, even for road and trail protection.
- The culvert at North Burnt Fork Creek in the WVA would be replaced by a bridge.
- Prescriptive fire, prescriptive grazing, and natural flooding would be used to enhance the existing riverfront and gallery forest plant communities. Where appropriate, cottonwood and ponderosa pine would continue to be planted to expand the gallery forest areas, with a focus on sloughs and historical ditches.
- Unless eroded by the Bitterroot River, the wetland impoundments would be retained; however, management capabilities would be limited. The gravel pits would be retained and managed for boreal toad and Columbia spotted frog habitat.
- The Service would attempt to introduce more native plant species into tame grassland areas.
- The Service would work with partners to map and treat invasive species and monitor treated areas to prevent reintroduction and spread.
- Refuge staff would continue to perform issue-driven scientific research.
- Wildlife-dependent compatible priority uses (hunting, fishing, wildlife observation, wildlife photography, and interpretation) would continue at current levels. Outreach and education programs would continue, primarily onsite, but there would be insufficient resources to update signs, informational kiosks, and brochures or to improve hiking trails and access roads.
- Five full-time staff persons would continue to be assigned to the refuge along with four zone or state-wide support staff who could assist with refuge programs.

Alternative B (Proposed Action)

This alternative constitutes the draft CCP (chapter 5) and focuses on the expansion and restoration of native plant communities on the refuge including grassland and shrubland, gallery and riverfront forests, and wetland impoundments. A significant part of the restoration proposal includes the control of invasive species. Grasses and shrubs native to the uplands (in the floodplains and on the alluvial fans, or areas of sedimentary deposits where fast-flowing streams have flown into flatter plains) would be restored to provide habitat for native wildlife including

grassland-dependent migratory birds. Before any restoration is conducted, invasive species (including seedbeds) will be reduced primarily with prescribed burning and farming.

Some wetland impoundments and Service (non-public) roads would be removed to allow for river migration scouring, which could help restore native gallery and riverfront forest for riparian-dependent wildlife. Most of the remaining impoundments would be managed to mimic natural conditions for wetland-dependent migratory birds.

The Service would expand and improve the refuge's compatible wildlife-dependent public use programs, particularly the wildlife observation, environmental education, and interpretation programs. The visitor contact area would be expanded into a visitor center with new displays and an additional combination conference room and environmental education classroom. New displays would be professionally planned and produced. The refuge would work with Ravalli County staff to designate the county road traveling through the refuge as an interpreted auto tour route, which would include pulloffs for wildlife viewing. A seasonal hiking trail would be added around Pond 8, and current trails would be improved for wildlife observation and photography. Interpretation and environmental education programs would be expanded using added staff and volunteers. All public use programs would provide visitors with a consistent message about the purposes and values of the refuge and the mission of the Refuge System. The refuge staff would be expanded by 3.5 individuals: an assistant refuge manager, two biological science technicians (one part-time), and a visitor services specialist.

Increased research and monitoring efforts, staff, funding, infrastructure, and partnerships would be required to accomplish the goals outlined in chapter 2 and the objective and strategies outlined in chapter 5. Additional staff and funding would be dependent on the regional priorities for those funds allocated to the Service for management of lands and waters within the Refuge System. Key elements of alternative B follow:

- Levees and ditches would be modified or created to reconnect floodplain habitats with the Bitterroot River, thereby providing the opportunity for overbank and backwater flooding into and out of the floodplain. These actions would facilitate the restoration of the natural braided migration patterns of the Bitterroot River across the refuge, where possible.
- Water control structures and obstructions in tributary and floodplain channels would be removed or modified to allow unimpeded flow from North Burnt Fork Creek and Three Mile Creek into the Bitterroot River. North Burnt Fork Creek would be reconnected with historical channels and the Bitterroot River.
- Water control structures would be replaced in Ponds 1–6, Pond 8, and Pond 10 so that water regimes could be managed for a more seasonal, annual dynamic that emulates natural increases in water distribution and depth in spring and gradual drying in summer and fall. Complete drawdown of each pond would occur on a rotational basis.
- Levees, ditches, and water control structures would be removed to facilitate the restoration and expansion of the gallery forest habitat (Ponds 7, 7a, 7b, 9, and D) and native grassland habitat (Pair Ponds and Potato Cellar Pond) while ensuring that restoration areas do not become new sites for invasive species.
- The pool height of Ponds 8 and 10 would be lowered to allow for the restoration of gallery forest to the west of these ponds.
- Once invasive species were well controlled on restoration sites (using primarily farming and prescribed fire), native plant communities would be restored based on geomorphology, soils, topography, and hydrologic features.
- As appropriate, vegetation would be removed from gravel pits to restore desirable boreal toad habitat. The presence or absence of Columbia spotted frogs (which may respond negatively to vegetation removal) would be monitored.
- Mechanical, chemical, and biological methods, including prescribed fire, would be used to convert introduced and tame grasses to native species, where possible. Prior to restoration, these sites would be treated for invasive species.
- Through partnerships, a program would be developed to treat and monitor off-refuge sources of early plant invaders.
- Plant communities would be inventoried and the responses of target species to restoration treatments would be monitored.
- Research projects that address refuge issues and support habitat and public use program objectives would be pursued and implemented.
- Work with the State to determine the viability of allowing hunters to use muzzleloaders and/or shotguns to harvest white-tailed deer within this archery-only hunting district.
- Current visitor services and facilities would be maintained and expanded significantly. Visitor services staff would be hired; new programs highlighting refuge habitats, wildlife, cultural resources, and restoration efforts would be created; and a seasonal walking trail around Pond 8 would be added.
- Refuge headquarters would be expanded to create a visitor center, classroom, and additional office space.
- Three and a half permanent, full-time employees would be added to the current staff.

Alternative C

Alternative C contains many of the elements found in alternative B related to expanding visitor service programs and facilities. However, habitat management would be focused on maintaining the wetland impoundments, attempting to restrict the movements of the Bitterroot River throughout the refuge, and providing waterfowl and other waterbird habitat. Key elements of alternative C follow:

- To prevent river movement and natural overbank and backwater flooding, the Service would take action to repair and maintain eroded levees and dams.
- Water level management structures would be replaced as needed to continue providing impounded wetland habitat. Where possible, the water management of impounded areas would be changed to seasonal water regimes and periodic dry conditions to improve wetland production.
- Limited pheasant and turkey hunting opportunities would be provided in compliance with refuge and State regulations. The refuge would establish a fee program for using hunting blinds.
- Special fishing events would not be permitted in closed areas. The refuge would participate in other fishing events offsite.
- Three and half permanent, full-time employees would be added to the current staff, the majority of whom would work on visitor services programs.

3.3 Summary of Environmental Consequences

The Service assessed the potential environmental consequences of each alternative on the physical, biological, socioeconomic, and cultural resources of the refuge.

Effects common to all alternatives

The management activities and programs of all alternatives would, to the extent possible and practicable, avoid and minimize adverse effects on federally listed species. The sections below describe other effects expected to be common to all alternatives.

Environmental Justice

In keeping with 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 EA would disproportionately place any adverse environmental, economic, social, or health effects on minority or low-income populations compared with the general public. The Service is committed to ensuring that all members of the public have equal access to the Nation's fish and wildlife resources, as well as equal access to information that would enable them to participate meaningfully in activities and policy shaping.

Cultural Resources

Each alternative would protect existing cultural resources and extend protection to newly discovered cultural resources. Limited cultural resource surveys have been performed on the refuge; additional surveys must precede new construction or excavation to fully satisfy provisions of NEPA and other applicable regulations concerning historical and archaeological resources. Any potentially negative effect from trail or facility construction would require review by the Mountain–Prairie Region's archaeologist and consultation with the Montana State Historic Preservation Office.

Climate Change

The actions proposed in this draft CCP and EA would conserve or restore land and habitat, thus retaining existing levels of carbon sequestration throughout the refuge. This would contribute positively to efforts to mitigate human-induced global climate change. The use of prescribed fire, which releases carbon dioxide, should result in no net loss of carbon because new vegetation would quickly replace the burned-up biomass. Overall, there should be little to no net change in carbon sequestered on the refuge from any of the management alternatives. As it relates to global climate change, documenting the long-term changes in vegetation, species, and hydrology is an important part of research and monitoring. Invasive species may also become more prolific and widespread and more difficult to control in the wake of climate change. Management adjustments may be necessary over time to adapt to climate change. The refuge would continue to reduce its carbon footprint by using renewable energy (for example, wind and solar energy) and green technologies in the development of any new facilities.

Geology and Soils

All alternatives would positively affect soil formation processes on the refuge. Some disturbance to surface soils and topography would occur at locations selected for:

- administrative, maintenance, and visitor facilities;
- channel excavation and levee adjustment or removal;
- mechanical removal and eradication of invasive plant species;
- restoration of native habitat.

3.4 Detailed Descriptions of Alternatives and Consequences

Management actions are prescribed in the alternatives as a means for achieving the vision and goals for the refuge while responding to issues raised by Service managers, the public, and governmental partners. Because management would differ for each alternative, the environmental and social effects from implementation would likely differ as well.

Table 4 describes management direction and consequences of alternative A (current management) for comparison with alternatives B and C. In most instances, the proposed management alternatives outlined in alternatives B and C would differ from current management.

In this table, management actions and their consequences are organized first by major habitat types found on the refuge, followed by the proposals for invasive species, research, cultural resources, visitor services, partnerships, and operations and facilities. Columns in the table contain management actions for each alternative followed by the estimated potential effects from carrying out the actions of an alternative.

Socioeconomics

This section analyzes the local economic impacts associated with current management activities (alternative A) and the change in management activities associated with the proposed action (alternative B) and alternative C.

Alternative A (Current Management–No Action)

Alternative A, the no-action alternative, would not significantly change the refuge's contribution to the local economy. Visitation levels and visitor spending would likely increase only slightly, and the refuge would continue to employ eight full-time employees (3.5 of which are zone or state-wide support employees who do not exclusively support refuge operations).

Alternative B (Proposed Action)

Alternative B would increase the refuge's contribution to the local economy. Visitation under this alternative is expected to increase due to expanded and more frequent visitor services programs and events, new visitor center, new trail, and an interpreted auto tour route. Employment would increase from eight to 11.5 full-time equivalent employees, and many seasonal staff would be hired. Of these 11.5 employees, 8 would directly support refuge operations. The remaining 3.5 positions would continue to be zone or state-wide support employees. Accordingly, increases in visitor and employee spending in the local communities would be anticipated.

Alternative C

Alternative C would be the same as B.

Cumulative Impacts

Cumulative impacts are the incremental effects of an alternative's actions when added to past, present, and reasonably foreseeable future actions. Cumulative impacts can be the result of individually minor impacts that can become significant when added together over time.

Whenever the environmental analysis process detects possible significant impacts on habitat, wildlife, or the human environment, mitigation measures must be put into place. This requirement is mandated by the Council on Environmental Quality, the agency that implements the National Environmental Quality Act.

None of the activities proposed in this draft CCP and EA are expected nor intended to produce significant levels of cumulative environmental impacts that would require mitigation measures. Nevertheless, the final CCP will contain the following measures to preclude significant environmental impacts from occurring:

- To protect federally listed species from intentional or unintended impacts, activities would be not be planned where these species occur, especially during periods such as nesting.
- All proposed activities would be regulated to lessen potential impacts on wildlife, fish, and plant species, especially during sensitive reproductive cycles.
- Monitoring protocols would be established to determine goal achievement levels and possible unforeseen impacts on resources. This would allow for application of adaptive resource management to ensure wildlife and habitat resources, as well as the human environment, are conserved.
- Five years after its approval, the final CCP could be revised to correct for unforeseen impacts that occurred during the first 5 years of plan implementation. Adaptive resources management would inform this revision.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
GOAL for Bitterroot River Floodplain and Associated Wildlife. Manage and, where appropriate, restore the natural topography, water movements, and physical integrity of surface water flow patterns across the Bitterroot River floodplain to provide healthy riparian habitats for target native species and to educate visitors about the benefits of sustaining a more natural floodplain.		
Floodplain—Actions		
Remove or modify existing levees that impede movement of the Bitterroot River or allow them to further erode. Evaluate and modify refuge levees to allow for river movement while protecting selected refuge roads. Do not inhibit tendencies for the Bitterroot River to move primary discharge through the North Island Slough. Remove degraded government residence and allow natural flood events to occur. Allow the WVA to further erode as the Bitterroot River migrates eastward. Educate visitors about this process.	*Same as alternative A, plus:* Expand efforts to remove or modify levees, berms, dams, roads, and ditches to reconnect floodplain habitats with the Bitterroot River, thereby providing opportunity for overbank and backwater flooding into and out of the floodplain. Facilitate the restoration of the natural braided migration patterns of the Bitterroot River across the refuge, where possible. Transition Ponds 11, 12, and 13—or portions of these pools—to riparian and gallery forest, reestablishing backwater channels on the Bitterroot River and creating flooded meadow and reduced wetland areas in nonchannel areas. Continue to allow Bitterroot River seasonal flows into and through North Island Slough.	Construct bioengineered channels, streambanks, or hardened banks on the river, and repair and maintain eroded levees, artificial structures, and dams that prevent natural overbank and backwater flooding and river movement.
Floodplain—Environmental Consequences		
As levees erode, the floodplain would again become connected to the river. Management capabilities of some wetland impoundments would be lost. The historical disconnection in fish passages would persist in North Burnt Fork Creek. Year-round access would be reduced as roads and levees are modified by erosion and natural flooding occurs.	The Bitterroot River would flow more naturally within the refuge floodplain supporting the maintenance and restoration of riparian habitats. Some restoration of natural fish passages may occur. Brood habitat may decrease for waterfowl but increase for neotropical migrants. Cavity nesters would eventually benefit from restoration of gallery forest. As habitats are restored, new opportunities for visitors to see and learn about wildlife and habitats native to the Bitterroot floodplain would be created.	Wetland impoundments would be retained and managed for water bird habitat. Refuge staff would spend significant time and funds to maintain and restore wetland impoundment and road infrastructure affected by natural river movements. Opportunities to restore the gallery forest and other native riparian habitats in the natural floodplain would not be pursued.
Creeks and Tributaries—Actions		
Allow North Burnt Fork Creek to function as an unimpeded riparian stream. Continue to monitor the streamflow of North Burnt Fork Creek through Francois Slough to evaluate the quality of fish passageways. Restore newly exposed banks to riparian habitat. To address the impeded channel of North Burnt Fork Creek and direct flow towards the northeast channel, replace the culvert with a bridge.	*Same as alternative A, plus:* Remove water control structures and obstructions in tributary and floodplain channels to reconnect unimpeded flow from North Burnt Fork Creek and Three Mile Creek into the Bitterroot River. Reconnect the North Burnt Fork Creek with flow pathways through Francois Slough and into the Bitterroot River. Through partnerships, attempt to restore river and stream connectivity off-refuge to reestablish fish passage.	Connect North Burnt Fork Creek directly to the river, bypassing Francois Slough.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Creeks and Tributaries—Environmental Consequences		
Management capabilities of some wetland impoundments would be lost. Managed foraging habitat for water bird species would decrease. Native fish may regain access to sections of North Burnt Fork Creek. Cottonwood and willow would potentially be restored to the riverfront forest. Elevated water temperatures, increased sedimentation, and unnatural amounts of persistent emergent habitat may result.	Water would move freely into the Bitterroot River to allow fish and other aquatic animals to use the North Burnt Fork Creek flowage corridor. Creek water temperatures would decrease and water and nutrient flow would improve, potentially enhancing native cold-water species habitat. There may be a loss of fishing opportunities. Breeding habitat for overwater nesting bird species would decrease, but the expanded willows and cottonwood areas would provide additional habitat for migratory birds that prefer riparian woodlands. Removal of concrete structures on North Burnt Fork Creek could cause head cutting along the stream and erosion of stream sides. There would be increased backwater flooding for fish movement.	There would be fewer obstructions to fish passage. There would be less water in Francois Slough for fishing and wildlife use.
Topography and Flow Patterns—Actions		
Retain nesting islands, level ditching, and water level management structures unless they are eroded by flooding. Allow the river to naturally scour Ponds 12 and 13.	Remove and/or breach spoil material berms (from the level-ditching) and levees along major drainages to systematically restore natural topography and reconnect natural waterflow patterns and corridors, where possible. Remove roads, berms, ditches, and other structures that disrupt natural sheet flow of water into the floodplain. Plant native or desirable vegetation on restored sites to prevent invasive species encroachment.	Construct hardened banks on the river, and repair and maintain eroded levees, artificial structures, and dams that prevent natural overbank and backwater flooding and river movement.
Topography and Flow Patterns—Environmental Consequences		
Level ditching would continue to affect water movement. Unnatural topography would continue to create sedimentation traps and unnatural plant communities that tie up nutrients and reduce productivity—ultimately increasing monocultures and decreasing diversity. Allowing river movements through the north end of the refuge would aid the restoration of the riverfront forest but may initially create new areas for invasive species.	Where possible, natural waterflow patterns and corridors would be restored to promote natural plant communities. Exposed soil would be a potential site for invasive plant establishment. There would be a reduction of persistent emergent habitat within impoundments.	The refuge would spend time and funds to maintain Ponds 11–13; however, the river may still continue to erode portions of Ponds 12 and 13. Opportunities to maintain and restore the gallery forest and other native riparian habitats in the natural floodplain would be reduced.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Reestablishment and Expansion of the Riverfront and Gallery Forest Plant Communities—Actions		
Use prescriptive fire, prescriptive grazing, and natural flooding to enhance the existing riverfront and gallery forest plant communities. Encourage the natural regeneration of the shrubland component of the gallery forest (including, hawthorn, alder, wood's rose, and dogwood). Plant cottonwood and ponderosa pine to expand gallery forest areas, focusing on areas with appropriate soils.	*Same as alternative A, plus:* Lower maximum pool height of Ponds 8 and 10 to allow gallery forest restoration to the west of these impoundments. Restore distribution of plant communities to appropriate sites based on hydrogeomorphic (HGM) documented geomorphology, soils, topography, and hydrologic features. Reestablish riverfront forest along the margins of the Bitterroot River on newly deposited or scoured coarse material surfaces. Reestablish gallery forest communities on higher-elevation floodplain areas with sandy-loam soils on natural levees and other floodplain ridges that have 2–5 year flood recurrence intervals. Manage for persistent emergent habitats to the fringes of deeper depressions, Slocum loam soils, and more permanent water regimes. Sustain wet meadow communities on Slocum loam soils with 2–5 year flood frequencies. Restore native grassland in silt loam soils on higher floodplain elevations and on terraces. Agricultural crops would be grown to treat invasive species and prepare areas for restoration. Construct deer exclosures to protect newly planted areas and regeneration sites. Inventory plant communities and monitor responses of forest target species to restoration treatments.	*Same as alternative A, except:* Repair levees as they erode, preventing natural flooding. Use planting and prescribed fire for any gallery forest restoration efforts.
Reestablishment and Expansion of the Riverfront and Gallery Forest Plant Communities—Environmental Consequences		
Existing gallery and riverfront forest and associated shrubland would be expanded, providing some additional habitat for migratory birds and other wildlife. Waterfowl would continue to be provided natural food sources in managed wetland and upland units. Static emergent wetland habitat would continue to provide a persistent, historical level of waterfowl production.	*Same as alternative A, except:* Restoration would depend more on natural ecological processes such as flooding and scouring. Riverfront forest would be restored on newly scoured areas. Additional efforts to treat invasive species in these scoured areas would be needed. Gallery and riverfront forest would be expanded, providing additional habitat for migratory birds, including target species; however, some tree species may take the life of this CCP to reach sizes that are beneficial to some species, such as Lewis's woodpecker. Wetland species habitat would decrease. Emergent vegetation would persist in ponds and deeper old river channels,providing habitat for native and nonnative aquatic species.	*Same as alternative A, except:* There would be a continued loss of both quantity and quality of riverfront and gallery forest habitats and wildlife that uses habitats. There would be a loss of natural regeneration from dry sites becoming drier and wet sites becoming wetter. Cattail populations would increase in impoundments, causing a drop in biodiversity. Diversity and density of nonnative plants would increase due to a loss of nutrient and sediment movement across the floodplain. Wetland impoundment habitat would be retained, but productivity would decrease due to a lack of nutrient regeneration and spread of cattails into open-water habitat.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
	Water birds would be provided desirable wet meadow habitat for nesting and foraging. Greater interspersion of open water and emergent habitats would provide better quality waterfowl brood and stopover habitat. Restored grassland areas would provide habitat for grassland nesting birds, insects, rodents, and amphibians and reptiles. Cattail monocultures would be reduced in Ponds 1–6, 8, and 10, creating more interspersion of emergent and open-water habitat.	
GOAL for Wetland Impoundment Habitat and Associated Wildlife. Where appropriate, manage wetland impoundments to create a diversity of habitats for target waterfowl, shorebirds, and other associated native wetland-dependent species.		
Wetland Impoundments—Actions		
Continue to maintain water level management structures to manipulate water levels in Ponds 1–6 for water birds, including shorebirds and waterfowl. Allow Ponds 7, 7a, 7b, 9, and D; Potato Cellar Pond; and Pair Ponds to remain dependent on irrigation water, leaving them minimally managed. Pond 8, Pond 10, and Otter Pond would be periodically drained, and monocultures of cattails would be treated using prescribed fire and prescriptive grazing. Once reflooded, desirable emergent vegetation should be available for waterbirds.	*Same as alternative A, except:* Replace water management structures in Ponds 1–6, 8, and 10 to manage water regimes for a more seasonal, annually dynamic water regime that emulates natural increases in water distribution and depth in spring followed by rotational drying in summer and fall. While drawing down wetlands, treat exposed shorelines to prevent invasive species and monotypic stands of cattails from becoming established. Remove levees, ditches, and water control structures to facilitate the restoration and expansion of the gallery forest habitat (around Ponds 7, 7a, 7b, 9, and D) and native grassland habitat (around Pair Ponds and Potato Cellar Pond). Emulate long-term patterns of drier conditions in floodplain wetlands in most years, periodic complete drying in some years, and occasional prolonged flooding every few years. Determine the feasibility and methods for restoring the natural flow of Three Mile Creek, including sedimentation deposits, through Ponds 11–13. Remove levees, ditches, and water control structures from all higher elevation areas within the floodplain and on terraces. Maintain Ponds 8 and 10 at a lower elevation to allow for the reestablishment of gallery forest.	*Same as alternative A, except:* Maintain all wetland impoundments and replace structures as needed to continue providing impounded wetland habitat. Where possible, change the water management of impounded areas to seasonal water regimes and periodic dry conditions to improve wetland production.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Wetland Impoundments—Environmental Consequences		
Impoundments that receive an infrequent water supply or do not hold water (for example, Potato Cellar Pond) would remain dry most years, providing occasional wetland habitat for wildlife. The impoundments would provide some brood, stopover wintering, foraging, and breeding pair habitat. The impoundments may provide a greater opportunity for the methalization and bioaccumulation of mercury. Cattails would be controlled in Pond 8, Pond 10, and Otter Pond providing more interspersion of open water and emergent vegetation for wildlife.	*Same as alternative A, except:* New opportunities would exist to restore the unique gallery forest and associated shrublands. Sedge wetland habitat and grassland areas would be restored. Desirable wetland plants will be provided to waterfowl and other wetland-dependent wildlife. Shrub and sedge wetland habitat would be restored, providing important habitat for migratory birds and other wildlife. Drying cycles would increase productivity and release nutrients through aerobic decomposition. Eliminating permanent waterbodies could result in less bioaccumulation of mercury. There may be a decrease in fishing opportunities for largemouth bass at future fishing events. Waterfowl hunting may be affected next to ponds that would not be reflooded before the hunting season due to habitat objectives.	Additional marginal waterbird habitat would be provided at great expense. The Bitterroot River could continue to erode repaired structures and levees, particularly in the north end of the refuge. Little opportunity would exist to restore areas that were historically gallery and shrubland forests. A greater bioaccumulation of mercury may result in these permanent waterbodies.
Gravel Pits (Ephemeral Wetlands)—Actions		
Retain gravel pits for boreal toad and Columbia spotted frog habitat.	*Same as alternative A, plus:* As appropriate, remove vegetation to restore the desirable boreal toad habitat. Monitor impacts on Columbia spotted frogs. Do not harvest gravel from existing gravel pits except when necessary to restore boreal toad habitat. Do not attempt to protect these gravel pits from the river's movements. Monitor the use of gravel pits by boreal toad and Columbia spotted frog and the effects of vegetation removal on improving habitat.	*Same as alternative B.*
Gravel Pits (Ephemeral Wetlands)—Environmental Consequences		
The gravel pits would continue to provide egg laying habitat for the boreal toad and Columbia frog until the aquatic vegetation returns.	Removal of vegetation may affect Columbia spotted frogs that could also be using these pits. The results of the proposed management action would be monitored and adapted to verify that these techniques are providing habitat for both the boreal toads and Columbia spotted frogs. Certified weed-free gravel would be purchased or retrieved from removed levees. Gravel pits would not be protected from the river's movements. If these gravel pits are removed by the river, this breeding habitat for boreal toads and Columbia spotted frogs would be lost.	*Same as alternative B.*

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
GOAL for Grassland and Shrubland Habitat and Associated Wildlife. Create the conditions that will allow for the restoration, maintenance, and distribution of native grassland and shrubland species (such as rabbitbrush, needle and thread grass, Junegrass, and hairy golden aster) to provide healthy lands for a diverse group of target native resident and migratory wildlife species and to educate visitors about the historical plant and animal diversity of the valley.		
Native Vegetation Restoration—Actions		
Continue to implement and evaluate tested techniques for reducing cheatgrass. Continue to reseed and use prescribed burning, grazing, irrigation, and invasive species treatments to introduce more native species into tame grassland areas. Continue to restore former agricultural fields to native bunchgrasses to outcompete cheatgrass and other invasive species.	*Same as alternative A, plus:* Restore and expand grassland and sagebrush communities on high terrace elevations and on alluvial fans, where appropriate. Use farming to treat invasive species by continually farming specific areas until the seedbed is reduced or the field would be chemically fallowed. Restore these areas to native species found on that site. Monitor these areas to detect reinvasion. Use mechanical, chemical, and biological methods, including prescribed fire, to systematically begin to remove introduced and tame grasses, including dense nesting cover, from locations where native grassland communities were present, and restore native species where possible. Convert higher elevations of current impounded wetlands (Pair Ponds, southwest corner of Field S–1) back to native grassland and shrubland habitat (based on soil type) by removing levees and water control structures, and by restoring seasonal water regimes. Provide occasional disturbance through prescribed fire, mowing, or grazing to recycle nutrients and regenerate grass and forb species.	*Same as alternative A, plus:* Manage all maintained and restored levees for tame grasslands and treat to remove invasive plants.
Native Vegetation Restoration—Environmental Consequences		
Tame grasslands would eventually be restored to native grasslands as resources became available. These restored native grassland areas would provide diverse, productive habitat for grassland-dependent wildlife. Initially, a loss of structure and a potential for the additional spread of invasive species would occur as areas are being restored.	*Same as alternative A, plus:* Invasive species, which have currently overtaken these sites, would be reduced, which would provide a greater opportunity for the restoration of native species. Converting dense nesting cover and tame grasses to native grassland communities would result in a reduction in nest density of upland nesting waterfowl, upland gamebirds, and upland nesting songbirds until native species are fully established. Restoration of native grasses and shrubs would require intensive management, and it may be difficult to maintain native communities at this scale with such fragmentation of habitats surrounding the refuge.	*Same as alternative A, plus:* As levees are restored, soil would be exposed, providing new seedbeds for invasive species. Treating these areas and reseeding them to tame grassland would not provide the most diverse habitat, but it would suppress establishment of new invasive species areas and provide some cover for wildlife.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
GOAL for Invasive and Nonnative Species. Prevent, reduce, and contain the invasion and spread of noxious, invasive, and harmful nonnative species within the refuge while working with partners to address off-refuge infestations within the surrounding landscape.		
New Invaders—Actions		
Continue to manage new invaders through early detection and rapid response with the Service's Montana Invasive Species Strike Team, refuge staff, and county cooperators for managing new invaders through early detection and rapid response. Train and certify employees and other cooperators in the identification of invasive species, GIS and mapping, and mechanical and chemical treatment methods. Continue to inventory the refuge for new invaders and monitor treatment effectiveness. Monitor and retreat areas to prevent reintroduction and spread.	*Same as alternative A plus:* Recruit one biological science technician to coordinate and implement the IPM program. Survey and monitor the potential impacts caused by pest, nonnative, and invasive wildlife and fish species. Promote and participate in an early detection, rapid response program with surrounding landowners and agencies to treat and monitor off-refuge sources of early invaders. Provide opportunities for volunteers, cooperators, and community support groups to actively participate in new invader treatments. Continue and expand partnerships to monitor aquatic invaders and wildlife and plant diseases.	*Same as alternative B.*
New Invaders—Environmental Consequences		
Through partnerships, new invaders would be identified, mapped, and monitored to eliminate them or contain their spread. Successful early detection and removal of new invaders would prevent further degradation of habitats and the wildlife that depend on them.	*Same as alternative A, plus:* The addition of a staff person dedicated to this program would enable the refuge to prioritize, plan, and implement an invasive species management program that would remove more invasive species and restore habitat. Restored areas would likely resist the invasion of new species and impede the reintroduction of eradicated invasive species. Heightened awareness and containment of new invaders within the landscape would help prevent new invaders from reaching the refuge. Understanding the impacts of noxious and other nonnative species would allow the refuge to prioritize management action and level of treatment.	*Same as alternative B.*
Established and Widespread Invaders—Actions		
Through partnerships, continue to map, prioritize, treat, and monitor known infestations using the Refuge Lands Geographic Information Systems database (RLGIS) and cultural, mechanical, biological, and chemical techniques. Train (and possibly certify) employees and cooperators in identification of invasive species, mapping techniques, chemical applications, and other cultural, mechanical, and biological treatments.	*Same as alternative A, plus:* Continue to map and monitor treated areas and develop a weed database using RLGIS. Expand capabilities to treat and restore (as needed) identified priority areas to create contiguous blocks of habitat for native species. As soil is disturbed for restoration and management, treat and restore areas to native or desirable species.	*Same as alternative A, except:* Only treat State-listed noxious weeds outside the grassland units. Do not control bullfrogs on the refuge.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Monitor and retreat areas to prevent reintroduction and spread. Investigate methods to better control invasive bullfrogs that feed on native wildlife.	Through partnerships, attempt to prevent the reinvasion of treated areas from off-refuge sources. Encourage volunteers and community support groups to participate in restoration programs. Prioritize treatment sites based on wildlife values and proposed habitat objectives and determine the best methods for control and eradication. Maintain a database of identified invasive species, their impacts on natural resources, and the most up-to-date and effective treatment methods including farming, grazing, haying, and other mechanical, chemical, and biological treatments.	
Established and Widespread Invaders—Environmental Consequences		
Established invaders would continue to be contained and controlled. There would be more effective control of bullfrogs but not eradication, primarily due to a lack of safe, effective control methods and outside sources of reintroduction.	*Same as alternative A, plus:* Treated and restored areas would impede the reintroduction of eradicated invasive species and provide desirable wildlife habitat. Initially, little wildlife habitat would be provided, as native seed is costly and may be difficult to establish. Addressing established and widespread invaders could help restore native habitat and lessen opportunities for new invaders to become established. Restoring natural processes may control bullfrogs and allow native wildlife a competitive advantage. Understanding the impacts and treatments of these species would help determine the priority species and most effective methods for treatment.	Additional resources would be available to treat and control State priority noxious weeds. Uncontrolled, other non-listed species such as cattails and cheatgrass would to continue to spread and degrade habitat. Bullfrog populations would expand, affecting native wildlife, particularly reptiles and amphibians.
GOAL for Research. Pursue and maintain compatible research projects that would provide information on refuge resources and address refuge issues to assist management in making decisions based on the best available information and science.		
Existing and Proposed Research—Actions		
Continue to participate with other Service divisions and the State in researching wildlife diseases on the refuge. Continue to authorize and cooperate in the Montana Bureau of Mines and Geology and Montana Department of Environmental Quality research on ground water quality of incoming surface and subsurface flows. Continue to investigate causes of variability in the number of nesting osprey on and near the refuge.	*Same as alternative A, plus:* Evaluate all current research projects to determine their value in addressing refuge management concerns. Evaluate impacts on water quality caused by off-refuge water sources entering the refuge. Work with universities to study the methods and effects of restoring parts of the floodplain and associated habitat on the refuge. Evaluate the impacts of herbivory on the survival and recruitment of current and restored shrubland and forested areas. Complete a research project to deter-	*Same as alternative B, except:* Work with universities to further research the implications of maintaining the wetland impoundments.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
	mine the interchange between ground and surface water. Determine what visitors value on the refuge and what they hope to experience and learn. Use this information to develop future visitor services programs. Develop partnerships with local universities to provide opportunities for students to conduct research and monitoring projects that are beneficial to the refuge.	
Existing and Proposed Research—Environmental Consequences		
The refuge would have a greater understanding of the potential wildlife diseases that have or would occur on the refuge, including their impacts and treatments. Understanding the impacts of surrounding development on water resources would provide information to better address water quality issues. Understanding if the refuge is contributing to the decline of the osprey population would help the refuge determine if current management activities needed to be modified.	*Same as alternative A, plus:* Approved research projects may cause some disturbance to wildlife and short-term impacts on refuge resources. A network of partnerships would be developed that could continually provide science-derived information on which to base management decisions and address refuge issues. The results of research projects could be applied on other conservation lands. Pursue grants to complete the restoration of the Whaley House and develop appropriate interpretation materials of previous land uses.	*Same as alternative B, plus:* The refuge would gain a greater understanding of the best methods to manage wetland impoundments and the effects of maintaining them.
GOAL for Cultural Resources. Provide opportunities for visitors to learn about the unique glacial, Native American, and Euro-American history of the Bitterroot Valley while maintaining and protecting the integrity of the refuge's cultural and historical resources.		
Known Cultural Resources—Actions		
Rely on volunteers to continue incrementally restoring and interpreting the Whaley Homestead site. Continue to incorporate the unique history and culture of the Bitterroot Valley within its education and interpretive programs.	*Same as alternative A, plus:* Through partnerships, provide visitors with information on the unique history of the Bitterroot Valley and the refuge including the Nez Perce and Salish tribes, Lewis and Clark, Whaley Homestead, and Stevensville (longest occupied town in Montana). Use partnerships and volunteers to continue to restore the Whaley Homestead and interpret its history. Evaluate the potential to use this site as a visitor contact area.	*Same as alternative B.*
Known Cultural Resources—Environmental Consequences		
Restoring the Whaley Homestead over many years would eventually ensure its longevity, but during the years of restoration, visitors would be unable to regularly learn about this historic homesite. Visitors would gain a greater understanding of the unique history and culture of the Bitterroot Valley.	Visitors would gain a greater understanding of the importance and value of this area to Native American tribes as well as the Euro-American history of the refuge and Bitterroot Valley. The Whaley Homestead would be available to the public to learn about the history of this historical homestead site.	*Same as alternative B.*

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Undocumented Cultural Resources—Actions		
Continue to comply with Section 106 of the National Historic Preservation Act prior to initiating projects. Document discovered cultural resource sites and ensure their protection.	*Same as alternative A, plus:* Work with the zone archeologist, contractors, Native American tribes, the State Historic Preservation Office, universities, and other partners to begin a comprehensive cultural resource inventory. As the refuge learns more about the history and culture of the area, continue to update the cultural history displays with this new information, as appropriate.	*Same as alternative B.*
Undocumented Cultural Resources—Environmental Consequences		
Compliance with requirements of Section 106 would ensure cultural resources are protected prior to disturbing sites. Inventory of the refuge's cultural resources would continue at a minimal level. This lack of knowledge would make it more difficult to adequately protect cultural resources sites from theft and vandalism.	*Same as alternative A, plus:* A comprehensive cultural resources survey would enhance Service protection of these resources from public use activities. A cultural resource display that can be revised would keep the display interesting and provide visitors with new information and an appreciation for the unique history of this area.	*Same as alternative B.*
GOAL for Visitor Services. Provide visitors of all abilities with opportunities to participate in and enjoy quality, compatible wildlife-dependent recreation, environmental education, and interpretation programs that foster an awareness and appreciation of the importance of protecting the natural and cultural resources of the refuge, the Bitterroot Valley, and the National Wildlife Refuge System.		
Hunting—Actions		
According to State regulations, continue to provide a quality white-tailed deer (archery only) hunt, (excluding the WVA and headquarters). Continue to provide a quality waterfowl hunt from designated blinds on the southeast part of the refuge, according to State regulations (figure 6). Continue to monitor hunter satisfaction and harvest information. Continue to collaborate with volunteer instructors and the State to provide hunter education programs to youth.	*Same as alternative A, plus:* Work with the State to determine the viability of allowing hunters to use muzzleloaders and/or shotguns to harvest white-tailed deer within the refuge portion of this archery-only hunting district (currently Hunting District 260). The areas where firearms are permitted may be rotated depending on management objectives. The number of hunters permitted to use firearms would be limited. This hunt would be evaluated if it was determined that deer numbers on the refuge needed to be reduced due to overbrowsing of native habitats. Allow archery hunters with disabilities to access refuge roads near the Whitetail Golf Course (within the refuge boundary).	*Same as alternative B, plus:* Establish a fee program for hunters or introduce a recreation fee and charge for blind use. Provide limited pheasant and turkey hunting opportunities, according to State and refuge- specific regulations.
Hunting—Environmental Consequences		
Hunters, including those with disabilities, would continue to be provided high quality hunting opportunities.	*Same as alternative A, including:* Providing additional and more effective methods to harvest deer may increase hunter success and reduce overbrowsing by deer. Permitting additional methods of harvest would provide opportunities for a greater number and different types of hunters.	*Same as alternative B, plus:* While the fee may provide additional funds for hunting programs, it might lead to declining hunt visits. A new hunting opportunity would be provided to pheasant and turkey hunters. Due to the refuge's size, adding another hunting program (such as the proposed pheasant and turkey hunts) would

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
	There would be some risk associated with using modern weapons. Additional safety precautions, such as requiring the use of hunter orange, would alleviate some of this risk. Limitations on hunting hours and locations would also be used to reduce risk and disturbance to other refuge users. The potential for dispersed or decreased deer numbers may allow more vegetation in the gallery forest to recover and survive to provide habitat for migratory birds. Additional signage and maps would be needed to provide information on locations, regulations, and safety. There would be additional short- term wildlife disturbance due to additional hunting activities.	most likely negatively affect the quality of other hunting programs and wildlife observation opportunities and further disturb non-target wildlife.
Fishing—Actions		
Allow fishing only in the WVA (including the Bitterroot River), according to State regulations. Maintain the accessible fishing platform in the WVA (figure 6). Do not allow boats anywhere on the refuge. If compatible, continue to provide opportunities for cooperators to host a youth and a universally accessible fishing clinic each year. The Service would continue to cooperate with MFWP, which would transfer caught largemouth bass to other State nonnative fishing waters.	*Same as alternative A, plus:* Work with partners to restore Francois Slough and North Burnt Fork Creek to enhance this waterway for native cold water species.	*Same as alternative B, except:* Prohibit special fishing events in closed areas. The refuge would participate in other fishing events offsite. Provide limited and seasonal fishing to the public in Pond 8.
Fishing—Environmental Consequences		
Fishing would continue to be permitted in designated areas on the refuge. Youth would continue to be provided this opportunity to successfully catch fish and be encouraged to appreciate the sport of fishing. Fishing events may disturb wildlife, but the disturbance would be limited to the one or two day special event. Children would not only be taught fishing techniques but they may come to appreciate and even want to further explore the natural environment that surrounds them. Focusing the event on capturing largemouth bass would give the Service an opportunity to teach the students about the impacts of nonnative fish. Allowing youth and accessible fishing events would continue to cause some dis	*Same as alternative A, except:* Stream restoration projects would support initiatives to restore a native cold-water fishery.	*Same as alternative B, except:* This would still promote the enjoyment of fishing. Nevertheless, students would not be afforded the opportunity to fish on the refuge and learn about refuge resources as part of associated programs. Allowing the public to fish Pond 8 would provide an additional fishing opportunity on the refuge, but it may reduce bass numbers and would disturb the wildlife that uses this pond.

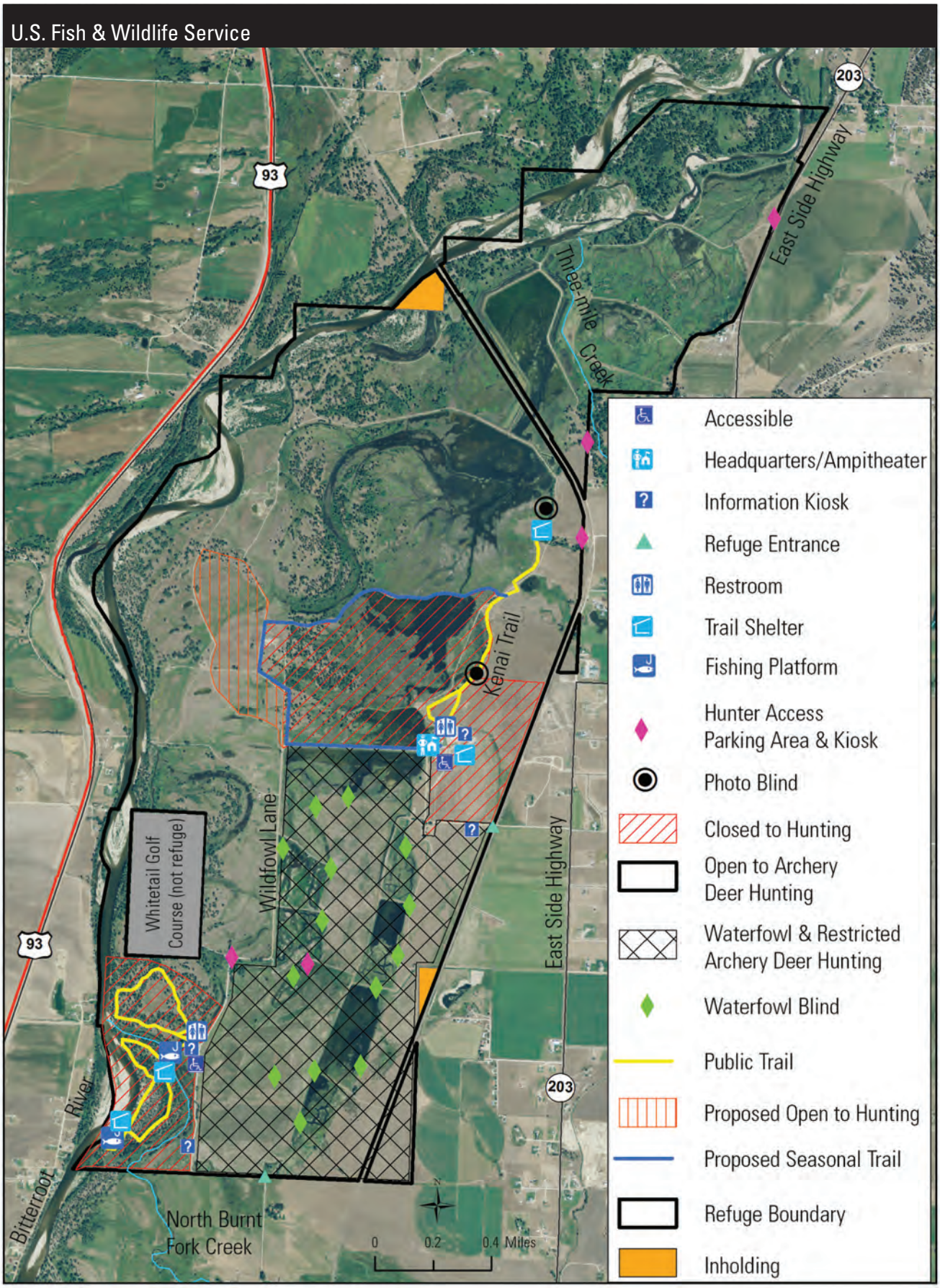


Figure 6. Public use map for Lee Metcalf National Wildlife Refuge, Montana.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
turbance to wildlife and may provide an incentive to maintain a nonnative fishery. Transferring bass to other nonnative fisheries in the State may decrease opportunities in the short term for easily catchable bass for fishing events. Transferring bass to State waters encourages anglers to use those areas rather than the more sensitive and often imperiled fish habitats in the State, such as those that contain threatened cold-water species like bull trout.		
Wildlife Observation—Actions		
Continue to maintain and manage the WVA and associated facilities. Allow the continued erosion of the trail along the Bitterroot River (within the WVA) by the river's movement. Continue to allow visitors to move off the established trail in the WVA, creating multiple trails throughout. Continue to maintain the three groups of refuge walking trails, three viewing platforms, and associated facilities.	*Same as alternative A, except:* Work with the county to develop Wildfowl Lane—the county road that travels through the refuge (figure 6)—into an auto tour route with accompanying interpretation. To reduce disturbance to waterfowl and provide a more stable trail, move portions of the Kenai Nature Trail (figure 6) to the existing two-track maintenance road, and upgrade the road to that trail. Visitors would continue to be prohibited from moving off trail into the adjacent closed areas. Develop a walking trail around Pond 8 (figure 6). This trail may only be opened seasonally to protect waterfowl and other waterbirds using ponds 8 and 10 (figure 7) and nesting migratory birds using the gallery forest west of these ponds. The trail may be opened in the winter when migratory birds are no longer using these ponds. Update current wildlife list to meet Service standards.	*Same as alternative B, except:* The portion of the paved wildlife viewing trail that is eroding would be relocated within the WVA. The Kenai Nature Trail would be closed past the loop turnoff, but visitors could use the road below the trail to return to the trailhead.
Wildlife Observation—Environmental Consequences		
Visitors would continue to be provided opportunities to view wildlife on the refuge, excluding the eroded trail within the WVA. Visitors would be advised to stay on trails, lessening impacts on vegetation and the transporting of invasive species.	Additional wildlife observation opportunities would be provided. Additional wildlife disturbance may occur along newly established trails. An official auto tour route may lead to increased vehicle traffic but would add interpretive opportunities. Relocating the Kenai Nature Trail may decrease disturbance to waterfowl while adding a more level walking surface for a greater variety of visitors. Development and use of the loop trail around Pond 8 could disturb wildlife, particularly the heron rookery; seasonal restrictions could resolve this.	Relocating the WVA trail would retain a wildlife observation opportunity; however, it would be costly, would affect additional habitat, and may increase wildlife disturbance. This new trail could be eroded in the future as the river continues to move. Closing the Kenai Nature Trail past the loop turn off would prevent visitors from accessing a closed part of the refuge. The opportunities to view wildlife would be offset by the addition of the loop section of this trail.

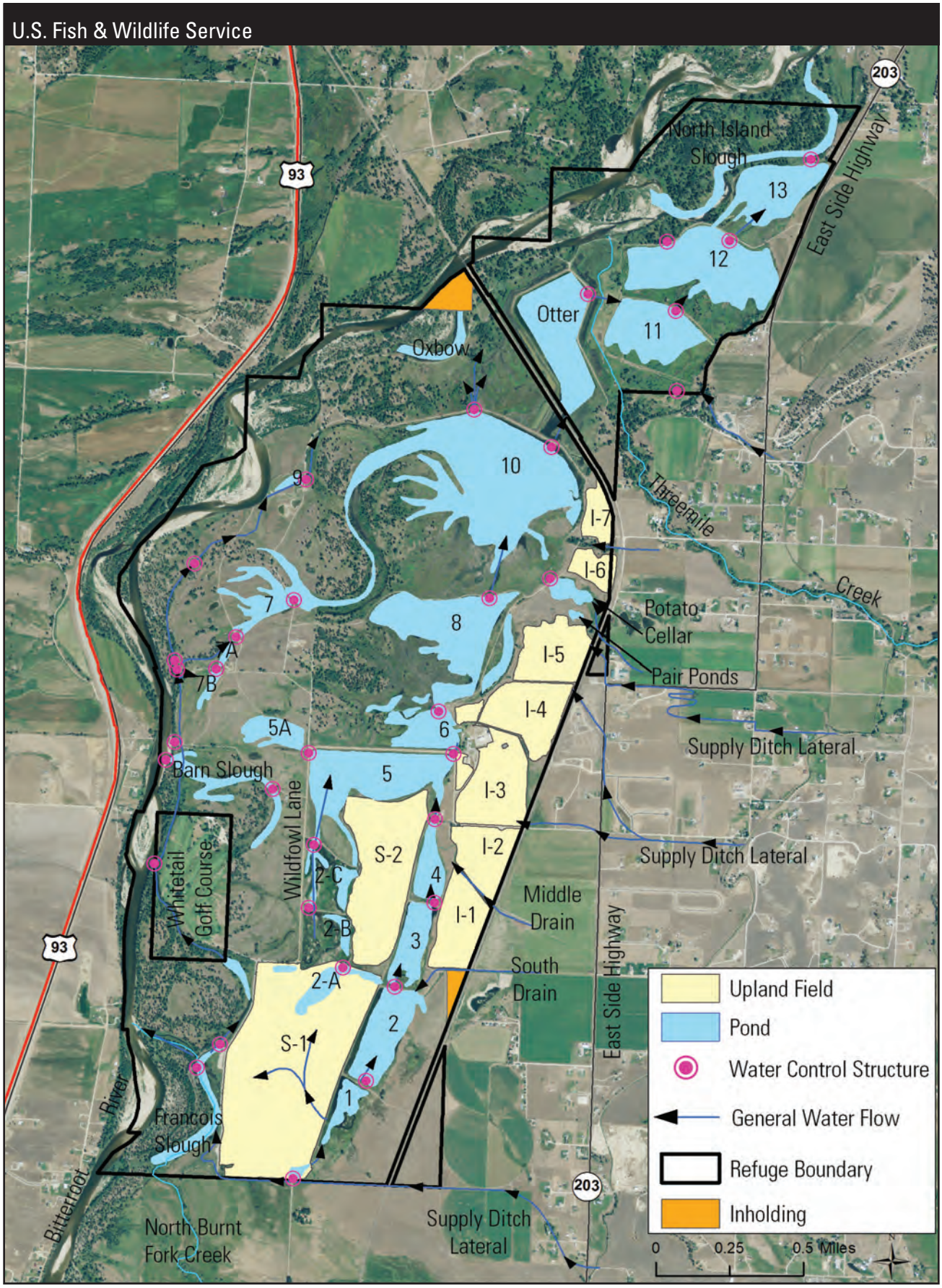


Figure 7. Ponds and upland fields in Lee Metcalf National Wildlife Refuge, Montana.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Wildlife Photography—Actions		
Continue to maintain two stationary photography blinds (figure 6). Evaluate requests for conducting commercial photography in closed areas on a case-by-case basis, as well as any request to conduct commercial filming. If determined appropriate and compatible, specify conditions in the required special use permit.	*Same as alternative A, plus:* Provide two portable photo blinds for use in areas currently open to the public. Upgrade waterfowl hunting blind 2 to provide a photo blind for photographers with disabilities. Through partnerships, conduct an annual wildlife photography workshop.	*Same as alternative B.*
Wildlife Photography—Environmental Consequences		
Quality wildlife photography opportunities would continue to be provided. Quality photographs of the refuge would provide the public with opportunities to appreciate refuge resources and wildlife. Wildlife may be disturbed, particularly by photographers not using a blind.	*Same as alternative A, plus:* Photographers, including those with disabilities, would gain additional opportunities to enjoy and photograph wildlife from blinds. Mobile photo blinds may provide more and unique opportunities to photograph wildlife, but they may cause greater disturbance to wildlife than stationary blinds. Through the workshop, photographers would improve their skills while learning how to minimize disturbance to wildlife.	*Same as alternative B.*
Environmental Education—Actions		
Through partnerships, continue to organize and provide 15–20 on- and off-refuge annual and special events for adults and students. Continue to provide onsite environmental education programs to more than 1,000 students annually. Continue to allow teachers and students to independently explore the refuge's public areas. Continue to maintain, develop, and provide educational kits related to refuge resources and associated field supplies for teachers and students. Continue to serve as the State coordinator for the Junior Duck Stamp Program. Continue to collaborate with universities to provide outdoor classrooms that promote the refuge and the Refuge System.	*Same as alternative A, plus:* If additional visitor services staff are hired, expand environmental education programs and activities on and off the refuge to at least 1,500 adults and 4,000 students. Recruit one environmental education specialist to work with local schools. Recruit a visitor services specialist to work with volunteers, manage the visitor center, and develop and present programs. Provide at least five offsite school presentations annually. Add a new classroom and associated supplies to the new visitor center for environmental education programs. Conduct annual teacher workshops to give teachers the tools to independently explore and teach students about the refuge. Create multimedia kits for teachers to provide background information to students before they participate in refuge programs. Organize or participate in an additional five annual environmental education events. Develop an education kit and program that explains the history and value of the restoration efforts proposed under this alternative.	*Same as alternative B, plus:* The refuge would sponsor an Elderhostel event annually for senior citizens.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
	Expand the refuge's online presence (social media, blog, and Web site) to include interactive educational opportunities and to help teachers plan field visits. Work with the State, local schools, universities, the Confederated Salish and Kootenai Tribes, Nez Perce, and other partners to create programs that highlight not only the values of the refuge and the Bitterroot Valley but its history and culture.	
Environmental Education—Environmental Consequences		
Outreach would be conducted to the same local schools and communities to develop an appreciation and awareness about the refuge and its resources. Most school programs would continue to be onsite, resulting in lost opportunities to reach additional students who cannot travel to the refuge. The lack of additional staff and programs would result in lost opportunities to reach a broader audience to educate them about the value of and threats to refuge resources and the Refuge System.	*Same as alternative A, plus:* New visitor services staff would provide additional resources and opportunities to develop and provide quality environmental education programs for students and adults. This may result in greater awareness and support for protecting and restoring refuge resources and the greater Bitterroot Valley ecosystem. An expanded self-study environmental education program would allow more students and teachers to independently learn about and appreciate the refuge and the Refuge System. Reaching more students while they are developing their environmental ethics may result in a greater awareness and appreciation of—and desire to protect—their surrounding natural resources. Visitors would gain a better connection to the refuge through firsthand experience and a heightened awareness of the unique history and culture of the Bitterroot Valley. Additional onsite programs and facilities may cause additional disturbance to wildlife and their habitats.	*Same as alternative B, plus:* The annual program for elderly visitors would provide an opportunity to teach them about the value of refuge resources and the Refuge System. This annual event would require additional resources and staff time to implement.
Interpretation—Actions		
Continue to maintain five kiosks including three with interpretive panels. Continue to maintain and update interpretive displays in the refuge visitor contact area. Update refuge brochures as needed.	*Same as alternative A, plus:* Use volunteers to provide interpretive programs on the history of the refuge, the surrounding Bitterroot Valley, the Whaley Homestead and other cultural resources, and the value of the refuge and surrounding areas to Native Americans. Update interpretive panels to have a consistent appearance and highlight the history and restoration of floodplain habitats. Provide interpretive signs combined with brochures, podcasts, and other digital media to interpret the resources within the WVA, the relocated Kenai Nature Trail, new auto tour route, and hiking trail around Pond 8.	*Same as alternative B, except:* Interpretive panels and other interpretive programs would focus more on wetland management rather than restoration of floodplain habitats.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
	Install panels at strategic locations that interpret the cultural resources of the refuge and the Bitterroot Valley including the importance of this area to Native Americans. Collaborate with Travelers Rest State Park to participate in events highlighting the history of Lewis and Clark in the Bitterroot Valley. Create a pulloff and interpretive kiosk at north end parking lot used by hunters. Update all brochures to meet Service graphic standards.	
Interpretation—Environmental Consequences		
Visitors would continue to be provided some interpretation of the refuge and its resources. There would continue to be missed opportunities to reach a wider audience, even off-refuge, and interpret other public use areas, such as walking trails.	*Same as alternative A, plus:* New technology and increased accessibility would appeal to a broader audience both on and off the refuge. There would be a greater opportunity to reach additional visitors with a more integrated and multimedia program of interpreting refuge wildlife, habitat management and floodplain restoration, history, culture, and land use. Professionally designed exhibit spaces could provide a more consistent and effective way of learning. Additional signage would need to be placed and used carefully so as not to detract from the visitors experience. Interpretive panels and other multimedia tools are costly and would take staff time and resources to develop.	*Same as alternative B, except:* Interpretive programs would provide a greater understanding of managing wetland impoundments.
Roads and Trails—Actions		
Maintain 18.1 miles of existing roads, including 2.8 miles of public roads. Maintain 3.5 miles of existing walking trails (figure 6).	Eliminate 3.3 miles of the current Service-access road system (figure 8). The roads would be systematically eliminated or modified through a priority system dependent on the objectives of the proposed restoration program. No public roads (namely Wildfowl Lane) would be eliminated. Improve access to the WVA by replacing the gate with bollards that allow wheelchairs to pass through. Designate the publically accessible county road (Wildfowl Lane) as an auto tour route. Add a partially accessible loop walking trail around Pond 8 (figure 8).	*Same as alternative B.*
Roads and Trails—Environmental Consequences		
Maintaining 18.1 miles of roads is costly, and these roads fragment habitats and potentially impede sheet flow from the Bitterroot River and its tributaries.	Eliminating unnecessary Service access roads would reduce maintenance costs. Removing roads would reduce fragmentation and restore sheet flow to some	*Same as alternative B.*

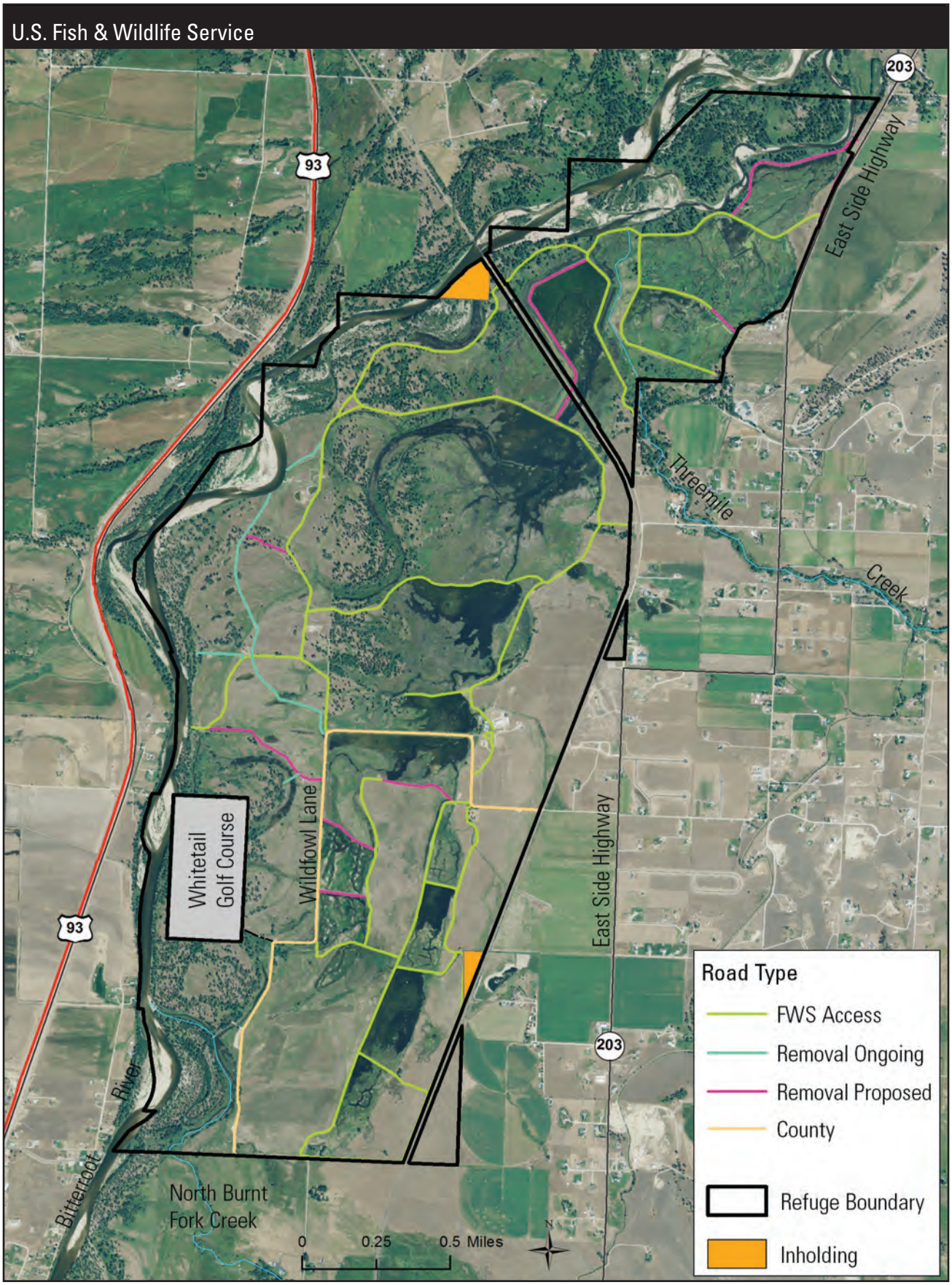


Figure 8. Roads within Lee Metcalf National Wildlife Refuge, Montana, including those Service roads proposed for removal.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
This expansive system of roads would continue to serve as an avenue to transport invasive species. The existing system of roads and trails would continue to allow Service personnel and members of the public to access and utilize the refuge.	areas while supporting proposed restoration efforts. Removing roads would make it more challenging for Service personnel to access certain parts of the refuge; fewer direct routes would require more walking and all-terrain vehicle use. Improving access to the WVA would allow visitors with disabilities to better access and enjoy this area. Development and use of the loop trail around Pond 8 could disturb wildlife, particularly the heron rookery; however, it would provide additional ways to enjoy the refuge, including wildlife observation and photography opportunities.	
Signage—Actions		
Maintain current refuge signage and replace if damaged.	Add directional signs along Interstate 90 and improve signs along Highway 93. Post a sign on the environmental education shelter in the WVA and at the Poker Joe access point to alert river floaters and other visitors that they are entering the refuge. Post a regulatory sign in public use areas including trailheads and the WVA. Add more consistent boundary signage—particularly along the refuge's west side—identifying areas open or closed to the public. Verify that electronic directional devices (for example, global positioning system units) and Web sites correctly identify the location of the refuge. Use signage to direct people to the east entrance (rather than south entrance) to provide quicker access to the refuge headquarters.	*Same as alternative B, plus:* Investigate the potential and benefits of using a billboard along Interstate 90 to direct visitors to the refuge.
Signage—Environmental Consequences		
Regulatory signs are insufficient to prevent violations of refuge regulations. Lack of proper signage causes public confusion (especially regarding hunting along the river, dog walking, staying on designated trails, etc.) and increases the chance for violations to occur. Currently, the refuge's boundary is not adequately marked by signs. Maintaining and enforcing the boundary along and across the Bitterroot River would improve protection of refuge resources, but would be difficult to enforce. Entrance signs would continue to adequately identify the refuge and direct visitors to the refuge office.	Quality, useful signage would better orient and educate visitors, make them feel more welcome, reduce violations, and enhance the visitors' experiences. The refuge would need to strategically use and place signs to minimize sign pollution that could detract from a visitor's experience.	*Same as alternative B, plus:* A billboard on the highway could notify motorists about the refuge, promote the Refuge System, and encourage visits. The sign could also contribute sign pollution along our highways. There would be some costs to maintaining this sign.

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Visitor Contact Area—Actions		
Continue to host approximately 143,000 visitors who drive through the refuge. Many of these visitors (over 6,000) would continue to stop at the refuge's 513-square-foot visitor contact area. Maintain current displays that focus on the wildlife of the Bitterroot Valley through interpretive signs and several preserved birds and mammals.	Expand the visitor contact area into a full visitor center and office with professionally designed and developed displays, exhibits, environmental education classrooms, and additional office space. Develop a consistent, interactive theme for the visitor center that focuses on floodplain restoration, native wildlife, migratory birds, the refuge's cultural and natural resources, and the role of the Refuge System. Recruit one full-time, permanent visitor services specialist to manage the visitor center, develop programs, and recruit and supervise volunteer staff.	*Same as alternative B.*
Visitor Contact Area—Environmental Consequences		
The existing, undersized visitor contact area would remain unable to accommodate the refuge's thousands of visitors (143,000 annually). Also lacking an overriding theme and Service branding, the station would continue to provide more of a "natural history museum" experience. As such, it would provide visitor enjoyment but may not convey the overall values of the refuge and the Refuge System.	Additional funds would be required to expand the current visitor contact center and office area; funding would also be required to cover maintenance costs, including utilities. Additional space would be available to accommodate the thousands of visitors currently using the refuge as well as staff. The additional space would also provide opportunities to develop professionally planned and produced displays and exhibits to more effectively teach visitors about the refuge while highlighting programs, management challenges, and the values of the Refuge System. Visitors would receive a consistent message that highlights the purposes of the refuge, the benefits of a healthy and functioning floodplain system, the unique history of the Bitterroot Valley, and the value of the Refuge System. The visitor services specialist would help develop and maintain professionally planned and produced displays and conduct interpretive programs. The manager would also recruit and supervise additional seasonal volunteer staff who could assist with visitor services programs at a minimal cost to the Service.	*Same as alternative B.*
GOAL for Partnerships. Maintain and cultivate partnerships that help achieve the vision and supporting goals and objectives of the Lee Metcalf National Wildlife Refuge Comprehensive Conservation Plan and support other initiatives designed to protect and restore habitats for Federal trust species within the Bitterroot River Valley.		
Volunteer Program—Actions		
Continue to implement and supervise a volunteer program, which generates more than 8,400 hours of volunteer time each year.	*Same as alternative A, plus:* Recruit a volunteer and partnership coordinator to supervise and expand a quality volunteer program and cultivate and maintain partnerships.	*Same as alternative B.*

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
Volunteer Program—Environmental Consequences		
The refuge would continue to receive assistance from a cadre of dedicated volunteers to accomplish projects at minimal cost to the Service. Managing and supervising this program would continue to require a great amount of time, preventing the program coordinator (the current outdoor recreation planner) from focusing on other visitor services programs.	*Same as alternative A, plus:* The volunteer coordinator would provide the resources to effectively expand the volunteer program, allowing more refuge projects to be accomplished.	*Same as alternative B.*
New and Existing Partnerships—Actions		
Work with partners to restore the connectivity of North Burnt Fork Creek for native fish species and riparian habitat. Continue to participate in the interagency weed group to address invasive and nonnative species on and next to the refuge. Continue to work with the Montana Preservation Alliance, State Historic Preservation Office, and Stevensville Museum to restore and preserve the Whaley Homestead.	*Same as alternative A, plus:* Work with Montana Rail Link to address impacts from riprap, the railroad trestle, and the rail bed. Receive assistance from the Confederated Salish and Kootenai Tribes and other tribes with a cultural connection to the Bitterroot Valley in developing programs and displays highlighting their histories and uses of natural resources. Work with the Bitterroot Land Trust to participate in the implementation of protecting habitat and wildlife corridors on private lands surrounding the refuge. Collaborate with students of various disciplines from local and State universities to develop a greater understanding of refuge resources, develop programs, and address issues. Work with the Whitetail Golf Course (located within the refuge acquisition boundary) to discuss wildlife habitat and mutual concerns, such as invasive species. Work with the State of Montana to address trespass through adjoining State lands.	*Same as alternative B.*
New and Existing Partnerships—Environmental Consequences		
Partnerships would allow the refuge and their partners to share information and combine resources to develop projects or learn more about areas of mutual interest. Partnerships may allow the refuge to have a greater impact not only on the refuge but also in the surrounding Bitterroot Valley.	These additional partnerships would allow the refuge to learn more about its resource, resolve issues, develop more effective programs, participate and contribute to regional restoration and protection programs, and share knowledge and resources with others.	*Same as alternative B.*
GOAL for Operations and Facilities. Prioritize wildlife first and emphasize the protection of trust resources in the utilization of staff, volunteers, funding, and facilities.		
Staff—Actions		
Continue to employ the current staff, which consists of a refuge manager, outdoor recreation planner, administrative support assistant (also a business team	*Same as alternative A, plus:* Recruit the following permanent staff to accomplish the actions described in this alternative: assistant refuge man	*Same as alternative B.*

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
member), law enforcement officer, and maintenance worker. Continue to supervise, support and provide resources for several zone or state-wide support staff, including a fire management officer, range/fire technician, business team staff member, and regional maintenance team member. Provide space and support for the IPM strike team.	ager, biological science technician, career seasonal (part-time) biological science technician, and visitor services specialist (to manage visitor center and volunteers and develop and present programs). Continue to work with Montana universities to develop a volunteer program by providing college credit in exchange for volunteer work experience. Actively recruit additional volunteers to assist with expanded visitor services programs and habitat management and restoration projects.	
Staff—Environmental Consequences		
Programs would be maintained at current levels. Refuge management would continue to be selective regarding which projects to complete and may possibly limit additional projects, including expanding habitat restoration and visitor services programs.	*Same as alternative B, plus:* Additional staff would be available to fully implement the objectives and strategies of the CCP, restoring and improving habitats and expanding quality visitor services programs.	*Same as alternative B.*
Facilities—Actions		
Maintain the current 513-square-foot visitor contact area for visitor use and interpretation of resources. Do not expand office space or equipment storage areas.	*Same as alternative A, except:* Expand the visitor contact area into a visitor center, add office space, and add a combined classroom and conference room. Relocate the pole barn closer to the maintenance area. Construct a duplex to provide housing for seasonal, transitional, and detailed staff. Purchase a seed storage bin for storing native seed. Through partnerships, rehabilitate and maintain the historical Whaley Homestead. Incorporate green technology and renewable power sources into all new construction and rehabilitation activities. Purchase an excavator to complete proposed restoration projects. Add a wash bay and containment area for washing equipment and vehicles to reduce the spread of invasive plants.	*Same as alternative B, plus:* Restore the Grube Barn to create an environmental education center. Use solar or other alternative power sources to power this facility. Construct a shelter over the existing amphitheater that blends into the natural environment. Install an elevated observation deck along one of the new refuge trails.
Facilities—Environmental Consequences		
The existing, undersized visitor contact area would remain unable to accommodate the refuge's thousands of visitors and provide little opportunity to expand and improve interpretive displays. The existing eight offices, which are fully occupied by current refuge and regional staff, would remain unable to accommodate additional staff, including seasonal employees. Equipment would continue to be stored	The thousands of refuge visitors would be better accommodated and interpretive facilities and programs could be expanded. The additional office spaces would provide work areas for added staff. Additional storage areas would provide secure areas to store equipment and supplies. Additional housing would enable the refuge to recruit and support additional	*Same as alternative B, plus:* Restoring the Grube Barn and covering the amphitheater would provide environmental education facilities that could be used in all weather conditions. The additional observation deck would provide new opportunities for visitors to view wildlife. There may be some additional disturbance to wildlife. There would be costs associated with these projects. The cost could be substantial

Table 4. Summary of CCP alternatives for Lee Metcalf National Wildlife Refuge, Montana.

Alternative A (current management–no action)	*Alternative B (proposed action)*	*Alternative C*
outside or in unsecured areas. There would continue to be insufficient storage for equipment used by other Service programs based at this refuge.	seasonal staff, including those from other Service programs based at the refuge. Restoring the Whaley Homestead would provide opportunities for interpreting part of the history of the Bitterroot Valley and refuge.	for rehabilitating and maintaining the Grube Barn, given the age and condition of this building.

Abbreviations: HGM = hydrogeomorphic, IPM = integrated pest management, RLGIS = Refuge Lands Geographic Information System, WVA = Wildlife Viewing Area, MFWP = Montana Fish, Wildlife & Parks.

CHAPTER 4—Affected Environment

Bob Danley/USFWS

Sagebrush buttercup is one of many plant species found on Lee Metcalf National Wildlife Refuge.

This chapter describes the characteristics and resources of the Lee Metcalf National Wildlife Refuge in Montana, as follows:

- physical environment (section 4.1)
- biological resources (section 4.2)
- State and federally listed species (section 4.3)
- cultural resources (section 4.4)
- special management areas (section 4.5)
- visitor services (section 4.6)
- management uses (section 4.7)
- socioeconomic environment (section 4.8)
- partnerships (section 4.9)
- operations (section 4.10)

4.1 Physical Environment

The following sections describe aspects of the physical environments that may be affected by implementation of the CCP. Physical characteristics include climate and hydrology, climate change, physiography and geography, soils, topography and elevation, and air quality. Unless otherwise noted, the information in this section is from unpublished Service data or a hydrogeomorphic (HGM) report entitled "An Evaluation of Ecosystem Restoration and Management Options for Lee Metcalf National Wildlife Refuge," which was developed by Greenbrier Wetland Services (Heitmeyer et. al. 2010).

Climate and Hydrology

The climate of the Bitterroot Valley is characterized by cool summers, generally light precipitation, little wind, and relatively mild winters. Annual precipitation averages about 13 inches but is variable related to position in the valley (figure 9). Precipitation increases with elevation along the valley margins and ranges from less than 13 inches in the Bitterroot Valley floor to nearly 60 inches near the Bitterroot Mountain summits on the west side of the valley. In contrast, precipitation along the crest of the Sapphire Mountains on the eastern margin of the Valley is about 25–35 inches per year. The growing season in the Valley averages about 103 days; on average, the last freeze occurs May 30, and the first frost occurs September 10. Spring is the wettest period of the year, with about 25 percent of the annual precipitation falling in May and June (Heitmeyer et al. 2010). Runoff in the Bitterroot River is highest in spring, with about 55 percent of the river's discharge occurring in May and June following snowmelt and local rainfall (McMurtrey et al. 1972). Natural flows in the Bitterroot River decline from spring peaks throughout the summer and remain relatively stable through winter. On average about

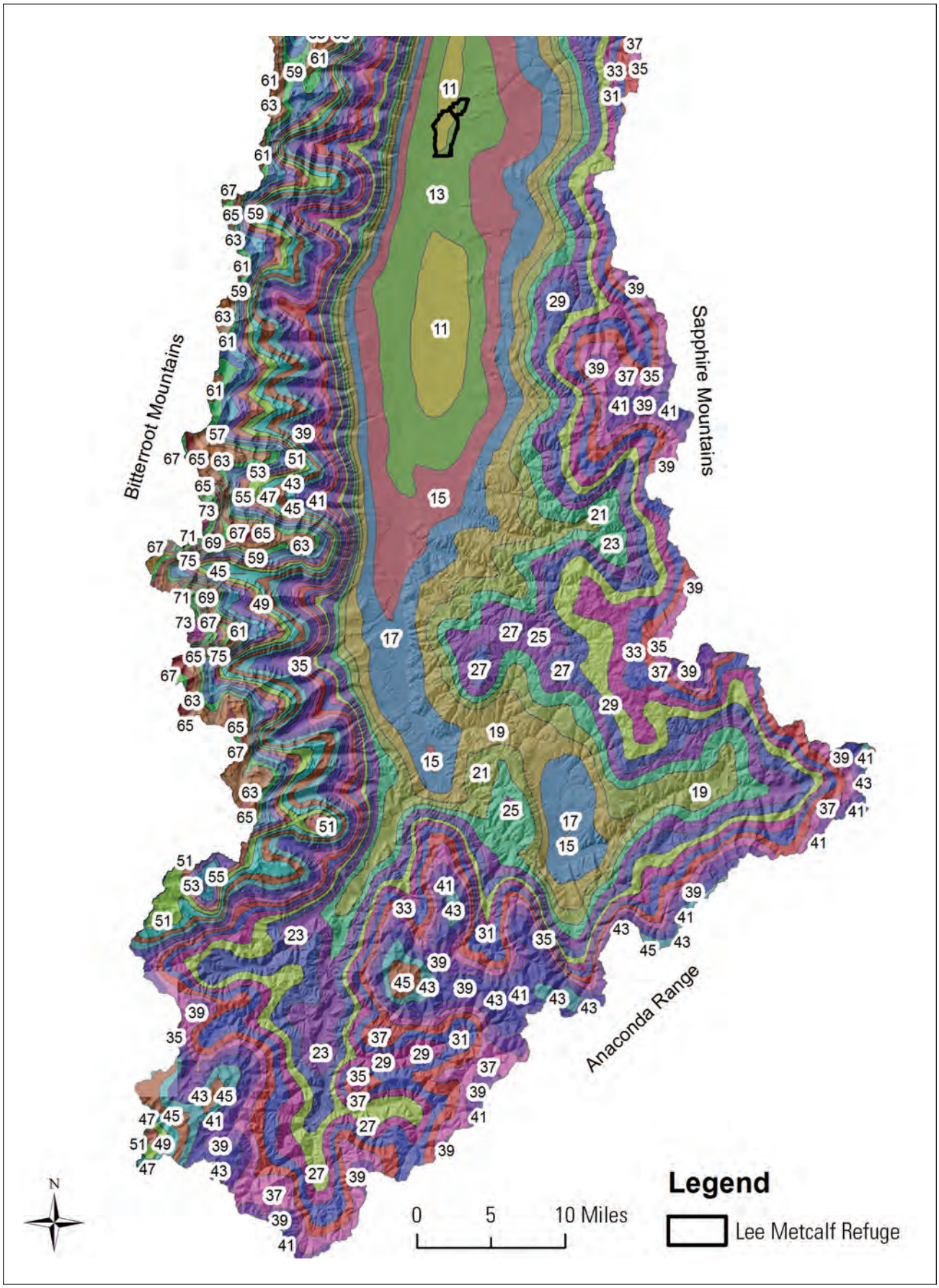


Figure 9. Ravalli County average annual precipitation (inches).

1.772 million acre-feet of water flows into the Bitterroot basin via the Bitterroot River each year. Of this, 52 percent flows from the west, 37 percent flows from the south, and 11 percent flows from the east (Briar and Dutton 2000).

Numerous tributaries enter the Bitterroot Valley from mountain canyons. North Burnt Fork Creek and Three Mile Creek are major tributaries flowing across Lee Metcalf Refuge into Francois Slough and North Island Slough, respectively (figure 10). Other minor, within-floodplain drainages that historically crossed refuge land and ultimately emptied into the Bitterroot River included, Swamp Creek, Rogmans Creek, and the recently modified McPherson and Nickerson Creeks (now called Ditches). Rogmans Creek's historical channel is now covered by Ponds 2 through Otter Pond. Valley-wide, about four times as many tributaries join the river from the Bitterroot Mountains on the west compared to the drier Sapphire Mountains on the east.

Records of flow and flood frequency relationships for the Bitterroot River near Florence date back to 1950. For this period of record, the river exceeded 1,050 cubic feet per second (cfs) at a 50 percent recurrence interval, or a frequency of every other year. Bank full discharge at Florence is about 13,000 cfs. This high flooding discharge causes extensive flooding throughout higher floodplain areas (figure 11) but occurs very infrequently (that is, at a greater than 50-year recurrence interval). At flows greater than 10,000 cfs, some modest backwater flooding on the refuge occurs with a greater than 7-foot stage height (USFWS 1974). This spring backwater flooding into connected floodplain sloughs and oxbows occurs regularly (that is, at a 5–10 year recurrence interval).

The Darby stream gauge station, approximately 35 miles upstream of the refuge, has the longest period of record for discharge on the Bitterroot River (beginning in 1937). Discharges on the Bitterroot River at Darby have less influence from irrigation return flow; accordingly, this gauge station represents the best location to evaluate relatively natural long-term patterns in riverflow. Records of peak discharge at Darby from the 1940s suggest some higher periodic discharge (greater than 10,000 cfs) at about 20- to 25-year intervals, with intervening years of moderate to low flows (figure 12). During the period of record, more very low flow (less than 4,000 cfs) years, about 20, occurred than did more average flow (greater than 8,000) years, about 16. In summary, river gauge data suggest the floodplain at the refuge was seldom extensively flooded historically (for example, 1974; figure 11), but that some backwater flooding into primary sloughs and tributaries occurred at a less than 50 percent recurrence interval in spring.

Many of the morphological characteristics of capillary (or secondary) channels of the Bitterroot River floodplain, including those at the refuge (such as Three Mile, Rogmans, McPherson, and Nickerson Creeks and Francois Slough), show an intimate connection with ground water discharge (Gaeuman 1997). Large upstream and downstream variations in discharge within individual channels, and observed springs along the margins of floodplain terraces reveal a substantial subsurface flow. Many of these channels are probably remnants of formerly large channels (including past abandoned channels of the Bitterroot River) that have filled incompletely. In other cases, ground water discharge may be actively excavating channels that seem to be growing by head cuts (abrupt changes in streambed elevation).

Alluvial aquifers in the Bitterroot Valley are generally unconfined and interconnected, although the configuration of water-bearing layers in the heterogeneous valley fill is highly variable (Briar and Dutton 2000). Permeability is highest in alluvium of the low Quaternary terraces and floodplain, and hydraulic conductivity of up to 75 feet per day has been calculated in low terrace alluvium. Ground water circulation is predominantly away from the valley margins toward the Bitterroot River. The basin-fill aquifers are recharged by infiltration of tributary streams into coarse terrace alluvium, subsurface inflow from bedrock, and direct infiltration of precipitation and snowmelt. High amounts of precipitation on the western side of the valley cause greater recharge in this area than on the east side of the valley. Ground water discharge occurs through seepage to springs and streams, evapotranspiration, and now by withdrawals from wells. Water in basin-fill aquifers is primarily a calcium bicarbonate type. Median specific conductance is about 250 microsiemens per centimeter at 25 °C, and median nitrate concentration is relatively low—0.63 milligrams per liter (mg/L)—within the aquifer. Nitrate concentration in surface waters may reach 6 mg/L (Briar and Dutton 2000).

Climate change

The U.S. Department of the Interior issued an order in January 2001 requiring Federal agencies under its direction with land management responsibilities to consider potential climate change effects as part of long-range planning endeavors. The U.S. Department of Energy's report, "Carbon Sequestration Research and Development" (1999), concluded that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. 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

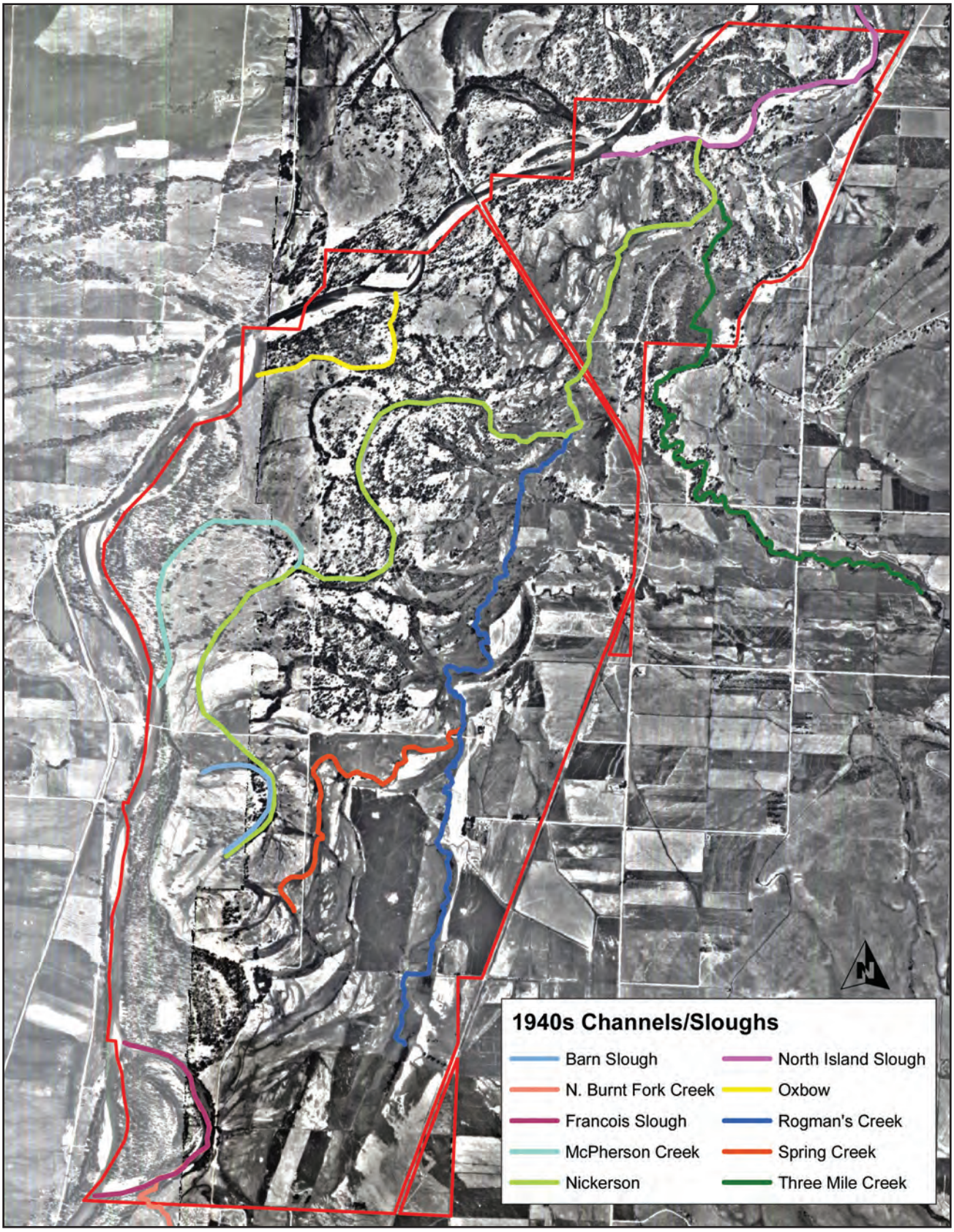
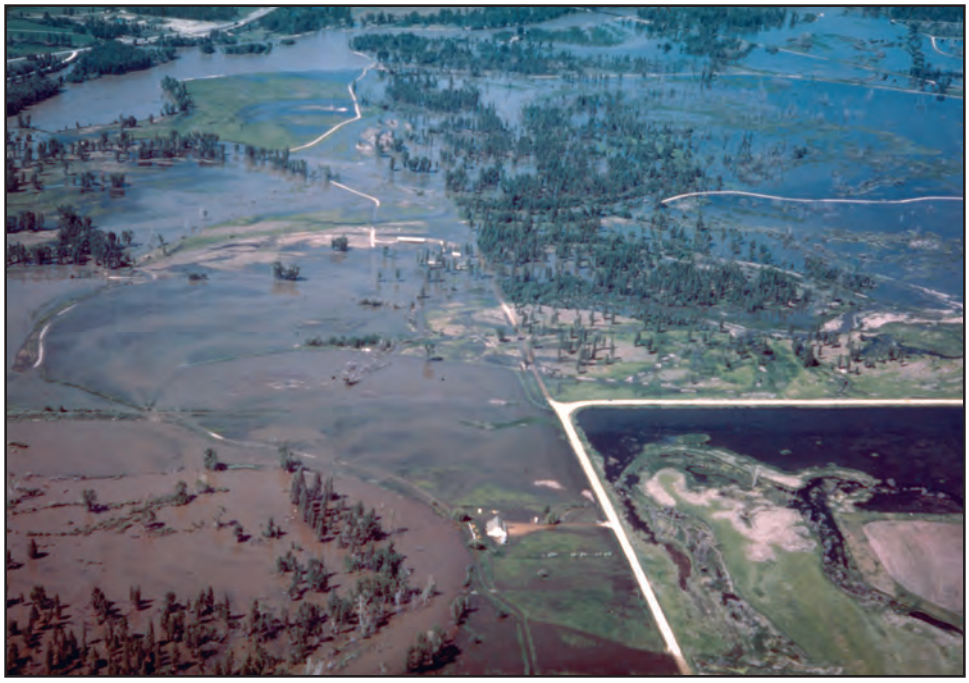


Figure 10. Channels and sloughs of the Bitterroot River in the 1940s (Heitmeyer et al. 2010).



USFWS

Figure 11. Flooding of the Bitterroot River on Lee Metcalf National Wildlife Refuge in 1974.

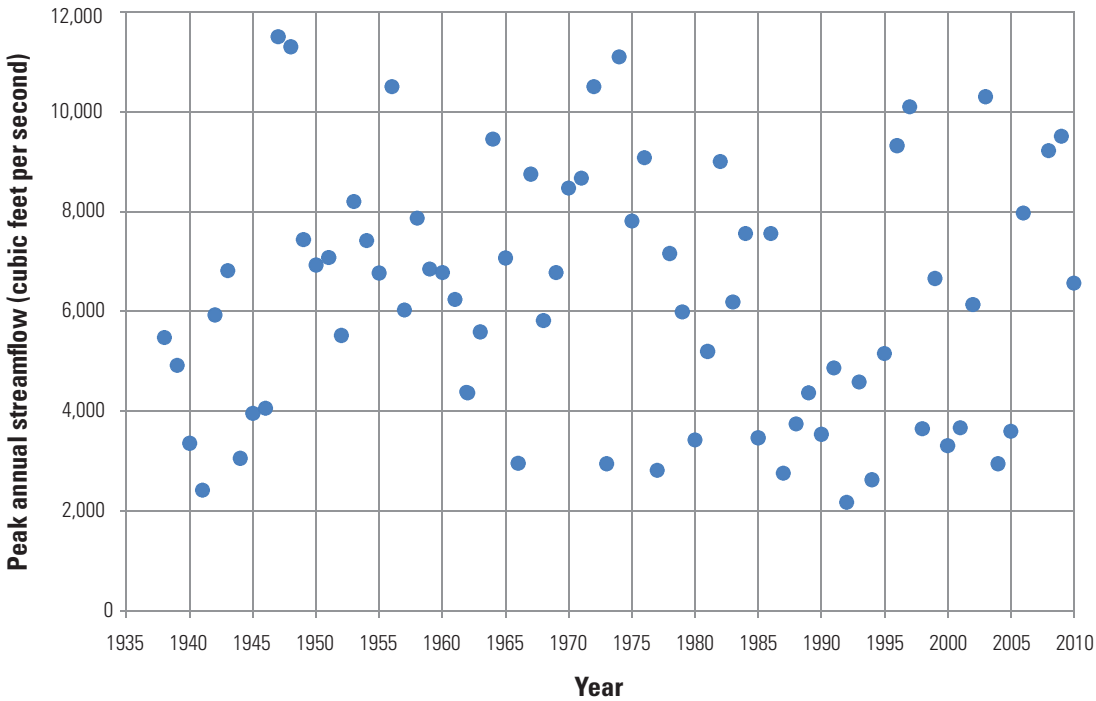


Figure 12. Bitterroot River streamflow near Darby, Montana—USGS 12344000.

Bob Danley/USFWS

Although prescribed burning releases CO_2, there is no net loss of carbon because new vegetation quickly germinates or regrows to replace the burned-up biomass.

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 is a tremendous factor in carbon sequestration. Large, naturally occurring communities of plants and animals that occupy major habitats—grassland, forest, wetland, tundra, and desert—are effective both in preventing carbon emission and in acting as biological scrubbers of atmospheric CO_2.

One Service activity in particular—prescribed burning—releases CO_2 directly to the atmosphere from the biomass consumed during combustion. However, there is no net loss of carbon because new vegetation quickly germinates or regrows to replace the burned-up biomass. This vegetation sequesters an approximately equal amount of carbon as was lost to the air (Dai et al. 2006).

Climate data for Montana show a slight reduction in annual precipitation and increases in temperatures over the last 100 years (National Climatic Data Center 2011). Climate change impacts predicted in the Rocky Mountains are rising temperatures, less snow, less water in snowpacks, earlier spring snowmelts, and lower streamflows in the summer. These changes will in turn lead to increased forest ecosystem water stress, increased winter temperatures, earlier snowmelts, and longer summer drought periods. With this warming trend, the growing season will increase, but with limited water resources, forest ecosystems will be water stressed and most likely begin to release CO_2 instead of acting as net absorbers of CO_2 (Running 2010). Other impacts anticipated include increased wildfires and insect infestations. This change in climate could also alter vegetation patterns and species, possibly allowing for additional invasive species to become established. Invasive plants could spread more rapidly, the effectiveness of control methods may be altered, and certain species would likely survive the drier and milder climates, thereby outcompeting native plants.

Stronger and more frequent droughts associated with climate change could cause waterfowl and other waterbirds to lose breeding and migration habitat. In addition, changes in the timing of migration and nesting could put some birds out of synchronization with the life cycles of their prey. Natural food sources for wildlife could be reduced or eliminated.

As surface water supplies might decrease with climate change, the refuge could depend more on subsurface water sources; this would increase management costs due to the challenges of pursuing ground water that has also been depleted by increased demand. Less ground water recharge, along with a greater demand for human consumption and irrigation, could limit water available for wildlife purposes. Increased potential exists for managed wetlands that depend on runoff and delivered water to not receive adequate amounts of water for waterbird habitat. Water impoundments might go dry more often and for possibly longer periods of time. Compatible public use activities may be affected on Service lands due to degraded habitats and less wildlife. Furthermore, climate change could displace local ranchers and farmers if they could no longer produce enough crops and livestock to maintain the viability of their businesses; this could cause an even greater change in land use as ranches and farms become further subdivided and developed.

Physiography and Geology

The Bitterroot Valley, where the Lee Metcalf Refuge is located, is a north-trending basin bounded by the Bitterroot Mountains on the west and the Sapphire Mountains on the east. These mountains and the rich montane Bitterroot Valley date to nearly 90 million years before the present (B.P.) (Hodges and Applegate 1993). The Bitterroot Valley extends about 120 miles from the confluence of the east and west forks of the Bitterroot River south of Darby to its junction with the Missoula Valley and Clark Fork River 5 miles south of Missoula. The elevation of the valley floor ranges from about 3,900 feet above mean sea level (amsl) in the south to about 3,200 feet amsl near Missoula. Summit elevations of surrounding mountains range from 6,000 to 8,000 feet amsl in the Sapphire Range and exceed 9,500 feet amsl in the Bitterroot Range.

The Bitterroot Mountains are composed of granitic rocks, metamorphic materials, and remnants of pre-Cambrian sediments of the Belt series. The Sapphire Mountains are mostly Belt rocks with localized occurrences of granitic stocks.

The unusually straight front of the Bitterroot Range is a zone of large-scale faulting (Langton 1935, Pardee 1950); however, the Bitterroot Valley shows little sign of recent tectonic activity (Hyndman et al. 1975). Undisturbed valley fill shows that tectonic movement since the early Pliocene has been slight or that the entire valley floor has moved as a single unit.

The structural basin of the Bitterroot Valley has accumulated a considerable thickness of Tertiary sediments capped in most places by a layer of Quaternary materials. Surficial geology evidence suggests Tertiary fill in the Bitterroot Valley may be up to 4,000 feet thick in some locations (Lankston 1975). Sediment is coarse colluviums near the fronts of mountains with finer-grain alluvial fill deposits that interfinger with floodplain silts and clays. Channel deposits of the ancestral Bitterroot River lie beneath the valley center.

Low terrace alluvium occurs as outwash, or alluvial fans, below the mouths of tributaries on both sides of the valley (Lonn and Sears 2001). Floodplain alluvium is mostly well-rounded gravel and sand with a minor amount of silt and clay derived from the edges of the neighboring terraces and fans. Most of the refuge is mapped as Qal alluvial deposits of recently active channels and floodplains. These deposits are well-rounded, and sorted gravel and sand with a minor amount of silt and clay. Minor amounts of Qaty (younger alluvial outwash terrace and fan complex deposits from the late Pleistocene) occur next to the Bitterroot Valley alluvium on the north end of the refuge. Materials in these terraces are well-rounded and sorted gravel of predominantly granitic, gneissic, and Belt sedimentary origin (Lonn and Sears 2001). Qafy surfaces extend along the Bitterroot Valley on both sides of the refuge. These surfaces are younger (late Pleistocene) alluvial outwash terrace and fan complexes of well-rounded cobbles and boulders in a matrix of sand and gravel deposited in braided-stream environments that formed between and below the dissected remnants of older fans. These surfaces appear to have been at least partly shaped by glacial Lake Missoula, which reached an elevation of 4,200 feet and covered the Bitterroot Valley near the refuge 15,000–20,000 years B.P. during the last glacial advance (Weber 1972).

The Bitterroot River has an inherently unstable hydraulic configuration and high channel instability, particularly between the towns of Hamilton and Stevensville (Cartier 1984, Gaeuman 1997). The river reach immediately upstream from the refuge has a complex pattern that is characterized by numerous braided channels that spread over a wide area of the valley bottom. The zone of non-vegetated gravels associated with this main braided channel system has widened and straightened since 1937 (Gaeuman 1997). In addition to this widening, severe bank erosion is common, but numerous cutoff chutes counteract some lateral bend displacement. Together, active river movements and a braided river channel pattern create low riverbanks and natural levees that encourage chutes and other avenues of river overflow. A complex network of minor channels occurs in the valley floor including the floodplain lands on the refuge (figure 13). These minor channels appear to flow from ground water discharge, which promotes erosion at slope bases and headwater retreat of small channel head cuts on the floodplain. Channel fragmentation appears to be controlled by irregularities in the respective elevation gradients of the valley.

About 10–15 miles north of Stevensville, the Bitterroot River channel is more confined, compared to its highly braided form further south. Despite limited changes in river shape north of Stevensville, the river stretch along the refuge has maintained a highly dynamic, instable channel form due to its geological, topographic, and hydraulic position. The historical floodplain at the refuge was characterized by the following: (1) multiple abandoned channels (for example, Barn and Francois Sloughs) that were connected with the main river channel during high-flow events; (2) small within-floodplain channels (for example, Rogmans and Swamp Creeks) that received water from ground water discharge and occasional overbank backwater flooding during high-flow events; (3) entry of two mountain- or terrace-derived major tributaries to the Bitterroot River (for example, North Burnt Fork Creek and Three Mile Creek); (4) slightly higher elevation inter-drainage point bars, natural levees, and terraces; and (5) alluvial fans (figure 10).

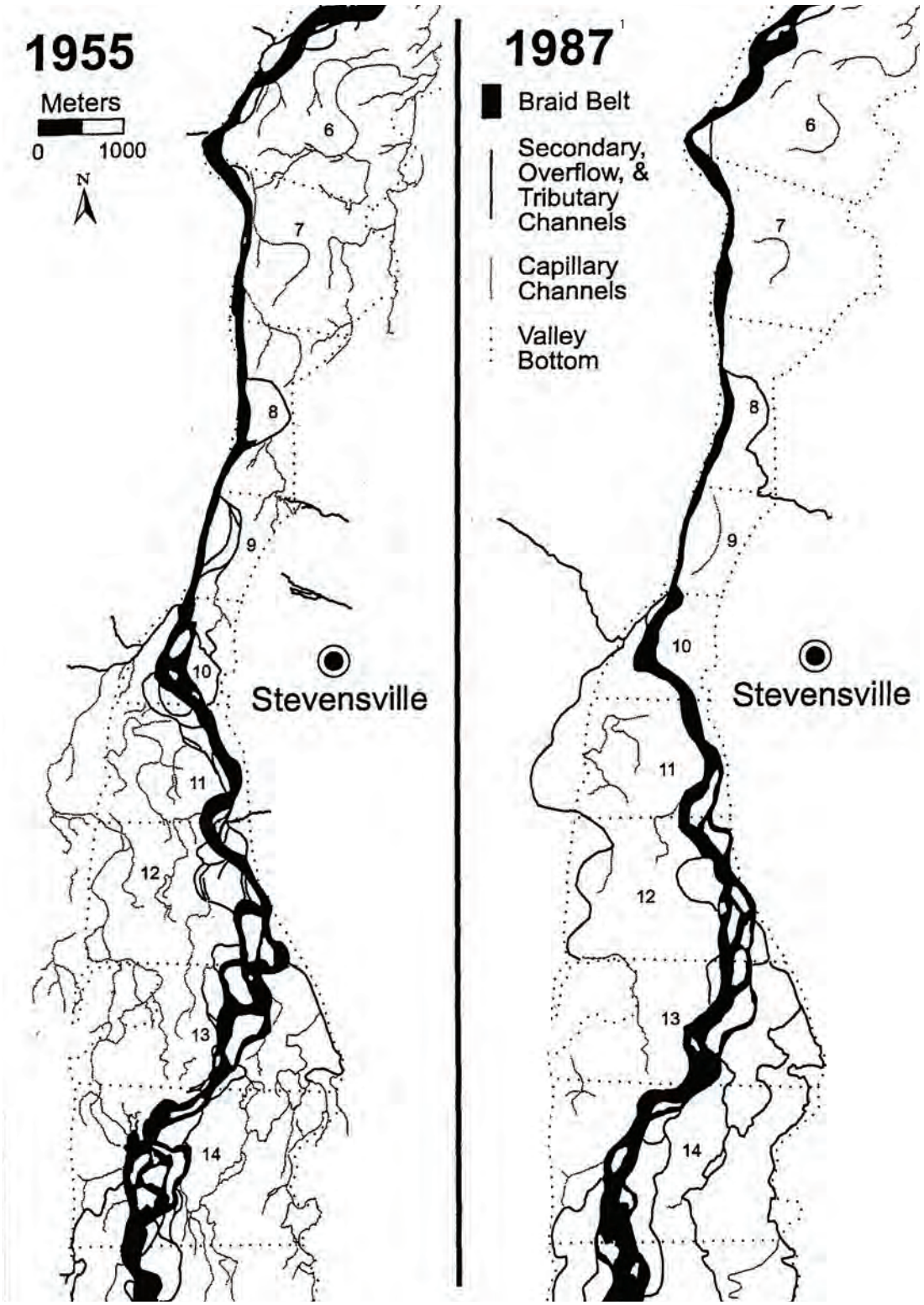
Soils

Nearly 25 soil types or groups currently identified by the U.S. Department of Agriculture Soil Survey Geographic databases are present on or next to the Lee Metcalf Refuge. The most extensive soils are Riverrun-Curlew-Gash complex, Ambrose creek sandy loams, and Riverside-Tiechute-Curlew complexes. Current soil maps of the refuge are constrained by numerous water impoundments where no soil type is identified and each impoundment area is simply identified as water. Consequently, soil surveys conducted prior to major floodplain developments and impoundment construction are more useful for understanding soil types. These soil surveys can also be used to determine the historical distribution of plant communities.

The combination of soils on the refuge is complex and highly interspersed, and it reflects the numerous channel migration events across the floodplain. It also reflects the introduction of mixed-erosion sediments from surrounding Quaternary and Tertiary terraces and alluvial deposition of Bitterroot Valley parent materials. Most soils on the refuge are shallow, with thin layers of silts and clays overlying deeper sands and gravels. In many places sandy outcrops occur, especially near the Bitterroot River.

Topography and elevation

Elevations on the Lee Metcalf Refuge range from about 3,230 feet on its north end to about 3,260 feet on its south end at the river (figure 14). The topographic variation within the refuge is related to the historical channel migrations of the Bitterroot River and



[1] *Apparent density of minor channels influenced by photographic scale. 1955 map from 1:20,000 photographs; 1987 map from 1:40,000 photographs.*

Figure 13. Network of minor channels occurring in the valley floor on Lee Metcalf National Wildlife Refuge, Montana (Heitmeyer et. al. 2010).

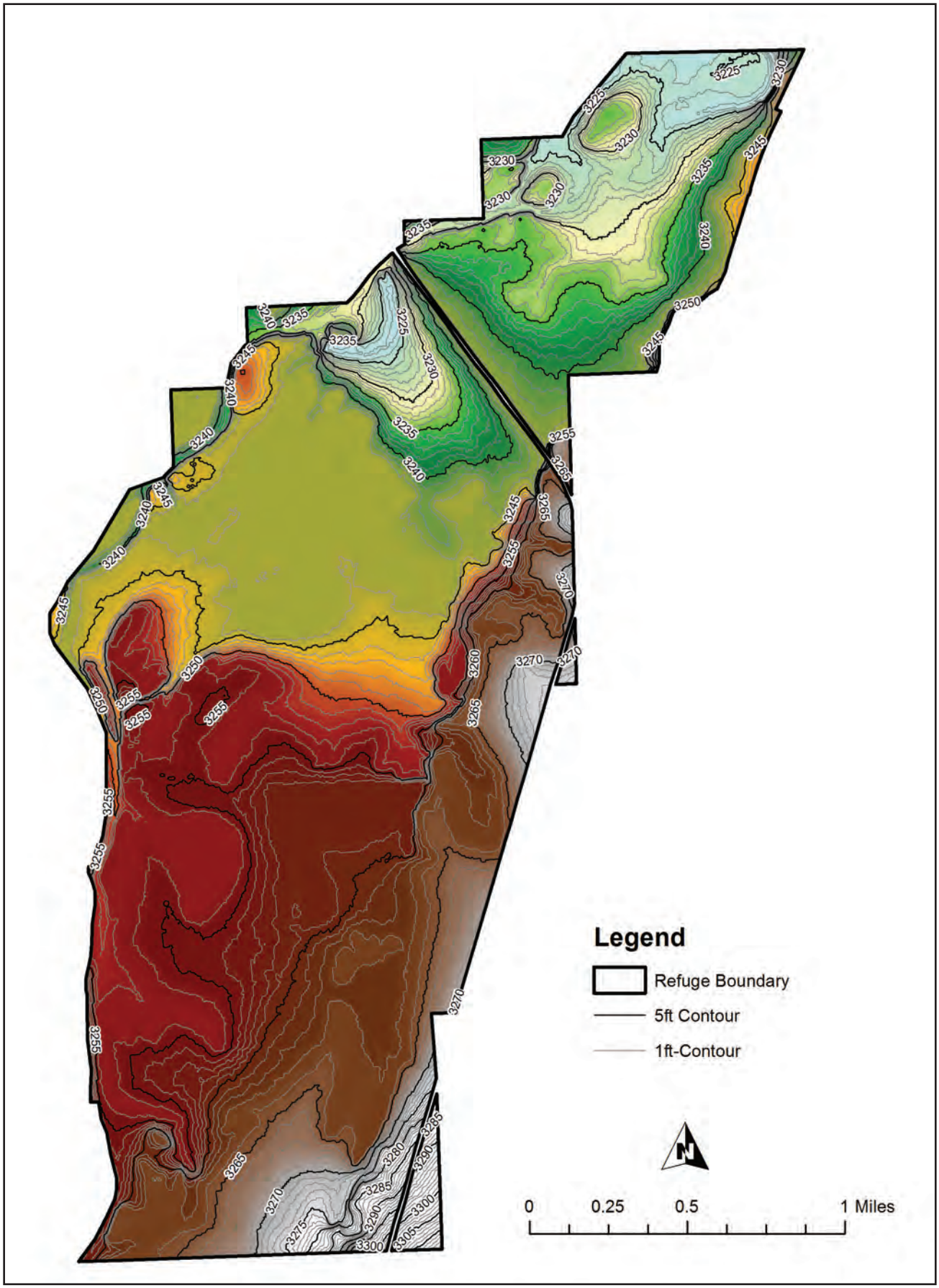


Figure 14. Map of Lee Metcalf National Wildlife Refuge showing 1-foot contour intervals (Heitmeyer et al. 2010).

its tributaries, scouring and natural levee deposition along minor floodplain channels, and alluvial deposition. A large southeast portion of the refuge contains higher, more uniform elevations while north and west portions of the refuge have lower, more diverse elevations. Alluvial fans are present in many locations along the Qafy geomorphic surfaces on the east side of the refuge. A larger tributary fan is present where North Burnt Fort Creek enters the Bitterroot River floodplain; this fan is much larger than the alluvial fans along the floodplain margin that grade into the Sapphire Mountains.

Water rights

The refuge has a complex system of irrigation ditches, springs, creeks, impoundments, and water control structures for moving water within the refuge to fill the various impoundments and to irrigate upland fields. In 1982, the refuge submitted 24 water right claims in response to State Senate Bill 76, which mandated adjudication of pre-1973 State water rights. These 24 pre-1973 claims total 31,297.88 acre-feet per year. There is also one post-1973 storage permit (300 acre-feet per year) and two domestic well permits (11.5 acre-feet per year) that increase the total refuge-owned water rights to 31,609.38 acre-feet per year (table 5). Most of these rights are supplemental, meaning the water sources are commingled to supply the refuge needs for optimum operation. In addition, the refuge receives up to 2,600 acre-feet per year (average diversion rate of 8.57 cubic feet per second) from the Supply Ditch Association to augment refuge water rights. This water flows through three lateral irrigation ditches and costs approximately $3,600 annually; however, the refuge does not receive this water at a rate of 8.57 cfs for a variety of reasons including the lack of ditch capacity and side diversions. Post-1973 claimed, permitted water rights total 34,209.38 acre-feet per year.

In 2008, the Department of Natural Resources and Conservation of the State of Montana began examining water right claims for the refuge. In this process, a claims examiner reviews various elements to determine the validity and necessity of each claim. A preliminary decree is anticipated to be issued by the water courts in the next few years. After the objection process is completed and the water court is satisfied, the claim representing prior use and a final decree will be issued.

Water is diverted on the refuge to store approximately 2,079 acre-feet of water on 795 acres of wetland impoundments. Water is also used for grassland units on approximately 205 acres. The main season of water use is from mid-March until early December. This varies with water conditions as determined by annual precipitation, snowmelt, and availability of water from the Supply Ditch. Adequate water is important to provide spring and fall migration stopover habitat for migratory birds and for irrigation of habitat restoration sites within upland fields during the summer. During the winter, most impoundments are kept full to provide water for resident species such as bass, aquatic invertebrates, and wintering waterfowl.

Hydrogeomorphic changes

The Bitterroot River stretch at the Lee Metcalf Refuge lies near the geomorphic threshold between a highly braided river channel pattern from Hamilton to Stevensville and a straight or sinuous channel pattern immediately downstream (figure 13). Consequently, the river channel pattern for the area is changing and highly sensitive to perturbation (for example, inputs of sediment, changes to shading or discharge) (Gaeuman 1997). The combination of irrigation development and land use changes, mainly in the 1900s, significantly altered hydrology and river channel morphology and movement in the Bitterroot Valley and its floodplains and facilitated degradation and loss of wetlands in this ecosystem (for example, Kudray and Schemm 2008). The extensive irrigation network of the Bitterroot Irrigation District led to construction of reservoirs, ditches, water diversion structures, and modified natural drainage routes. Stream channel networks, common in the Bitterroot Valley near the refuge, were altered by culvert and bridge crossings, railroad levees and beds, and extensive channelization of tributaries. Many stream channels, including sections of the Bitterroot River, were lined with riprap rock and car bodies to slow stream migration and in-channel bank erosion (figure 15). In addition to local physical disruptions to topography and hydraulics, the entire fluvial system of the Bitterroot River has been altered by historical land use changes (see section 4.4, "Cultural Resources"). The valleys and lower hill slopes have been grazed and farmed, while the upper valleys and mountains have been partly deforested. Overgrazing was common on many valley terraces and, when coupled with deforestation in neighboring mountains and slope areas, led to erosion and increased sediment loading in the Bitterroot River (Briar and Dutton 2000). Subsequently, extensive sedimentation has occurred in drainages and floodplain depressions on the refuge (USFWS 1988–1993).

The channel morphology and discharge of the Bitterroot River has also been affected by land and water use in the valley (Gaeuman 1997). From 1936 to 1972, the Bitterroot River underwent significant adjustments in sinuosity and braided character causing a nearly 4 percent reduction in channel length between Darby and Missoula (Cartier 1984). Other data suggest that in the last decade, increased instability, channel migration, and overall widening of the river's braided area from Hamilton to Stevensville has occurred compared to other reaches of the Bitterroot River both above and below (Gaeuman 1997). This instability has caused

Table 5. Water rights summary for Lee Metcalf National Wildlife Refuge, Montana.

Water right number	*Priority date*	*Volume rate (cubic feet per second)*	*Volume (acre-feet per year)*	*Irrigated acres*	*Source*
76H–W–142486	04/05/1882	3.57	1,060	1,837	North Burnt Fork Creek
76H–W–188239	06/10/1882	5	560	1,929	Rogmans Creek (also known as Spring Creek)
76H–W–142487	10/01/1882	2.5	742.5	1,837	North Burnt Fork Creek
76H–W–142482	06/15/1903	10	742.6	2,188	South Drain
76H–W–188233	06/15/1905	1.86	1,344	1,536	Unnamed tributary of Bitterroot River
76H–W–142483	05/15/1930	1	49	14	Three Mile Creek
76H–W–188235	07/02/1931	1.28	470	51	Middle Drain
76H–W–188236	05/07/1938	8	3,008	1,038	Rogmans Creek
76H–W–188231	08/15/1941	10	535.5	1,866	Swamp Creek
76H–W–142493	01/29/1947	10	2,162	1,544	Bitterroot River
76H–W–188238	11/04/1950	25	980	1,929	Rogmans Creek
76H–W–142492	04/01/1952	0.9	212	1,029	Unnamed tributary of Spring Creek
76H–W–142491	05/15/1953	5	301	1,619	Unnamed tributary of Bitterroot River
76H–W–142489	11/13/1957	1.8	1,306	2,188	Unnamed tributary of Spring Creek
76H–W–142484	07/13/1960	1	49	None	Three Mile Creek
76H–W–142485	12/10/1963	2	1,120	209	Three Mile Creek
76H–W–188237	12/10/1963	20	6,317	1,929	Rogmans Creek
76H–W–188232	12/10/1963	0.25	181.5	720	Unnamed tributary of Spring Creek
76H–W–142490	12/10/1963	2	629.8	67	Drain #2 (also known as water and seepage; also known unnamed tributary of Spring Creek)
76H–W–188234	12/10/1963	1.86	1,344	1,536	Middle Drain (also known as water and seepage; also known unnamed tributary of Spring Creek)
76H–W–184100	12/10/1963	5	3,629	1,288	South Drain (also known as water and seepage; also known unnamed tributary of Spring Creek)
76H–W–142488	12/10/1963	2	1,445	1,837	Drain #1 (also known as water and seepage; also known unnamed tributary of Bitterroot River)
76H–W–188240	12/10/1963	1.25	32	1,288	Spring (unnamed tributary to Bitterroot River)
76H–W–188230	12/10/1963	5	3,078	1,866	Swamp Creek
76H–81434	02/02/1968	0.02[1]	1.5	None[2]	Ground water
76H–W–10850	12/30/1976	0.03[3]	10	None[2]	Ground water
069642–S76H	10/14/1988	25	300	None[4]	Spring Creek

[1] *Equals well pumping capacity of 12 gallons per minute.*
[2] *Domestic use.*
[3] *Equals well pumping capacity of 15 gallons per minute.*
[4] *Post-1973 permit for Otter Pond.*

Source: USFWS, Region 6 Water Resources Division 2011.

rapid erosion of riverbanks on the refuge (figure 16) and increased physical dynamics of sediment and waterflow that facilitate rapid lateral channel migration across the refuge floodplain. In contrast to the highly active river migration physics from Hamilton to Stevensville, substantial narrowing of the Bitterroot River occurred near Stevensville and the refuge lands after 1937 in part because of artificial control structures. Part of the river has been channelized immediately upstream of riprap bank stabilization structures near the railroad embankment on the refuge. This artificial narrowing of the Bitterroot River to control river migration and bank erosion has actually heightened river migration tendencies immediately upstream of structures and has the potential to carve new channels across the refuge floodplain.

Aerial photograph maps of a 2.5-mile stretch of the Bitterroot River on the north end of the refuge from 1937 to 2009 show the highly unstable channel location of the river (figure 17). Three key points (labeled A, B, and C on figure 17) of river migration are apparent through the time-series of photographs, and typical movements of the outer riverbanks average about 8 feet per year. During more active periods of river

Bob Danley/USFWS

Figure 15. Car bodies along the Bitterroot River at the north end of Lee Metcalf National Wildlife Refuge, Montana.

Bob Danley/USFWS

Figure 16. Bank and levee erosion along the Bitterroot River on the west side of Lee Metcalf National Wildlife Refuge, Montana (Heitmeyer et al. 2010).

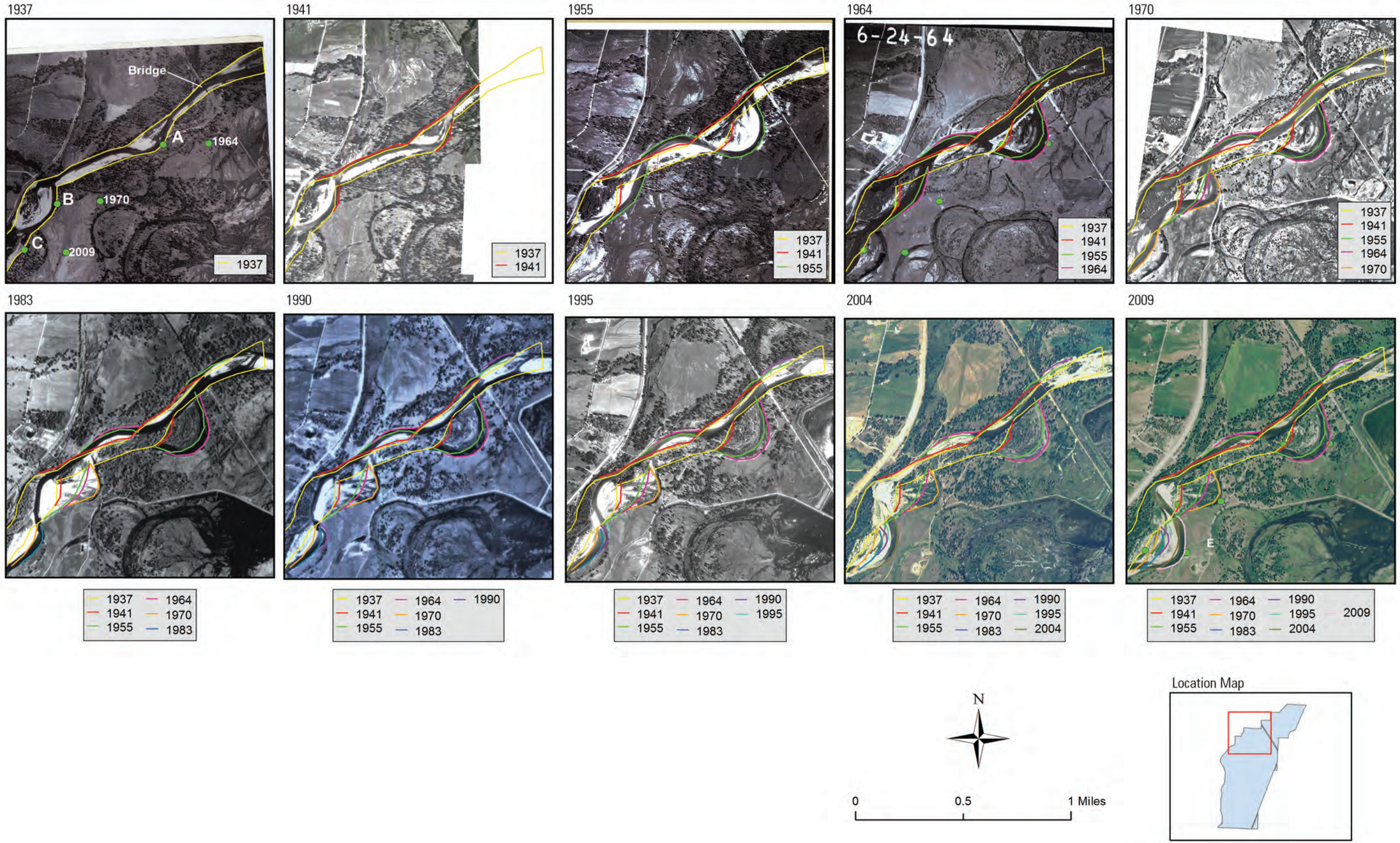


Figure 17. Maps showing the changes in the main channel of the Bitterroot River (Heitmeyer et al. 2010).

channel bank migration, the rate of erosion is greater than 32 feet per year. The 1955 photograph reveals that the river migrated significantly to the south and was deemed a threat to the existing railroad bed and trestle. Subsequently, actions were taken by the railroad company to stop river migration by placing car bodies (figure 15) along the riverbank to act as riprap and cut off the river, which created an oxbow that is still present. The most active area of river migration in 2009–2010 is at point C. Between 2004 and 2009, the river migrated about 197 feet east, or about 39 feet per year. If this rate of river migration continues, then the river may reach the refuge's main road in about 15 years and effectively remove about 10.5 acres of current floodplain land.

The Bitterroot River Irrigation District's Main Supply Canal continues to transport water to most of the eastern benches in the Bitterroot Valley, including those next to the refuge. This canal facilitates a net transfer of about 75,000 acre-feet per year of water from the west side of the valley to the eastern benches and terraces. During summer, irrigation withdrawals significantly reduce flow in the Bitterroot River and some of its tributaries. Part of the diverted flow eventually drains back into the river system; this irrigation return flow is about 280,000 acre-feet per year in normal precipitation years. This includes well water and other canals used for irrigation. Average discharge of the Bitterroot River near Florence is 1,540,000 acre-feet per year, and at this point there is about a 13 percent current loss of discharge from irrigation use, other consumptive uses, and evapotranspiration. More than 10,000 wells are now in the valley, and the extraction of water from these wells, coupled with irrigation diversion, may be affecting ground water levels, recharge to floodplain wetlands, ground and surface water quality, and the connections of branches (anastomosis) of the Bitterroot River (Briar and Dutton 2000).

Air quality

Air quality is a global concern. The U.S. Environmental Protection Agency has lead responsibility for the quality of air in the United States; through the 1990 Clean Air Act, the agency sets limits on the amount of pollutants that can be discharged into the air. More than 170 million tons of pollution is emitted annually into the air within the United States, through either stationary sources (such as industrial and power plants) or mobile sources (such as automobiles, airplanes, trucks, buses, and trains). There are also natural sources of air pollution such as fires, dust storms, volcanic activity, and other processes. The U.S. Environmental Protection Agency has identified six principal pollutants that are the focus of its national regulatory program: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.

Air quality problems in Montana are usually related to urban areas and narrow mountain river valleys that are prone to temperature inversions. These temperature inversions cause chemical and particulate matter to become trapped in the air. (Particulate matter is tiny liquid or solid particles in the air that can be breathed in through the lungs, with the smaller particulates being more detrimental than larger particles.) These air pollutants have the greatest adverse effect on Montana's air quality.

Air quality in the Bitterroot Valley and Ravalli County is classified as either "attainment" or "unclassifiable-expected attainment" with respect to the National and Montana Ambient Air Quality Standards for all regulated air pollutants. The primary pollutant of concern in the Bitterroot Valley is particulate matter less than 2.5 microns in size ($PM_{2.5}$). Ambient $PM_{2.5}$ levels have been measured at several locations in the Bitterroot Valley over the past several years and continue to be measured in the community of Hamilton, approximately 20 miles south of the refuge. Smoke from wood burning appliances (primarily residential heaters and woodstoves), forestry and agricultural prescribed burning practices, and forest fires occasionally result in elevated $PM_{2.5}$ levels in the Bitterroot Valley. The Montana Department of Environmental Quality conducts an open burning smoke management program to mitigate impacts from forestry and agricultural burning. Nevertheless, Missoula experienced 16 days of Stage I Air Alerts in 2003. The Montana Department of Environmental Quality evaluates monitored concentrations of $PM_{2.5}$ during the winter months to address elevated $PM_{2.5}$ levels primarily resulting from wood burning appliance emissions during periods of poor atmospheric dispersion (Hoby Rash, Monitoring Section Supervisor, Ambient Air Monitoring, Montana Department of Environmental Quality; email; September 27, 2010).

4.2 Biological Resources

This section describes the biological resources that may be affected by CCP implementation. It begins with a description of the refuge's historical land cover and vegetation communities, and it discusses changes to the refuge since its establishment. Following this background, the current vegetative habitat type descriptions (upland, riparian, and wetland) and the associated birds, mammals, amphibians, reptiles, and fishes are described. The remainder of this section describes the invasive species, wildlife diseases, and contaminants found on the refuge.

Unless otherwise noted, the information in this section is from unpublished Service data; a hydrogeomorphic (HGM) report entitled "An Evaluation of

Ecosystem Restoration and Management Options for Lee Metcalf National Wildlife Refuge," developed by Greenbrier Wetland Services (Heitmeyer et. al. 2010); or from another habitat analysis entitled "Lee Metcalf National Wildlife Refuge 2009 Assessment of Upland Units" prepared by Aeroscene Logic (Graham 2009). These data and reports are available at the refuge headquarters.

Land cover and vegetation communities

The Bitterroot Valley is composed of the intermountain and foothill grassland ecotype cut and formed by the meandering Bitterroot River that creates core riparian zones and wetland areas. This ecotype harbors more wildlife communities than any other in Montana (MFWP 2005). The relatively low precipitation in the Bitterroot Valley prohibits the establishment of expansive areas of densely wooded or herbaceous wetland vegetation communities. Consequently, the distribution of woody or wetland-type species is restricted to areas of greater soil moisture—primarily sites next to the Bitterroot River and in floodplain drainages and depressions (Heitmeyer et al. 2010).

Historically, vegetation in the Bitterroot River floodplain on the Lee Metcalf Refuge included seven distinct habitat and community types: (1) riverfront-type forest, (2) floodplain gallery-type forest, (3) persistent emergent wetland, (4) wet meadow herbaceous, (5) floodplain and terrace grassland, (6) saline grassland, and (7) grassland-sagebrush. Figure 18 is a composite model of potential historical vegetation communities present on the refuge prior to significant alteration and development beginning in the late 1800s; community identification was made on the basis of HGM attributes (table 6).

The Bitterroot River floodplain at the refuge historically supported a wide diversity of vertebrate and invertebrate animal species associated with the interspersed riparian woodlands, floodplain wetland, and grassland habitats (appendix E). Resources used by animal species were seasonally dynamic and also annually variable depending on long-term climate and riverflow and flooding patterns. In the refuge region, most bird species exploited seasonal resources during migration and in the summer, but a few species overwintered in the area. Many waterbirds likely stayed in the Bitterroot Valley during wet summers to breed when floodplain wetlands had more extensive and prolonged water regimes. In contrast, limited numbers of species and individuals probably bred in the valley during dry years. In the years when wet springs combined with carryover water in the fall, larger numbers of waterbirds would stopover in the valley during fall migration. In average or dry years, however, little wetland habitat would have been available in fall except in historical river channels. Cold winter temperatures freeze most wetlands in the floodplain, but the river and a few springs remain open throughout winter in most years and provided sanctuary, loafing, and some foraging resources for some species. Amphibian and reptile annual emergence and life cycle events coincided with spring thaw and flooding and the availability of key arthropod and other prey species. Larger mammals moved in and out of the floodplain to forage and take advantage of cover during winter and in other seasons when nutritious grassland forage and prey were present.

Figure 19 shows the 2,800 acres of habitat and vegetation communities that exist today. Historical vegetation communities have changed over time due

Table 6. Hydrogeomorphic matrix of historical distribution of vegetation communities and habitat types on Lee Metcalf National Wildlife Refuge.

Habitat type	*Geomorphic surface*[1]	*Soil type*	*Flood frequency*[2]
Riverfront forest	Qal, Qaty	Riverside, Riverwash, Chamokane gravelly-sand, sand, fine sand-loam	1YR–I
Gallery forest	Qal	Chamokane loam and loamy sand	2–5YR
Robust emergent–shrub or scrub	Qal	Slocum poorly drained loam	1YR–P
Wet meadow	Qal	Slocum deep loams	2–5YR
Grassland	Qal, Qafy	Corvallis, Hamilton, Grantsdale silt loam	>5YR
Grassland-saline	Qal	Corvallis saline silt loam	>5YR
Grassland-sage	Qafy	Lone Rock mixed erosional alluvial fan	>10YR

[1] *Qal = Quaternary alluvial deposits, Qafy = Quaternary younger alluvial fan and outwash terrace complex, Qaty = late Riverside and Hamilton terraces.*

[2] *1YR–I = annually flooded for intermittent periods, primarily during high water periods of the Bitterroot River; 2–5YR = surface inundation at a 2- to 5-year recurrence interval; 1YR–P = annually flooded primarily for most of the year; >5YR = surface inundation at a greater than 5-year recurrence interval; >10YR = surface inundation rare except for lower elevations during extreme flood events.*

Source: Heitmeyer et al. 2010.

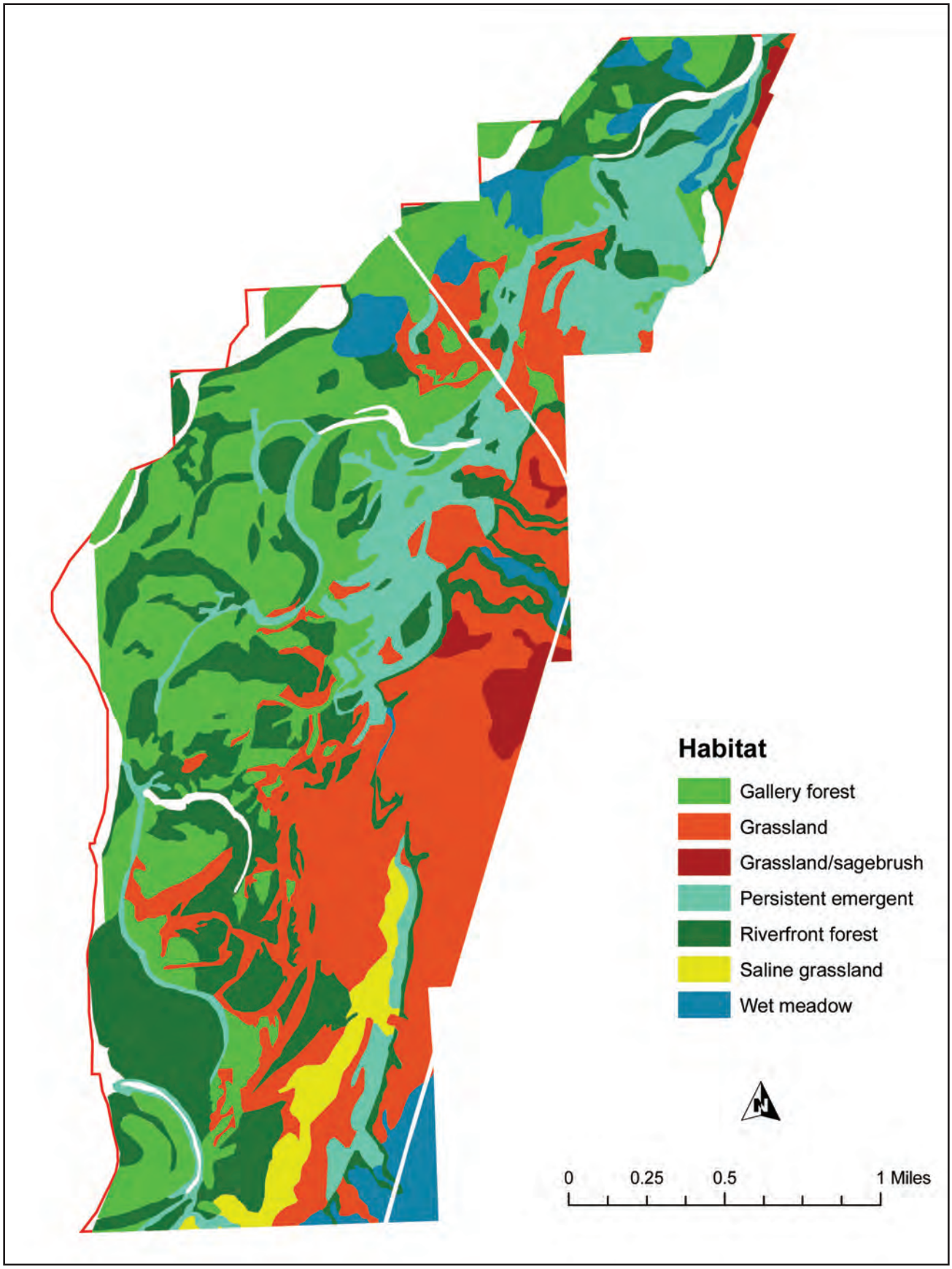


Figure 18. Hydrogeomorphic-derived map of potential vegetation communities on Lee Metcalf National Wildlife Refuge prior to European settlement in the mid-1800s (Heitmeyer et al. 2010).

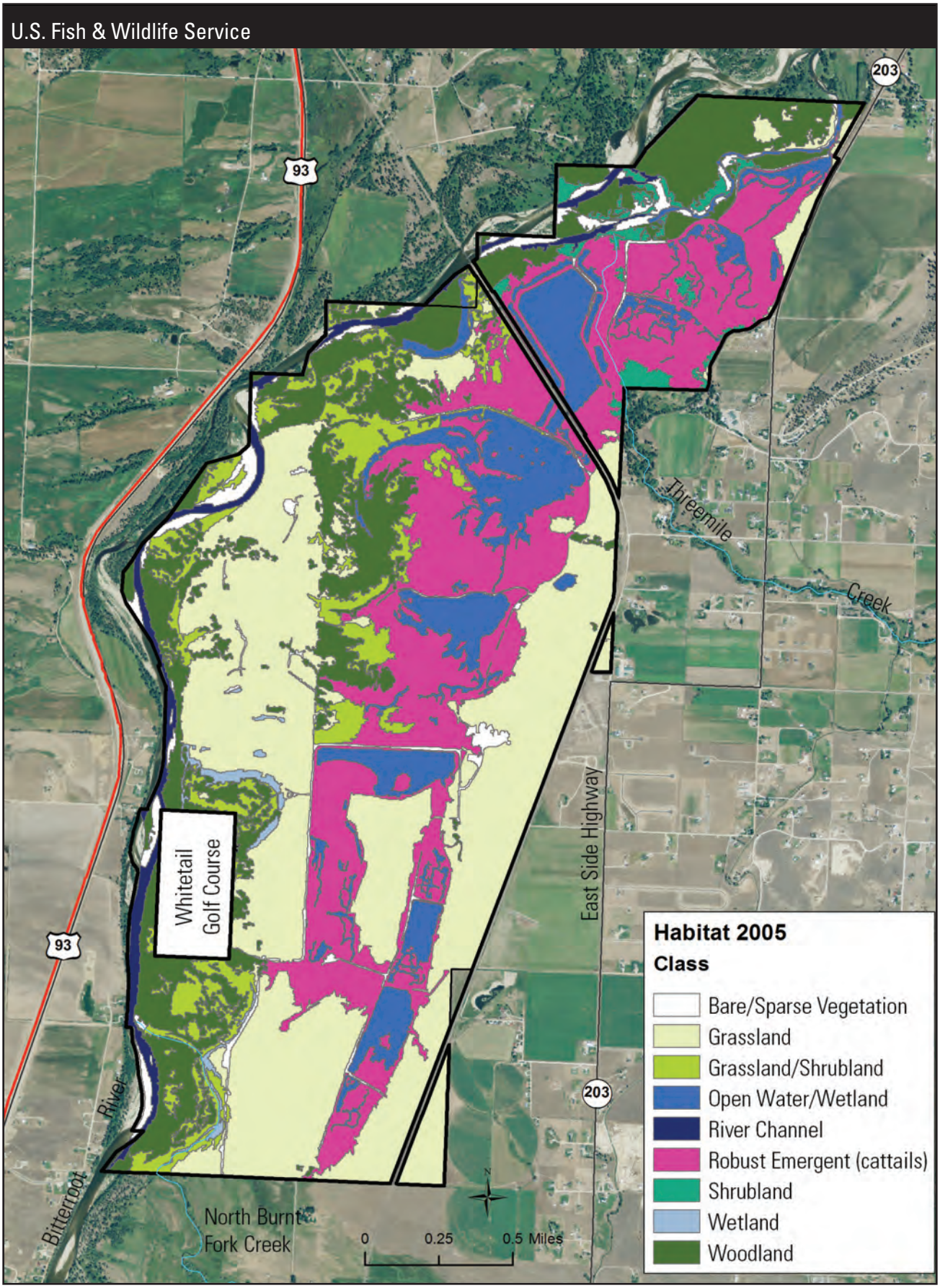


Figure 19. Existing habitat and vegetation communities on Lee Metcalf National Wildlife Refuge, Montana.

to past and present land uses, including agriculture and the creation of wetland impoundments. The existing habitat and community types present today are described below in three different vegetation communities: (1) uplands, (2) riparian, and (3) wetland impoundments.

Migratory birds are especially abundant on the refuge during fall and spring migration. More than 260 species of birds are present in the Bitterroot River watershed, and 242 species have been documented on the refuge (USFWS, unpublished refuge files), including grebes, bitterns, herons, egrets, waterfowl, raptors, shorebirds, flycatchers, swallows, chickadees, warblers, wrens, sparrows, and blackbirds. Additionally, many bird species nest in forest, wetland, and grassland areas; the most common species are ducks, warblers, flycatchers, swallows, blackbirds, sparrows, wading birds, and raptors.

More than 40 mammal species also are present in the refuge. Some of the more common species include white-tailed deer, yellow-bellied marmot, yellow-pine chipmunk, northern pocket gopher, meadow vole, porcupine, striped skunk, muskrat, American beaver, mink, and raccoon. At least eight species of reptiles and amphibians commonly use the refuge including three snakes, one turtle, two frogs, one toad, and one salamander. Several species of native fish historically were present in the Bitterroot River, and many moved into floodplain drainages, oxbows, and wetlands during high flow periods. Native species include mountain whitefish, northern pikeminnow, large scale sucker, longnose sucker, and redside shiner. Presently several nonnative fish are also present in refuge impoundments, including, but not limited to, largemouth bass, yellow perch, and brown and rainbow trout.

Habitat modifications since establishment

Following establishment, the refuge began physical developments on floodplain lands in the mid-1960s, with the purpose of creating wetland habitat for waterfowl and other waterbirds. By the late 1980s, 14 impoundments (or ponds) encompassing more than 1,000 acres had been created (figure 7).

The following list encompasses major wetland management and development activities on refuge lands from 1963 through the early 1990s, according to refuge annual narratives (USFWS 1988–1993) and as summarized in Heitmeyer et al. (2010):

- Lee Metcalf National Wildlife Refuge was authorized by Migratory Bird Conservation Commission on December 10, 1963.
- The first parcel was purchased in February 1964.
- In the mid-1960s, evidence revealed that the west Barn Slough area, a pre-refuge diversion structure, was sending water through the McPherson and Nickerson Creeks (now Ditches).
- Ponds 1–4 were completed in the summer of 1966 (refuge files). By 1970, Pond 5 was impounded by forming the existing county road into a levee. Ponds 6, 8, and 10 were constructed between 1967 and 1970, judging from photos from this period.
- In the mid-1960s, no dikes or structures existed on Francois Slough and North Burnt Fork Creek was unimpeded on the refuge. By 1970, three water control structures were constructed on these waterways, and they remain in place today.
- Ponds 11–13 were built between 1970 and 1973, as refuge photos show the north ponds in the flood of 1974. Pond E, which was a small impoundment on Rogmans Creek near Pond 11, was likely built around the same time. Pond E was expanded by the creation of Otter Pond in 1989.
- As part of the Montana Power Company mitigation project in the early 1970s, artificial ponds were built on the refuge just south of the area now occupied by Potato Cellar Pond. Within a few years these ponds were washed out by floods causing them to go dry.
- In the early 1980s, the refuge focused on Three Mile Creek sedimentation issues. This creek flowed into Pond 11 and out through Pond 13 to the river. Two supply ditches were cleaned out in 1985. Ultimately, a bypass channel with three sediment ponds was constructed in 1984 to lead the creek directly to the river.
- By July 1988, the Pair Ponds were established as part of a rehabilitation project by the Montana Power Company. Pair Ponds comprise 10 acres and are up to 3 feet deep in some areas.
- Otter Pond was built in 1989 as a solution to the sedimentation of the northern ponds from Three Mile Creek. An 18-inch diameter siphon was constructed to bring water from Pond 10 under Three Mile Creek bypass to supply water to Ponds 11, 12, and 13. This expanded the existing Pond E to about 65 surface acres.
- In the early 1990s, ditch leveling was completed in Swamp Creek and Ponds 1, 3, 4, 11, and 12.

These wetland impoundments were developed using levees to back water up drainages and depressional areas. Because of river channelization, development, and wetland loss, the refuge currently manages more than 20 percent of all palustrine wetlands present in the Bitterroot Valley (Kudray and Schemm 2008). Water control structures that significantly alter the direction and amount of surface water flow in natural drainages have been constructed on Rogmans Creek, Barn Slough, and Francois Slough/North Burnt Fork

Creek. Three Mile Creek was re-routed because of sedimentation in ponds. Wetland impoundments have been managed by diverting irrigation and tile drain water (that is, excess water drained from agricultural subsurfaces), flows in minor channels and tributaries, and Three Mile Creek water into and through the impoundments.

Water that enters or can be diverted to the refuge comes from multiple points of diversion (PODs). Certain sources, such as the South Lateral Ditch and Middle Lateral Ditch, supply private property in addition to the refuge. Tile drain water also enters the refuge from open tile drains or ditches from surrounding private lands. The refuge receives nutrient-rich water from these drains, and during summer months this water has abundant algal growth. Most water enters managed wetland impoundments from the south end of the refuge and sequentially is routed via gravity flow through Ponds 1–13. However, the variability of water sources often results in variable amounts and timing of available water for individual ponds. For example, water from the South Lateral Ditch can be moved by gravity flow into all refuge ponds, whereas water from Rogmans Creek can only be used for Ponds 2–13. The Spring Creek POD (outlet of Pond 10) flows under the railroad tracks into Otter Pond and is then siphoned under Three Mile Creek to feed Ponds 11, 12, and 13. Currently, Three Mile Creek contains high sediment loading that, when diverted into impoundments, precipitates out. Three Mile Creek is currently directed via a bypass channel to what is now North Island Slough.

Since refuge establishment, most wetland impoundments have been managed to promote waterfowl production by holding water through summer or year-round and occasionally draining areas for vegetation management using tillage, grazing, and burning (USFWS 1988–1993). Otter Pond was stocked with warm-water fish in 1989 to provide both prey for nesting osprey and limited public fishing opportunities. Other wetland developments included construction of a siphon to move water; level-ditching in Swamp Creek and Ponds 1, 3, 4, 11, and 12; pool construction near Potato Cellar Pond; and sediment removal in Three Mile Creek. Ephemeral ponds also resulted from the excavation of gravel pits.

Certain upland areas were converted to warm- or cool-season grasses for dense nesting cover for waterfowl (figure 20), and two predator-exclusion fences were built around some fields and a levee. From the 1960s through the early 1980s, some higher elevation fields on the refuge were used for small grain production.

In 1971, the refuge contracted the placement of riprap material along 1,250 feet of the east bank of the Bitterroot River west of McPherson Ditch (USFWS 1988–1993). This riprap was subsequently eroded and moved by high riverflows; by 1984 the riprap was gone, and the bank at this location was moving eastward. Since the mid-1990s, levees built along the Bitterroot River, including the area where the riprap was placed in 1971, have eroded and been at least partly breached in places as the Bitterroot River attempts to move laterally (figure 17). Also, the Bitterroot River appears to be moving more discharge through the North Island Slough area immediately north of Otter Pond on the north side of the refuge. These river movements could potentially affect the north Otter Pond levee; cause water movement across other floodplain areas on the refuge; and affect other structures, roads, and the railroad bed.

More than 18 miles of roads are present on the refuge along with five buildings, three trails, two education shelters, and an amphitheater. Seven residences and several outbuildings have been removed over time.

Changes to the Vegetation Communities

Collectively, the many landscape and hydrological changes in the Bitterroot Valley since the presettlement period have dramatically altered the physical nature, hydrology, and vegetation communities of the Lee Metcalf Refuge. Prior to Euro-American settlement, the relatively dry climate of the valley and the traveling nature of the Bitterroot River created a heterogeneous mix of communities: riverfront and gallery forest next to the Bitterroot River and floodplain drainages, persistent emergent wetland communities along floodplain drainages and fluvial-created depressions, wet meadow habitats, and grassland and sagebrush communities on higher elevation terraces and alluvial fans (figure 18). This community matrix was maintained by:

- periodic overbank flooding of the Bitterroot River that inundated much of the floodplain for relatively short periods in spring;
- regular backwater flooding of the Bitterroot River up tributaries and floodplain secondary channels into floodplain wetland depressions;
- annual spring discharge of water from tributaries, sheet flow across terraces and alluvial fans, and seep and spring discharge from mountain slopes and terraces;
- frequent burning of the grasslands and shrublands (primarily by Native Americans) that may have led to frequent, low-intensity fires in the adjacent ponderosa pine forest (Arno 1980) that, when combined with grazing, recycled nutrients and established germination and regeneration sites for specific plant species.

Each of these primary ecological processes at the refuge has been systemically altered:

- Water diversions, channel constriction, and river channel modification have reduced overbank flooding and restricted floodplain connectivity. Fewer

Bob Danley/USFWS

Figure 20. Field planted as dense nesting cover on Lee Metcalf National Wildlife Refuge, Montana.

extensive overbank events now occur, but lateral movement and bank erosion of the Bitterroot River have been accelerated in this river stretch.

- The above changes, some of which have occurred upstream of the refuge, have restricted backwater flow from the Bitterroot River into its floodplain and tributaries, and floodplain secondary channels have been ditched, diverted, dammed, and impounded.
- Waterflow across the floodplain has been altered by extraction and diversion of water from drainages prior to reaching the floodplain. Sheet flow across terraces and alluvial fans is almost completely eliminated, and ground water aquifers and discharge from seeps and springs are changed, usually by reduction from presettlement times.
- Wildfires have been eliminated or greatly reduced.

In addition to changes in the primary ecological processes of the Bitterroot Valley ecosystem on the refuge, the local and regional landforms and vegetation communities have been negatively affected by many alterations to topography, drainages, clearing, conversion to various agricultural crops or livestock forage, extensive grazing by cattle and sheep, sedimentation, expansion of nonnative plants, and recent urban expansion. Vegetation changes are documented in aerial photographs from the 1940s to the present (figures 5 and 10). Collectively, the system now has:

- reduced areas of riverfront and gallery forest;
- fewer wet meadows;
- increased areas of persistent emergent and open-water habitat;
- increased areas of herbaceous wetland vegetation;
- fewer native grassland communities;
- more agricultural and tame grass fields;
- increased presence of invasive and exotic plant species.

Invasions of sulfur cinquefoil, Dalmatian toadflax, leafy spurge, spotted knapweed, Canada and musk thistle, houndstongue, St. Johnswort, and yellow flag iris are present in many areas on the refuge (Kudray and Schemm 2008, Lee Metcalf Refuge unpublished data). Of the 32 currently considered noxious weeds in Montana, 15 species are present on the refuge. (Refer to "Invasive and Noxious Species" under section 2.6 for more detail).

Changes to Fish and Wildlife Populations

The many ecological and community changes to the Lee Metcalf Refuge ecosystem have corresponding effects on fish and wildlife populations using the area. Unfortunately, few quantitative data are available on animal use of the area during historical times, but correlations of species occurrences with specific habitat types can indicate relative abundance for at least some groups. Apparently, waterbirds and other wetland associated birds increased in number and seasonal occurrence on the refuge at least during the 1970s and 1980s after wetland impoundments were built and managed for more prolonged water regimes during summer and fall. Peak numbers of dabbling and diving ducks, shorebirds, and wading birds on the refuge collectively exceeded 20,000, especially during spring and fall migrations in some years in the 1970s and 1980s; now, they seldom exceed 5,000 (USFWS 1988–1993). One contributing factor may be the conversion of grain

fields surrounding the refuge to housing developments. Production of ducks on the refuge also reached 10,000 in some years during the 1970s and 1980s, but now annual production typically is less than 1,000 ducklings (unpublished refuge data). Populations of other birds associated with more permanently flooded wetlands including osprey and certain passerines also apparently increased 20–30 years after wetland impoundments were built, but now these populations are declining. For example, osprey production on the refuge reached a peak of forty young in 1988, but it has declined since (figure 21). Concerns about mercury contamination of osprey eggs and young relate to the consumption of warm-water fish stocked in Otter Pond and high mercury levels in other refuge impoundments and regional waters. Mercury concentrations in fish (mainly largemouth bass) on the refuge average more than 0.1 milligram per kilogram wet weight for 14- to 22-inch size classes (figure 22).

Some data suggest declines in animals using riparian forest, grassland/sagebrush communities, and floodplain channels and tributaries to the Bitterroot River (Brandt 2000, U.S. Fish and Wildlife Service, unpublished refuge inventories). Reduction of riparian forest habitat has meant less foraging, nesting, loafing, and stopover habitat for many passerine birds, raptors, and native resident species. Additionally, conversion of native grassland to pasture, hayland, and agricultural crops has reduced resources for many birds, mammals, and amphibians. While the Bitterroot River and its floodplain did not historically support a large diversity of native fishes, many species were highly abundant and widely distributed, especially when overbank and backwater floods occurred. Distribution is now restricted to primary channels of the Bitterroot River and impoundments or ponds (Brandt 2000). The Federally listed threatened native bull trout is now rarely found in the river (Chris Clancy, fisheries biologist, MFWP, personal communication, October 2011) but historically occurred in North Burnt Fork Creek. The bull trout is now restricted to the upper reaches of this creek on U.S. Forest Service land because of dammed and diverted waterflows, sedimentation, and increased water temperatures in the creek and the impounded Francois Slough area on the refuge (Stringer 2009); heavy irrigation modifications upstream of the refuge have also contributed to the decline of this species.

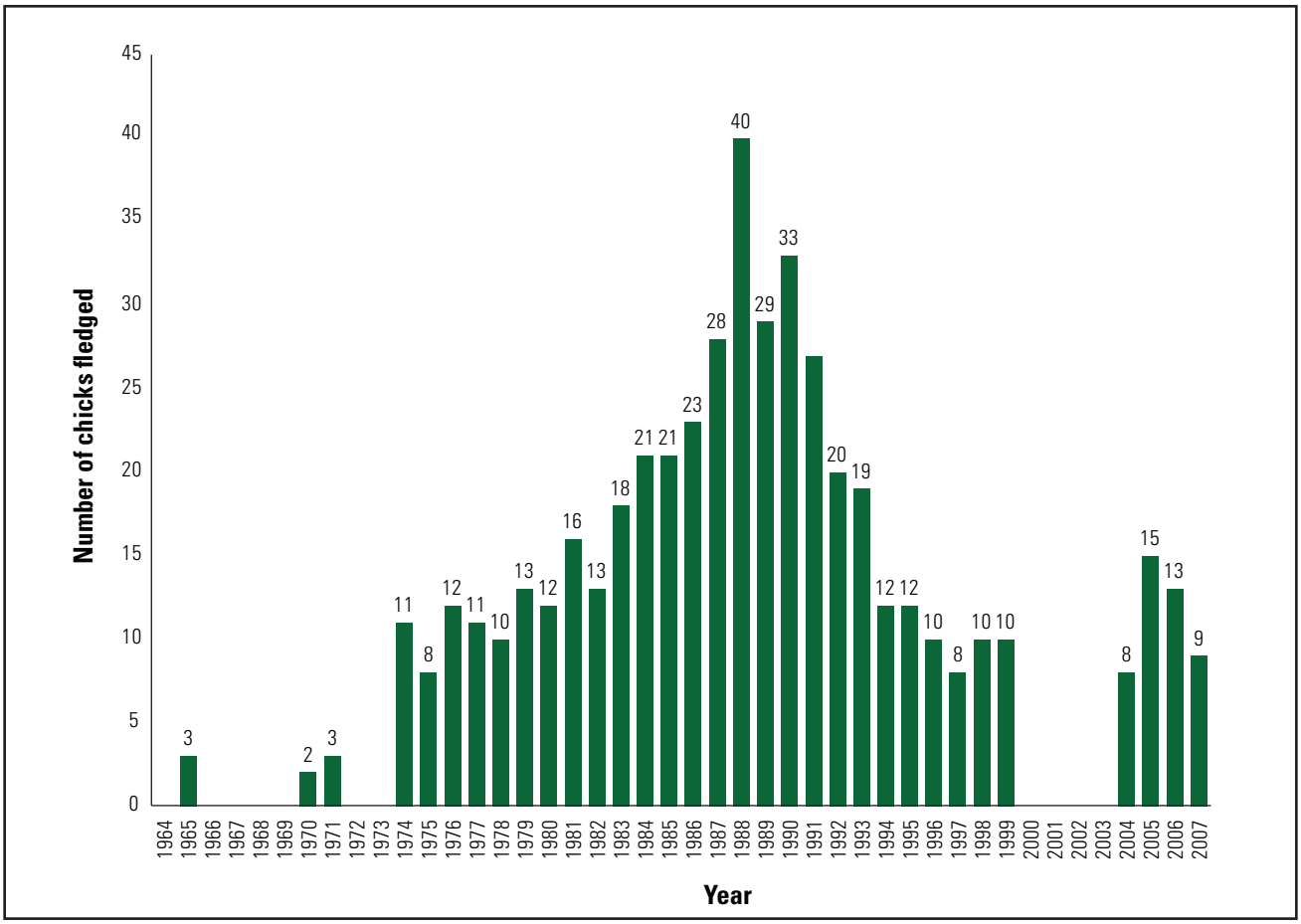


Figure 21. Osprey production on Lee Metcalf National Wildlife Refuge, Montana, 1964–2007.

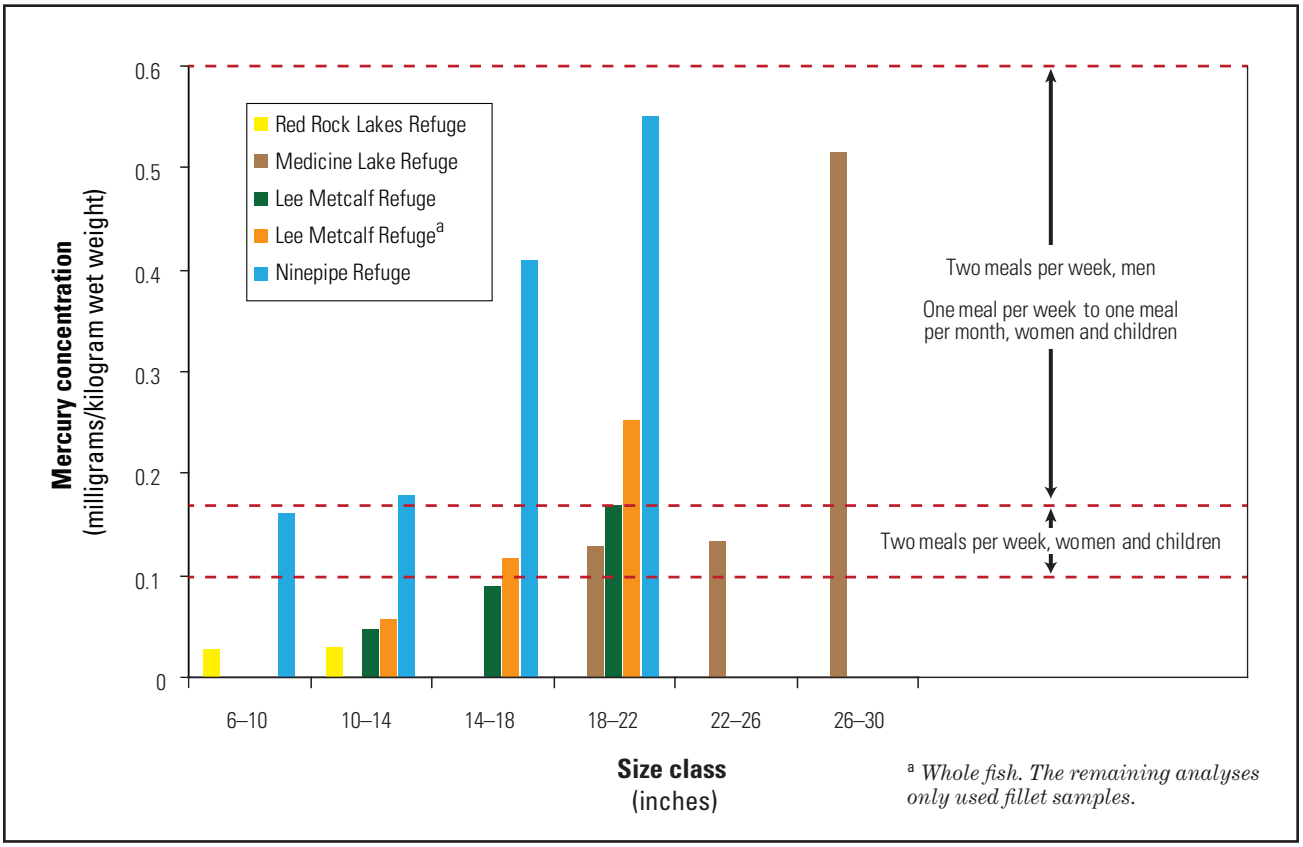


Figure 22. Mercury concentration in fish from Montana refuges (Heitmeyer et al. 2010).

Upland Habitat

The Lee Metcalf Refuge's 1,186 acres of uplands consist of floodplain and terrace grasslands, grassland/shrublands, and shrublands. These communities are defined as having grassland and shrubland species considered facultative or obligate and that usually occur in nonwetland habitats. Historical documents suggest that most higher elevations within the refuge's floodplain region were covered with grasses and some scattered shrubs (Eckmann and Harrington 1917, Cappious 1939, Popham 1998). Sites with occasional surface flooding contained more wet meadow or grassland communities interspersed with wetland herbaceous plants (like smartweed), while higher floodplain terraces, slopes, and alluvial fans included both wetland and upland-type grasses (like needle and thread and Junegrass) and shrubs (like rabbit brush and sage). Most floodplain grassland areas have Corvallis, Hamilton, and Grantsdale silt loam and loam soils. Certain small sites in the refuge have saline soils that could have supported more salt-tolerant species. Larger alluvial fans, such as those near Three Mile Creek, are present on "Qafy" surfaces with Lone Rock mixed erosion soils, and these sites historically had a mixed grassland-sagebrush community (for example, Clary et al. 2005).

The uplands in the valley have historically been disturbed by a variety of land uses since Euro-American settlement in 1841. In 1872 Peter Whaley broke the first sod on what would become the refuge. The primary land use was cattle grazing and, later, agricultural crops (vegetables and grains). Once the refuge was established, the uplands were still disturbed by grazing, farming, haying, and other land practices. Eventually, these grazed and farmed areas were retired and seeded with tame grasses without reseeding of native plant species. These practices greatly altered the land, decreasing overall habitat and animal diversity and increasing the presence of invasive plant species (Graham 2009). Most wet meadows have disappeared, and potential saline grasslands are now mostly thistle and wheatgrass. Historical grassy upland terraces no longer contain substantial amounts of native grass or shrubland species. Invasive and other nonnative species now dominate more than 80 percent of refuge uplands. Dominant species now found in those areas include, but are not limited to, cheatgrass, smooth brome, common tansy, mustard species, spotted knapweed, and musk and Canada thistle.

Characteristic Wildlife

Small mammals like the Columbian ground squirrel, meadow vole, and the American deer mouse make up the majority of the wildlife on the refuge. As uplands

are dominated by invasive and other nonnative species, wildlife value is diminished and does not provide high-quality migratory bird habitat for nesting and cover from predators. Due to the presence of these small mammals, these areas do provide some feeding opportunities for great blue herons and raptors including red-tailed hawk, rough-legged hawk, American kestrel, and prairie falcon. Sandhill cranes have also been seen foraging in these fields.

Other mammal species include the striped skunk and American badger. Uplands also provide browsing opportunities for white-tailed deer and support predators such as coyote and red fox. Common reptile species include the terrestrial garter snake and the common garter snake.

Riparian habitat

The Bitterroot Valley is bisected by the Bitterroot River, which originates in the Anaconda-Pintler Wilderness and the Bitterroot Mountains and flows north to empty into the Clark Fork River near Missoula. Immediately alongside the river are riparian habitats consisting of woodlands (riverfront and gallery forest) and wetlands.

The Bitterroot River is characterized by constantly shifting stream channels through the riparian habitat. This habitat provides some of the most productive wildlife habitat in the State and is a home to a wide variety of birds, mammals, reptiles, and amphibians (MFWP 2005). According to the Bitterroot Audubon Society, the Lee Metcalf Refuge is a cornerstone of the Bitterroot Important Bird Area: it is the place where all key valley habitats come together and provide bird species richness (Sherry Ritter, Chair of the Important Bird Area Committee, Bitterroot Audubon Society, Montana; email; August 14, 2010).

The riparian habitat also includes wetlands in low elevation oxbows, depressions, and tributary off-channel areas that contain more permanent water regimes and support water-tolerant wetland vegetation species edged by persistent emergent species such as cattail. Certain low elevation sites with extended water regimes may have been periodically created by beaver activity and then abandoned during dry periods (Kudrey and Schemm 2008).

Riparian Woodlands (Riverfront and Gallery Forests)

The riparian woodlands of the refuge consist of 483 acres of riverfront and gallery forest. Each community has different vegetation and succession requirements.

Riverfront forest includes early successional species such as black cottonwood and sandbar willow characterized by very little, if any, understory. Wood's rose, fescue, and wheatgrass species may be present. This vegetation is present on newly deposited and scoured gravelly-sand, sand, and fine sandy-loams near the active channel of the Bitterroot River and in sand outcrop sites next to floodplain drainages. These sites have high water tables for most of the year and are inundated for short periods during high spring riverflows almost annually. Regularly scoured soils provide bare soil sites for seed deposition and subsequent germination and growth of willow and cottonwood (Cooper et al. 1999).

The riverfront forest lies alongside the Bitterroot River, running south to north within the boundary of the refuge. In some places, the riverfront forest occupies both sides of the river; in others, the riverfront forest occupies only the eastern side, primarily due to land clearing on the western side for other uses. Upstream development and riprap efforts along the river have caused substantial erosion, which has in turn resulted in the loss of riverfront forest in several areas in the refuge.

Gallery forest is located mostly on the western portion of the refuge, west of the river as well as east of the river, between the riverfront forest and the wetland impoundments. This habitat is more closely associated with backwater and overbank flooding than with drier upland conditions. Dominated by mature black cottonwood and ponderosa pine, it is found on higher floodplain elevations with layers of Chamokane loams over underlying sands along natural levees and point bar terraces next to minor floodplain tributaries. Indicator tree and shrubs species for gallery forest include ponderosa pine with black cottonwood along with an understory of large woody shrubs such as thin-leaved alder, river hawthorn, red osier dogwood, and Wood's rose. There may also be mixed grasses such as bluebunch and fescue under and between trees and shrubs. Historically, gallery forests were flooded by occasional overbank or high backwater floods from the Bitterroot River and secondary floodplain channels. When flooding did occur, it was for short durations during spring. Fire and grazing by native ungulates probably sustained the savanna nature of these sites and encouraged a mix of grass, shrubs, and overstory trees (Fischer and Bradley 1987).

Riparian Wetlands

The wetland component of the refuge's riparian habitat community is 20 acres of oxbows, sloughs, remnants of former gravel pits and creeks—specifically, Barn Slough, Oxbow, North Island Slough, Francois Slough, North Burnt Fork Creek, and Three Mile Creek. These wetlands are interspersed in the southern portion of the refuge with the exception of Three Mile Creek, Oxbow and North Island Slough, which are in the north. A bypass was constructed in the early 1980s to channel Three Mile Creek directly to the Bitterroot River to end sediment buildup in the open-water impoundments. Waterflow in some of these sloughs and creeks varies seasonally according to spring rainfall,

upstream irrigation use, and the upstream snowpack and the rate at which it melts.

Barn Slough is fed by natural springs; North Island Slough was created by the migration of the Bitterroot River and is now becoming a more established river channel. Oxbow was the river channel in the mid-1950s but was closed at both ends when the river moved back north. North Burnt Fork Creek and Three Mile Creek originate in the Sapphire Mountains and flow westward down the valley slope, ending at the Bitterroot River on the refuge. North Burnt Fork Creek feeds Francois Slough, which then empties into the river. Dominant vegetation in these riparian habitats consists of alder willow, snowberry, horsetail, various sedges, and rushes.

Characteristic Wildlife

Riverfront woodlands and wetlands provide important nesting, foraging, and stopover habitat for many birds. These include neotropical songbirds such as least flycatcher, yellow warbler, Vaux's swift, and Lewis's woodpecker, and waterbirds such as common merganser and wood duck. Riverfront forest is also important for nesting and perching sites for large raptors such as bald eagles and osprey. There is at least one known eagle nest on the refuge, and trees and numerous nesting platforms provide desirable nesting sites for osprey. The most common reptiles are garter snakes. Mammals that use the riverfront forest include the northern river otter, white-tailed deer, raccoon, beaver, muskrat, and the yellow-pine chipmunk.

As the gallery forest is found upslope from the riverfront corridor, many of the same bird species found in the riverfront forest—including Lewis's woodpecker, Vaux's swift, and wood duck—are present in the gallery forest, along with the red-naped sapsucker and brown creeper. These last two species rely on the mature trees found in the gallery forest for feeding and nesting. Yellow warbler, least flycatcher, and MacGillivray's warbler feed and nest in the understory of the forest. Some mammals include the red-squirrel, raccoon, white-tailed deer, porcupine, yellow-bellied marmot, red fox, and coyote. There are eleven bat species found on the refuge (appendix E), all of which depend on the gallery forest for various stages of their life cycles. Of these 11 species, 3 of them are State species of concern including Townsend's big-eared bat, hoary bat, and fringed myotis.

Throughout the riparian woodlands are various wetland types including ephemeral pools, sloughs, and remnants of former gravel pits which provide breeding grounds for amphibians such as the long-toed salamander and the boreal toad, a State species of concern. Documented fish species include both native fish (pike minnow and longnose sucker) and nonnative fish (largemouth bass, pumpkinseed, and brook and brown trout). Native beavers and Columbia spotted frogs and nonnative American bullfrogs also inhabit these wetlands.

The Service designated North Burnt Fork Creek as critical habitat for bull trout in October 2010. Historically, bull trout used North Burnt Fork Creek as a passageway to return to their spawning grounds in the headwaters in the Sapphire Mountains where populations are still viable. This no longer occurs. The refuge installed several structures along the refuge portion of the creek in an effort to create more pond-like habitat for waterfowl and warm-water fish (providing more fishing opportunities in the public area). Off-refuge, along the creek, ditching and irrigation occurred on private land. These actions resulted in a loss of stream habitat and fish passage for the federally listed bull trout (listed as threatened in 1994). Fish occupying the creek still consist of native species including minnows, suckers, and whitefish. Nonnative species such as brown and brook trout and pumpkinseed also use the stream (unpublished refuge files: Fish Trap Data 2009).

Wetland impoundment habitat

Wetland habitat on the refuge, other than that described above, consists of wetland impoundments and their surrounding areas. Wetland impoundments were created throughout the refuge to provide wetland habitat for migratory birds, particularly waterfowl. Levees were constructed, and water control structures were installed. A number of impoundments were semi-permanently flooded, constituting the largest area of open water in the Bitterroot Valley. The refuge now manages many impoundments for migratory birds by seasonally drying them to increase their productivity. Water to flood the impoundments is provided by natural springs, tile drains, creeks, and irrigation ditches.

The impoundments have areas of open water with mudflat edges and are surrounded and interspersed with submergent and emergent vegetation. Submergent flowering aquatic vegetation in many areas of the open water includes northern water milfoil, hornwort, and Richardson and Sago pondweed. Emergent vegetation includes, water smartweed, cattail, and various species of rushes and sedges. The combination of these and similar vegetative species is often referred to as persistent/robust emergent habitat, and it provides cover and nesting opportunities for American bitterns, rails, wrens, blackbirds, and waterfowl. However, if left unmanaged, emergent vegetation such as cattail can grow into a monoculture and leave little edge, outcompeting other emergent vegetation and reducing the amount of open water.

Characteristic Wildlife

The wetland impoundments and surrounding emergent vegetation make up 958 acres of the refuge. These impoundments provide stopover habitat for

migrant waterbirds including waterfowl species such as mallard; gadwall; Northern pintail and shoveler; cinnamon, green-winged, and blue-winged teal; and wood, redhead, and ruddy duck. Other waterbirds documented on these impoundments includes six species of grebe, American white pelican, white-faced ibis, and occasionally a great egret. Both trumpeter and tundra swans stopover at the refuge, and bitterns are sometimes seen hiding amongst the cattail. When extensive mudflats are present, migrant shorebirds such as least sandpiper, semipalmated plover, American avocet, black-necked stilt, dowitcher, and yellowleg are seen feeding in these areas. Double-crested cormorants can usually be found in the north ponds and have historically nested over water in dead trees. Abundant yellow-headed and red-winged blackbirds can be found nesting in the summer among the cattails along with marsh wren, sora, and Virginia rail.

Remaining refuge acres

Habitats that do not fall in the above categories include 63 acres of the Bitterroot River channel and 90 acres of bare or sparse vegetation that includes gravel bars, parking lots, roads, and facilities.

Invasive species

Nonnative species are prolific on the refuge, displacing native plants and affecting more than 70 percent of refuge lands as a result of alterations to topography, drainages, clearing, conversion to various agricultural crops or livestock forage, extensive grazing by cattle and sheep, and sedimentation pre- and post-establishment of the refuge. Many of the species are transported to the refuge as "hitchhikers" on vehicles, pedestrians, and animals. Wildfowl Lane, a county road that bisects the refuge, is used by more than 143,000 visitors annually in vehicles from all over the country. These factors have contributed to the introduction and distribution of invasive species, as have the surrounding development, landscape level invasive species in western Montana, the vulnerable exposed soil on the refuge (from wetland habitat construction and prior agricultural uses), and the locations of the Bitterroot River, the railroad bed, Highway 93, and Eastside Highway.

The State of Montana has 32 plant species on the Montana Noxious Weed List, 15 of which are found on the refuge in various degrees of infestation. During the past several years, new invaders (hoary alyssum, Dalmatian toadflax, and blueweed) have been detected. These species rank as high priority species for early detection and rapid response treatment. Some species, while not considered noxious by the State of Montana, are considered undesirable and problematic by refuge staff; these include musk thistle, cheatgrass, kochia, reed canarygrass, and teasel (table 7).

The refuge has a number of resources to respond to the invasive species problem. The refuge provides office space and other support for one of the Service's Montana Invasive Species Strike Teams. This team works with refuges throughout the State, including Lee Metcalf Refuge, inventorying and treating new invaders and high priority invasive and nonnative plants. Additionally, a partnership with the Ravalli County Weed District has provided several crew members wholly dedicated to treating more established noxious weeds. An annual volunteer weed-pull event for the public occurs, and youth groups like the Montana Conservation Corps, Youth Conservation Corps, and Selway-Bitterroot Foundation interns have also assisted in refuge treatment efforts. In addition, invasive species spread and control is integrated into staff fieldwork.

The main planning tool for treating invasives on the refuge is using integrated pest management (IPM). IPM is a structured and logical approach to managing weeds by using a combination of biological, mechanical, and chemical tools. Past IPM efforts have included mapping, treating, and monitoring invasive species on the refuge. Treatment methods for invasives vary with species, daily weather conditions, plant growth stage, and time of year. Methods used to treat invasives have included herbicide application, prescribed fire, biological controls (including goats, flower and root weevils, and flower and root moths), hand pulling, mowing, and cultivating. Along with prescribed burning and grazing, chemical applications of herbicides have significantly aided efforts to control the spread of invasive plant species and possibly the elimination of invasives from specific areas on the refuge. Chemical applications are used on specific species and applied during the optimal plant stage of growth to increase the effectiveness of the application. All chemicals must be approved by the Service for use on refuges, and the application of a specific chemical onsite must undergo a pesticide use proposal evaluation. Approximately 400 acres per year are treated for invasive plants, using chemical applications and mechanical means.

Wildlife diseases and contaminants

Several wildlife diseases have the potential in the near future to spread to the refuge from western Montana and neighboring states. Contaminants from surrounding residential development, historical mining activity, and atmospheric deposition also pose a threat.

Wildlife Diseases

Two common avian diseases have been documented near the refuge in very small numbers (less than 30 birds): aspergillosis and salmonellosis. Often fatal, aspergillosis is caused by birds ingesting or inhaling toxic fungi in contaminated feeds. Salmonellosis can also be fatal; it is caused by Salmonella bacterium that spreads

Table 7. Documented invasive and nonnative species on Lee Metcalf National Wildlife Refuge as of 2010 and the degree of infestation, priority for treatment, and State noxious status.

Common name	*Degree of infestation*	*Area of infestation or number of plants found*	*Priority for treatment*	*State noxious status*[1] *and comments*
Tall buttercup	Medium	0.23 acre[2]	High	Priority 2A—common in some areas, eliminate or contain
Yellowflag iris	Medium	0.82 acre[2]	High	Priority 2A
Blueweed	Low	Two plants found	High	Priority 2A
Hoary alyssum	Low	3.56 acres[2]	High	Priority 2A
Canada thistle	High	50 acres[3]	Medium	Priority 2B—abundant and widespread, eradication or containment where less abundant
Field bindweed	Low	1 acre	High	Priority 2B
Leafy spurge	Medium	7.51 acres[2]	High	Priority 2B
Spotted knapweed	High	6.64 acres[2]	Medium	Priority 2B
Dalmatian toadflax	Low	<5 plants	High	Priority 2B
St. Johnswort	Medium	15.2 acres[2]	Medium	Priority 2B
Sulfur cinquefoil	Low	0.06 acre[2]	High	Priority 2B
Common tansy	High	28.89 acres[2, 3]	Medium	Priority 2B
Oxeye daisy	Medium	6.43 acres[2]	Medium	Priority 2B
Houndstongue	High	48.33 acres[2, 3]	High	Priority 2B
Yellow toadflax	Medium	1.48 acres[2, 3]	Medium	Priority 2B
Cheatgrass	High	26.74 acres[2, 3]	Low	Priority 3—regulated plant with potential to have significant impacts, may not be intentionally spread or sold
Musk thistle	High	70 acres[3]	Medium	n/a
Italian bugloss	Medium	2.97 acres[2]	High	n/a
Teasel	Low	0.5 acre[3]	Medium	n/a
Kochia	High	7 acres[3]	Medium	n/a
Reed canarygrass	High	200 acres[3]	Low	n/a

1 *Sources: Montana Department of Agriculture 2010; U.S. Department of Agriculture 2010.*
2 *Estimated acreage of infestation (treated and untreated) within areas surveyed based on USFWS, Montana Invasive Species Strike Team 2009; additional infestations may occur within unsurveyed areas.*
3 *Acreage is estimated.*
Additional source: unpublished refuge data.

through (1) the air via bacteria shed from seed kernels or insects, (2) an infected organism's feather dust or feces, or (3) through other contact. While these are the only two diseases documented in this area, there may be impacts on the refuge in the future from unknown or emerging contaminants or diseases.

Highly pathogenic avian influenza has not yet been documented in North America, but because of the serious health risks to humans and domestic fowl, the Service has entered into an interagency agreement to develop an early detection system should this influenza migrate to the continent. Additionally, in 2006 the refuge completed a "Highly Pathogenic Avian Influenza Disease Contingency Plan." This plan will be reviewed annually and updated as new information becomes available.

Since 2006, the refuge has collaborated with MFWP to sample for avian influenza. More than 200 samples (obtained through cloacal and pharyngeal swabbing of hunter-killed ducks) were collected. All of these samples tested negative for highly pathogenic avian influenza. Another avian influenza testing effort was led by the University of California, Los Angeles and the Institute for Bird Populations. The goal of this project was to determine the pattern, distribution, and transmission of various strains of avian influenza between migratory and resident species. Neotropical migrants and resident passerines were sampled for avian influenza in 2007 and 2008 at the refuge bird banding station. No highly pathogenic avian influenza was documented in refuge birds.

Chronic wasting disease (CWD) is a transmissible spongiform encephalopathy that is found in deer and elk in North America. Spongiform encephalopathy is a progressive neurodegenerative disorder that produces changes in the brain and causes fatal chronic weight loss. The main theory of a causative agent is the abnormality of a group of proteins called prions. These prions infect the host and cause tissue damage in the brain, resulting in a "sponge-like" appearance. CWD is contagious and can be transmitted directly between animals through nose-to-nose contact and indirectly through shedding of infectious prions into the environment that are later ingested by healthy animals (U.S. Geological Survey, National Wildlife Health Center 2007). All 48 contiguous states have some form of CWD surveillance in place, and CWD has been found in Montana but only on deer game farms. It is anticipated that CWD will appear in wild populations because it is documented in the neighboring states of South Dakota and Wyoming. The refuge completed a "Chronic Wasting Disease Surveillance and Contingency Plan" in 2005. Beginning in 2014, this plan will be reviewed annually and updated as new information becomes available.

Contaminants

Concerns about links between mining-related contaminants in river sediment and their occurrence in nesting osprey prompted scientists to study the refuge and other areas throughout the Clark Fork River Basin (Langner et al. 2011). The refuge participated in this 3-year research project conducted between 2006 and 2009 by the University of Montana. The Bitterroot River was used as a control site, including the stretch alongside the refuge. The study tested mercury levels from several sources: river sediments, aquatic invertebrates, trout, and blood and feathers from osprey chicks. Osprey were chosen as subjects in this study as they are regarded as indicators of aquatic ecosystem health. Chicks were sampled because virtually all of their biomass grew from consumption of local fish, thus reflecting local environmental conditions.

One of the discoveries made during this study was that osprey chicks within and downstream of the refuge had elevated mercury levels. In the Lee Metcalf Refuge Bitterroot River reach, the mercury concentration of the fine-grain sediment is relatively low; nevertheless, the blood analysis showed elevated methylmercury levels in refuge osprey chicks. Methylmercury is extremely toxic, and it bioaccumulates—that is, increases in toxicity as it moves up the food chain. Methylation occurs when elemental mercury enters the water and is taken up by bacteria that convert it to methylmercury in anaerobic conditions (Langner et al. 2011). Many of the sampled chicks from the refuge were in nests alongside wetland impoundments. The wetland impoundments likely enhance methylation rates and mercury biomagnification within the aquatic food web (Langner 2011). Static water levels can create anaerobic conditions that promote methylation. The resulting methylmercury is moved through the food chain, eventually reaching osprey and other top predators such as otter. This could be a cause of the 20-year decline in chicks fledged on the refuge from a peak of 40 in 1988 to 9 in 2007 (figure 21). Alternatively, osprey populations may also be responding to availability of snags and appropriate habitat following wetland impoundment creation and then the maturing of these habitats. The study proposed that the source of this mercury is likely not from local mining but from atmospheric deposition (Langner et al. 2011).

Other contaminant concerns on the refuge are pharmaceuticals and nutrients (which enter the refuge ground water from the many subdivisions adjacent to the refuge), acid rain, and residual pesticides.

4.3 State and Federally Listed Species

The Service has not documented any current candidate or federally listed species under the Endangered Species Act using any lands or water within the Lee Metcalf Refuge. Many of the species found within the refuge have been designated as species of concern by MFWP and the Montana Natural Heritage Program (Montana Natural Heritage Program 2009) or as birds of conservation concern by the Service (USFWS 2008).

Species of Concern

According to the Montana Natural Heritage Program, species of concern are native animals breeding in Montana that are considered to be at risk due to their declining population trends, threats to their habitats, or restricted distribution (Montana Natural Heritage Program 2009). The Service identifies birds of conservation concern as migratory and nonmigratory birds of the United States and its territories that have

Jim Mogen/USFWS

Bull trout, a threatened species, are not found in refuge waters, but once crossed the refuge to spawning grounds.

declining populations, naturally or human-caused small ranges or population sizes, threats to their habitat, or other threats. Bird species considered for inclusion on this Federal list include non-gamebirds, gamebirds without hunting seasons, subsistence-hunted non-gamebirds in Alaska, birds that are candidates or proposed as threatened or endangered under the Endangered Species Act, and birds that recently have been removed from a Federal listing (USFWS 2008). Some of these Federal birds of conservation concern are not listed as State species of concern (for example, the horned grebe). This Federal species list covers the entire Northern Rockies, not just Montana; therefore, the species may not be imperiled in Montana and not warrant listing as a State species of concern. This designation helps stimulate coordinated and proactive conservation actions among Federal, State, tribal, and private partners.

A total of 42 wildlife State species of concern and 21 Federal birds of conservation concern have been found in the Bitterroot Valley (USFWS 2008). These wildlife species are identified on the State and/or Federal lists as species that require special attention to prevent them from becoming threatened or endangered. All but eight of these species have been documented using the refuge. There are also two plant species of concern found on or near the refuge, Guadalupe waternymph and shining flatsedge.

The State forest and grassland bird species of concern that have been recorded on Lee Metcalf Refuge are peregrine falcon, black swift, burrowing owl, great gray owl, Lewis's woodpecker, olive-sided flycatcher, Clark's nutcracker, loggerhead shrike, black-and-white warbler, LeConte's sparrow, and bobolink. There are also three documented mammal State species of concern on the refuge: hoary bat, fringed myotis, and Townsend's big eared bat. A damselfly, the boreal bluet, and an amphibian, the boreal toad, are also species of concern that have been recorded on the refuge.

Dave Menke/USFWS

Lewis's woodpecker has been documented on the refuge.

The State wetland bird species of concern that have been recorded on the refuge are common loon, American white pelican, American bittern, black-crowned night-heron, white-faced ibis, trumpeter swan, bald eagle, long-billed curlew, Franklin's gull, black tern, common tern, Caspian tern, and Forster's tern.

The bull trout is federally listed as threatened and historically used North Burnt Fork Creek, which traverses through the refuge, as passage to spawning grounds. Although it has not been documented on the refuge, there is a population off the refuge in the upper reaches of North Burnt Fork Creek in the Sapphire Mountains. On September 30, 2010, the Service designated 18,795 miles of streams and 488,252 acres of lakes and reservoirs in Idaho, Oregon, Washington, Montana, and Nevada as critical habitat for the wide-ranging native fish. The Bitterroot River and North Burnt Fork Creek are both located within this designated area. This designation and the status of the bull trout emphasize the need for coordination with other efforts to restore this critical habitat including special consideration in management of refuge resources.

Table 8 lists State species of concern and Federal birds of conservation concern that have been found in the Bitterroot Valley and on the refuge.

Table 8. Montana listed species of concern and Federal birds of conservation concern recorded in the Bitterroot Valley and on Lee Metcalf National Wildlife Refuge, Montana.

Species	*State species of concern*[1]	*Federal birds of conservation concern*[2]	*Recorded using the refuge*[3]
Boreal toad[4]	X	n/a	X
Trumpeter swan	X	—	X
Common loon	X	—	X
Horned grebe	—	X	X
Clark's grebe	X	—	X
American white pelican	X	—	X
American bittern[4]	X	X	X
Great blue heron	X	—	X
Black-crowned night-heron	X	—	X
Bald eagle	X	X	X

Table 8. Montana listed species of concern and Federal birds of conservation concern recorded in the Bitterroot Valley and on Lee Metcalf National Wildlife Refuge, Montana.

Species	*State species of concern*[1]	*Federal birds of conservation concern*[2]	*Recorded using the refuge*[3]
Northern goshawk	X	—	X
Swainson's hawk	—	X	X
Golden eagle	X	X	X
Peregrine falcon	X	X	X
Prairie falcon	—	X	X
Long-billed curlew	X	X	X
Marbled godwit[4]	—	X	X
Short-billed dowitcher	—	X	X
Franklin's gull	X	—	X
Forster's tern	X	—	X
Black tern	X	—	X
Caspian tern	X	—	X
Common tern	X	—	X
Least tern	X	—	X
Black-billed cuckoo	X	X	X
Burrowing owl	X	X	X
Short-eared owl	—	X	X
Great gray owl	X	—	X
Flammulated owl	X	X	X
Black swift	X	X	X
Calliope hummingbird	—	X	X
Lewis's woodpecker[4]	X	X	X
Pileated woodpecker	X	—	X
Willow flycatcher[4]	—	X	X
Olive-sided flycatcher	—	X	X
Loggerhead shrike	X	X	X
Pinyon jay	X	—	X
Brown creeper[4]	X	—	X
Winter wren	X	—	X
Veery	X	—	X
Sage thrasher	X	X	X
LeConte's sparrow	X	—	X
Bobolink[4]	X	—	X
Fringed myotis	X	n/a	X
Townsend's big-eared bat	X	n/a	X
Hoary bat[4]	X	n/a	X
Bull trout[5]	X	n/a	—
Boreal bluet	X	n/a	X
Boreal whiteface	X	n/a	X
Shining flatsedge	X	n/a	X
Guadalupe water-nymph	X	n/a	X

1 *Source: Montana Natural Heritage Program 2009.*
2 *Source: USFWS 2008.*
3 *Source: unpublished refuge data, includes casual sightings.*
4 *Proposed target species for refuge management.*
5 *Listed under the Federal Endangered Species Act as threatened.*

4.4 Cultural Resources and History

The following section describes the cultural resources and history of the refuge and the Bitterroot Valley, starting with the earliest documented occupation by Native Americans circa 12–15,000 years before present (B.P.). It then discusses Euro-American settlement in the valley and changes to the area's land uses, including those within the refuge boundary.

Prehistoric occupation

The cultural sequence for prehistoric occupation in this area is split into three major subdivisions based on Malouf (1956) including Early Hunter (10,000 to 6,000 before Christ [B.C.]), Middle Period (6,000 B.C. to Anno Domini [A.D.] 800), and Late Hunter (A.D. 800 to 1870).

Early Hunter

Woodside (2008) examined oral histories and other documentation to propose the presence of Paleo-Indians in Oregon and Washington prior to the flooding of Glacial Lake Missoula. Paleo-Indians, or Paleoamericans, is a classification term given to the first peoples who entered, and subsequently inhabited, the North American continent during the final glacial episodes of the late Pleistocene period. Woodside examined the Native American oral history of tribes in Oregon and Washington that described the cataclysmic flooding of Glacial Lake Missoula and how the tribes survived this event, dating about 15,000 years ago. Her research did cover other areas impacted by Glacial Lake Missoula, including the refuge. Ryan (1977) recovered two Cascade Points (projectiles) while performing archaeological research along the Clark Fork River west of Missoula. These points are indicative of this period and definitive evidence of Paleo-Indian presence. Ryan hypothesized that the Clark Fork Valley was an important corridor connecting the Columbian Plateau and the Northern Plains. Ryan also found an abundance of sites containing prehistoric activity. Alternately, Ward (1973) found a small number of archaeological sites in the Bitterroot Valley; many were pictographs only and not considered evidence of this period, nor did they date to this period of time.

Middle Period

Glacial Lake Missoula receded about 12,000 B.P., according to Alt (2001). Eventually native people occupied the new valleys formed by this event. Ward (1973) searched the Bitterroot Valley for middle prehistoric evidence of occupation. She found 19 sites no older than 5,000 B.P. None contained the traditional pottery, roasting pits, tipi rings, battle pits, rock piles, or fishing gear associated with this time period. Many had pictographs, which connect site occupation to the middle period. Ward refers to other work including that done in 1951 by Carling Malouf and his University of Montana archaeology class who found jasper and flint chips at the mouth of the North Burnt Fork Creek (a small occupation site on the refuge) (Malouf 1952).

Late Hunter

Malouf (1952) notes that in A.D. 1730 the Shoshoni of Idaho gave horses to the Salish of this area. This significantly changed the culture of the Salish people. Malouf stated that the Salish have occupied western Montana for several centuries dating back at least A.D. 1700. He cites tribal myths of animals that occupied this area, specifically coyote, beaver, otter, jay, and owl.

Protohistoric and Early Native Americans

The protohistoric period is the period of time between the arrival of horses and manufactured goods but before the arrival of Euro-American traders and explorers. This time period lasted only about 70 years due to the arrival of the Lewis and Clark expedition in 1805. Malouf (1952) noted that these intermountain areas of western Montana were the last areas of the United States to be settled by whites. Many traits of aboriginal times survived through this period without influence from Euro-American culture.

When early Euro-American explorers arrived, the area of western Montana was occupied primarily by three tribal groups: the Flathead and Pend d'Oreille (both considered Salish) and the Kutenai. In 1855, Governor Isaac Stevens stated the tribal population in western Montana to be 2,750 (Ryan 1977). In an unpublished University of Montana paper, Malouf (1952) reconstructed economy and land use by these tribes in western Montana using ethnographical and historical data.

All tribes were hunters and gatherers, and as such they did not allow for the accumulation of surplus food and supplies. However, famines were rare. Approximately 28 species of plants were the main sources of foods, medicines, cookware, and housing. The root of the bitterroot plant was a central dietary feature. One of the best places to dig the root was a mere 3 miles north of the refuge boundary at the mouth of Eight Mile Creek. Families could dig 50–70 pounds of bitterroot in late March or April. Arrowleaf balsamroot, an abundant plant in most elevations of western Montana, was also extensively eaten. Stems were typically peeled and eaten raw before flowering, and later roots were harvested and cooked. Ponderosa pine provided four forms of food: inner bark, sap between woody layers, cone nuts, and moss hanging from branches. Narrow leaf willow, a pioneer species on river gravel bars, was used in the construction of sweat lodges and baskets for cooking (sealed with gum). Most of the common mammals present today in western Montana were hunted including white-tailed deer and mule deer.

Columbian ground squirrel, which is still abundant in places on the refuge, was also harvested. Woodchuck Creek, about 5 miles north of the refuge, was a site where Salish regularly used dead fall traps to harvest marmots. Most birds were not harvested except waterfowl, yet mallard eggs were particularly plentiful and popular. Other gamebirds were not numerous. Fishing was employed on bison hunts and by those left behind when these bison hunt parties were gone. The place name for Missoula refers to the bull trout caught there.

The vicinity of Stevensville was the center of social and economic life for the Salish. Most tributaries in the Bitterroot Valley had one or more families inhabiting it. The alluvial fan at the mouth of North Burnt Fork Creek (partially on refuge property) was also home for a considerable number of Salish families. JoAnn BigCrane, a Native American historian, visited this part of the refuge in August 1990 (refuge annual narrative) and agreed that a seasonal encampment was here at one time. North Burnt Fork Creek doubled as a highway of sorts for Native American travel to the Clark Fork Valley over the Sapphire/Rock Creek divide. This was the shortest route requiring only one night of camping.

History of the Salish

The Salish–Pend d'Oreille Culture Committee furnished the following narrative for use on the Lee Metcalf Refuge Web site.

> The Bitterroot Mountain range is the backbone of the valley. The Salish call the Bitterroot Mountains "VCk Welk Welqey" which means "the tops are red." The life way of the Salish people is a cooperative dependent relationship with the land, plants, and animals.
>
> Salish is the name of a group of people, consisting of several tribes, and the language they spoke. The Bitterroot Valley was the permanent home of their forefathers. The Stevensville vicinity was their main winter camp.
>
> After the Hellgate Treaty of 1855, pressure increased for the removal of the Salish from the Bitterroot to the Jocko Valley on the Flathead Reservation. In 1872, General James Garfield presented the three Salish Chiefs Charlo, Arlee, and Adolf, with a second treaty which Charlo refused to sign. Charlo remained in the Bitterroot for 20 more years until he and his band were escorted from the valley by General Carrington in October 1891.
>
> The respect and love for the Bitterroot can be summed up in the words of Louise Vanderburg, a Salish elder:
>
> *"When we go home I think about our old people. I walk lightly when I walk around. The bones of my Grandparents and their Grandparents are all around here. We return to the Bitterroot each year on a Pilgramage to honor our connection with our homeland. Also to ensure the preservation of our ancestors' graves and sacred sites. In doing so we acknowledge the gifts left here by those who have gone on before us, gifts of language, songs, dance, spirituality. This way of life has been sustained for generations by our ancestors' prayers."*

Euro-American Settlement and Land Use Changes

The Bitterroot Valley was used by the first Euro-American explorers to the western United States, including Lewis and Clark. Following the Lewis and Clark expedition, fur traders from the Hudson's Bay Company entered the Bitterroot Valley to secure furs from the Indians and establish forts and missions. The oldest consistently occupied town in Montana was initially established at the present day site of Stevensville by Catholic missionaries in 1841 (Stevensville Historical Society 1971). At the request of four separate Indian delegations from the Salish tribe, Father Pierre De Smet came to the valley from St. Louis in the late 1830s. De Smet and other priests were eventually joined by Father Anthony Ravalli in 1845. Named St. Mary's Mission, this community kindled additional settlement in the region. St. Mary's Mission was closed in 1850, and the community was renamed Fort Owen, and then later Stevensville, after Isaac Stevens, the first Governor of the Montana territory.

The primary early land use by settlers in the Bitterroot Valley was cattle grazing. By 1841 extensive areas of the valley were grazed and used for winter range as cattle were moved from summer grazing and calving locations in mountain slopes and foothills back into the valley in the fall (Clary et al. 2005).

In the mid-1850s, the discovery of gold in western Montana fueled immigration to the State, and a short flurry of gold exploration and mining occurred in the Bitterroot Valley. Early workers in the gold camps subsisted on wild meat and the importation of produce, meat, and dairy products. At this time some residents began growing vegetable crops to feed the miners, and this demand stimulated the first agricultural development in the Bitterroot Valley. Subsequently, the Bitterroot Valley became the "breadbasket" that nourished Montana's genesis, and Fort Owen was the nucleus of the first Euro-American settlement. Gold exploration was short-lived in the Bitterroot region, and by the 1870s the area's economy was almost solely based on local agricultural crops and cattle production. Ravalli County was created in 1893, and by 1914 extensive settlement had occurred in the region. Timber harvest and grazing were the predominant economic uses of the area at that time (Clary et al. 2005).

The dry climate of the Bitterroot Valley created annual variation in the availability of water to support agricultural crops. As early as 1842, priests at St. Mary's Mission successfully planted and irrigated crops of wheat, potatoes, and oats (Stevensville Historical Society 1971), and thus by appropriation, the first water right in Montana was established. A water right on the North Burnt Fork Creek was filed in 1852 by Major John Owen, who used creek water to run a grist mill and sawmill.

Two methods of water appropriation occur in Montana. The first—used by early settlers, miners, and mill operators—applies the "relation back" rule of law, meaning that the right is dated to the beginning of construction of a ditch or a means to use the water in a so-called "beneficial" way. The second method involves posting a POD on a creek or other drainage and filing notices in the courthouse. A stream inevitably becomes over-appropriated when many people and industries make demands on it. Over-appropriation usually ends in "quick frozen" or "decreed" action, and adjudication of a stream becomes necessary when rights are conflicting.

In the early 1900s, the Bitterroot Valley Irrigation Company (formerly the Dinsmore Irrigation and Development Company) began construction of a major irrigation system for the Bitterroot Valley (U.S. Bureau of Reclamation 1939, 1982; Stevensville Historical Society 1971). This system included water storage and conveyance facilities along the Bitterroot River and its tributaries as well as several reservoirs, including Lake Como west of Darby, and a diversion dam on Rock Creek. In 1905 the existing dam at Lake Como was raised 50 feet, and by the winter of 1906, 17 miles of canals were built to convey Lake Como water northward in the Bitterroot Valley. Eventually, a channel was built from Lake Como to the Bitterroot River, at which point it was reverse siphoned into a 24-foot-wide canal, capable of carrying water 6 feet deep. Water was then flumed across several small gulches, across Sleeping Child Valley, and around the foothills for 75 miles to the Eight Mile Creek east of Florence. By 1909, 56 miles of canal had been built northward to North Burnt Fork Creek. Subsequently about 14,000 acres of cropland were sold, and irrigation water was delivered to the acreage. The company's Main Supply Canal (known as the "Big Ditch") was originally constructed to primarily deliver water to apple orchards. The canal, however, was only able to supply about half an inch of water per acre, which was barely enough to support fruit trees and only about half enough for other crops. The land was bought by local farmers and then re-sold in promotional schemes to eastern families for mainly apple production. Limited water and poor yields collapsed orchard production, and by 1918 the Bitterroot Valley Irrigation Company went bankrupt.

In 1920, a reorganized Bitterroot Irrigation District was formed, and it issued bonds to purchase water rights and to develop water storage and distribution works. Drought conditions in the late 1920s and 1930s coupled with the Depression-era economics further exacerbated water problems in the valley and curtailed agricultural expansion in the region during this period (Cappious 1939, Stevensville Historical Society 1971). Following further financial difficulty, in 1930 Congress authorized the Bureau of Reclamation to liquidate private indebtedness and rehabilitate the Bitterroot Irrigation District (U.S. Bureau of Reclamation 1939). Extensive rehabilitation to the district's Main Supply Canal and its distribution system was conducted from 1963 to 1967. Flood damage occurred in 1974, and extensive repairs were made on many structures. Currently the Bitterroot Irrigation District provides water to about 16,665 acres on the east side of the Bitterroot River (U.S. Bureau of Reclamation 1982).

Today, the Bitterroot Irrigation District's Main Supply Canal runs 1 mile east of the Lee Metcalf Refuge; however, it does not supply water to the refuge. Instead, irrigation water is supplied by the Supply Ditch Association, a private company formed in 1909. The association's Supply Ditch delivers Bitterroot River water to the refuge via three lateral ditches: the North Lateral Ditch (also called the Alleman Ditch), the Middle Lateral Ditch (also called the McElhaney Ditch), and the South Lateral Ditch (also called the Warburton Ditch) (figure 23).

Most of the Bitterroot Valley was unfenced in the early era of settlement from 1850 to 1910. However, in the early 1900s, the "apple boomers" who bought land in the valley began fencing most of the area. By the mid-1930s, more than 50,000 sheep and 30,000 cattle were present in the Bitterroot Valley; only about 22 percent of the valley was harvested cropland (Richey 1998). In the late 1940s and early 1950s generally wet conditions stimulated agricultural production in the Bitterroot Valley. Large-scale cattle grazing and haying operations and some small grain farming were conducted in and near the Lee Metcalf Refuge. Some native riparian forest and grassland in the Lee Metcalf Refuge region had been cut, cleared, and/or converted to alternate land uses by the mid-1900s. Two of the larger minor floodplain channels, Nickerson and McPherson Creeks (now called Ditches), were partly ditched in the early 1900s, and some minor impoundment of low elevation depressions and drainages occurred. By the 1960s, lands that became part of the refuge were controlled by about 13 landowners who heavily cropped and grazed the area. Much of the site was irrigated crop and pastureland using the extensive ditch and irrigation diversion system constructed across the floodplain (figure 23). These impounded ponds probably were created as water sources for

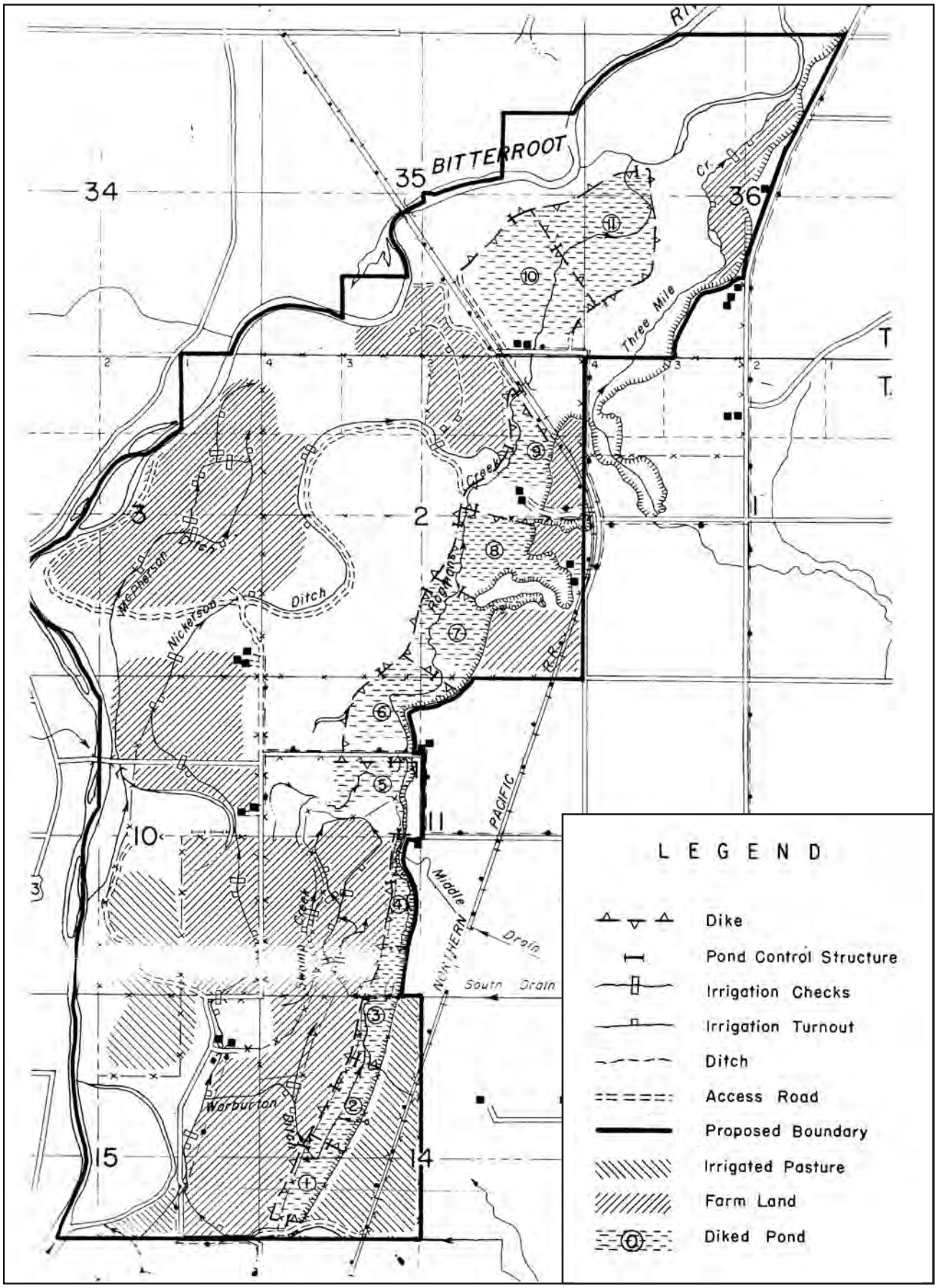


Figure 23. Proposed land use and drainage and irrigation infrastructure on Lee Metcalf National Wildlife Refuge in the 1960s (Heitmeyer et al. 2010).

livestock. Another development—a golf course—was established in 1933 within the southwest side of what became the refuge. It still exists today.

Many roads have been built in the Bitterroot Valley starting with a stage coach road in 1867 (Stevensville Historical Society 1971). This route eventually became Highway 93. Part of the main county road through the refuge follows the existing road shown on the 1873 plat map. Other early roads in the area were constructed from 1870 to 1900. These roads skirted higher ground and avoided the river, but eventually bridges were built across the Bitterroot River beginning in the late 1800s. These bridges were often destroyed by high water levels and floods.

The Bitterroot Branch of the Northern Pacific Railroad was constructed from Missoula to Grantsdale in 1889 and soon thereafter was extended to Darby. This rail line was built primarily to transport timber from the slopes of the Bitterroot Mountains and sawmills that sprang up all along the west side of the valley. Rail spurs connected mills, and eventually logging and mills expanded to the east side of the valley. Transporting lumber from the east side of the valley eventually led to the construction of rail bridge crossings over the Bitterroot River including the bridge and line at the northern boundary of the Lee Metcalf Refuge. In the high waters of June 1943, this bridge collapsed under the weight of a train loaded with logs. In 1927 and 1928, the railroad was relocated from south of Florence to the east side of the river.

By the late 1970s, farm sizes in the Bitterroot Valley increased greatly, but agricultural economies prevented more extensive small grain farming in the valley and landowners began subdividing holdings for residential development (Richey 1998). By the early 1990s, Ravalli County had the fastest growing population and residential expansion in Montana, expanding from about 25,000 residents in 1990 to more than 40,000 in 2010 (U.S. Census Bureau 2010). Today, most Ravalli County residents live on the Bitterroot Valley floor within a few miles of the river. Much of the increase in population occurred outside of established towns and became concentrated in areas where each dwelling or subdivision has its own well and septic system. Several hundred residential structures now essentially surround Lee Metcalf Refuge (figure 24).

Whaley Homestead (National Register of Historic Places)

The Whaley Homestead, which was included as part of a major land acquisition by the refuge in 1988, is listed on the National Register of Historic Places.

The Whaley Homestead was home to the family of Peter Whaley, an Irish immigrant who came to Montana in the 1860s, lured by gold strikes at Bannack and Alder Gulch. Whaley's wife, Hannah, and their nine children shared his adventures, including his service as the first agent on the Flathead Reservation, until the family settled on deserted land claimed in 1877. The house, built circa 1885, survives as an outstanding example of vernacular frontier architecture. Weatherboard siding conceals a massive, complicated understructure of square-hewn logs.

The Whaley family farmed and raised livestock until 1905 when they sold the property to a short-lived horse breeding operation. At the height of the "apple boom" in 1909, the Bitterroot Valley Irrigation Company purchased the homestead, planting the upper fields with McIntosh apple trees and gooseberry bushes for nursery stock.

In 1921 new owners Fred and Anna Hagen returned the homestead to a self-sufficient farm, raising corn, potatoes, hogs, and dairy cows. After more than 50 years of farming, they sold the land to the refuge and their son, Harold, and his wife remained there until 1988. During the 1979 ceremony renaming the refuge in Senator Lee Metcalf's honor, Harold Hagen waxed philosophical of the agricultural practices on the family farm that became refuge property: "I believe that we have attempted to mold the land to our ideas, to what it should produce when the land should have shaped our ideas and dictated to us what it could best produce" (refuge files).

4.5 Special Management Areas

Areas with official designations are managed to retain the special features that led to their designation. While not suitable for inclusion in the Wilderness System, the Lee Metcalf Refuge has been identified as a significant part of the Bitterroot Valley Important Bird Area.

Wilderness review

A wilderness review is the process used for determining whether to recommend Service lands or waters to Congress for designation as wilderness. The Service is required to conduct a wilderness review for each refuge as part of the CCP process. Lands or waters that meet the minimum criteria for wilderness would be identified in a CCP and further evaluated to determine whether they merit recommendation for inclusion in the Wilderness System. To be designated as wilderness, land must meet certain criteria as outlined in the Wilderness Act of 1964:

- generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable
- has outstanding opportunities for solitude or a primitive and unconfined type of recreation

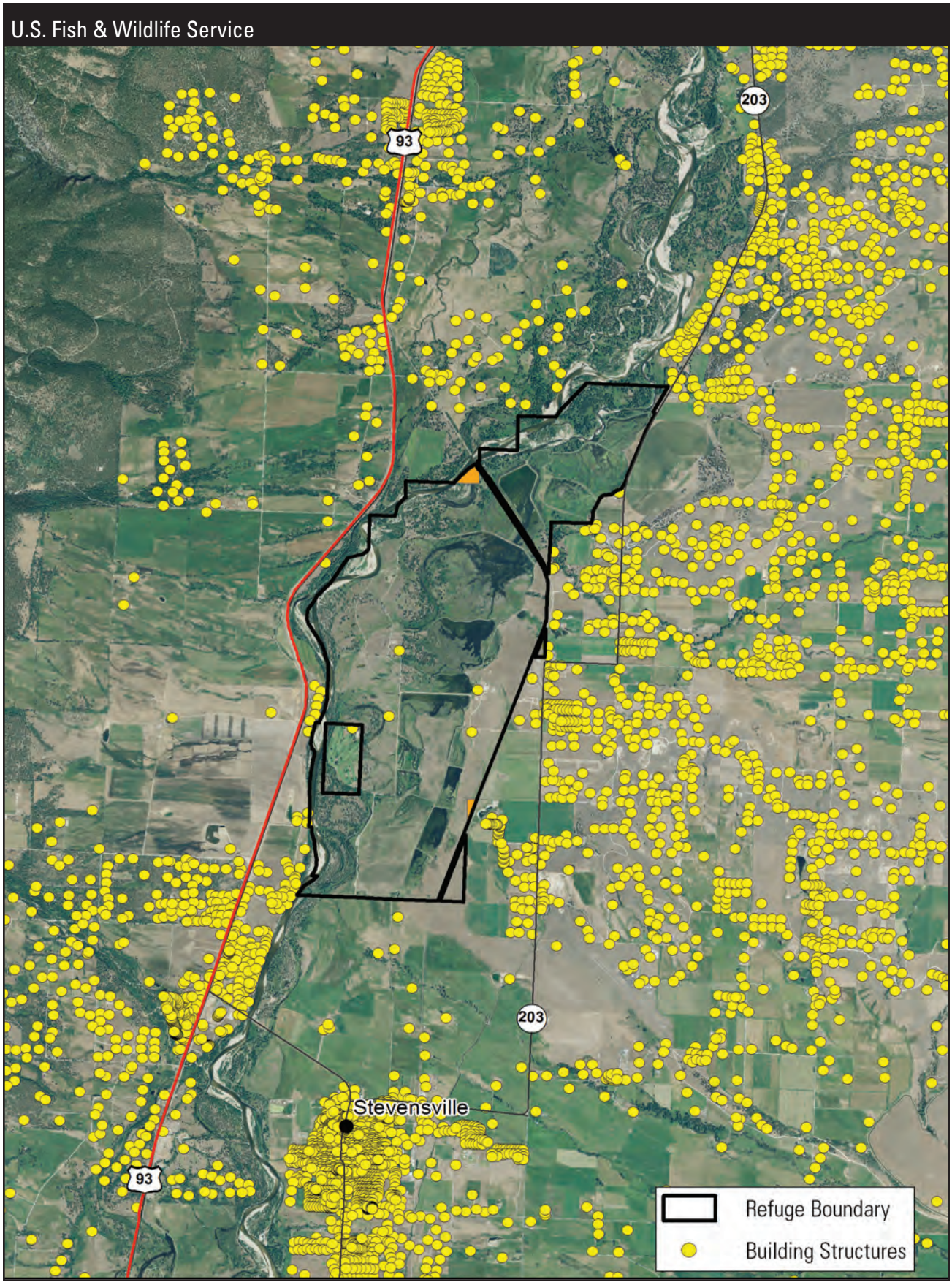


Figure 24. Location of residential structures near Lee Metcalf National Wildlife Refuge, Montana (Heitmeyer et al. 2010).

- has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unimpaired condition
- may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value

The refuge is only 2,800 acres and is altered by roads, ditches and levees. The refuge is also bordered by private land that has been developed for agriculture or housing. Although the refuge does provide visitors with opportunities for solitude and educational and scenic value, overall the refuge does not meet the criteria for wilderness designation and is not being recommended for inclusion in the Wilderness System.

Important Bird Area

The Important Bird Areas program, initiated in Montana in 1999, is a global effort managed by the National Audubon Society to identify and conserve areas vital to birds and biodiversity. To date 39 sites have been designated as Important Bird Areas in Montana, encompassing more than 10 million acres of outstanding wildlife habitat, including streams and wetlands. To qualify as an important bird area, sites must satisfy at least one of the following criteria to support the following types of bird species groups:

- species of conservation concern (for example, threatened and endangered species)
- restricted-range species (species vulnerable because they are not widely distributed)
- species that are vulnerable because their populations are concentrated in one general habitat type or biome
- species or groups of similar species (such as waterfowl or shorebirds) that are vulnerable because they occur at high densities due to their behavior of congregating in groups

Lee Metcalf Refuge is part of the Bitterroot Important Bird Area, one of the largest riparian and wetland Important Bird Areas in the State, and part of an Important Bird Area network crucial for bird survival throughout the year. The boundaries of the entire Bitterroot Important Bird Area were made to correspond closely to the 500-year floodplain, and the northern and southern extent of the area was decided based on wanting to capture the most extensive cottonwood gallery forest that was present. Lee Metcalf Refuge is a cornerstone of the Bitterroot River Important Bird Area. From the cottonwood galleries to willow shrubland, extensive wetlands, and valley bottom coniferous forests patches, all key valley habitats come together on this refuge to provide great bird species richness. The Important Bird Area documentation notes that more than 30 species of waterfowl, 20 species of shorebirds, and 20 species of riparian obligate bird species, plus marshbirds, terns, and gulls are found on the refuge.

4.6 Visitor Services

Visitors to the Lee Metcalf Refuge enjoy a variety of compatible wildlife-dependent public use activities: hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

The Lee Metcalf National Wildlife Refuge office and visitor contact area are open Monday–Saturday, 8:00 a.m.–4:30 p.m. The remaining areas open to the public can be accessed from dawn to dusk, except during hunting season when hunters are allowed reasonable time to access hunting areas. Brochures containing area maps, public use regulations, wildlife checklists, and general information are available to the public at the visitor contact area or the WVA kiosk.

Hunting and Fishing

The refuge is open to waterfowl hunting and archery-only hunting for white-tailed deer, both of which have occurred on the refuge since 1965 (USFWS 1966, refuge narratives).

A refuge hunting and fishing brochure was developed and printed in 2010. In addition to the site-specific regulations mentioned in the hunting brochure, all State of Montana hunting regulations apply to Service lands. All entry to refuge hunting areas is restricted to five specific parking areas, and all hunter parking areas have sign-in boxes to collect harvest data. A kiosk in the parking lot for the waterfowl hunting area provides refuge-specific waterfowl hunting regulations and information.

White-Tailed Deer Archery Hunting

The refuge is located in a State hunting district that only permits white-tailed deer to be harvested using a bow, also known as archery hunting. The earliest reference to archery hunting for deer on the refuge is found in the "Wildlife Inventory Plan" (USFWS 1966),

Bob Danley/USFWS

Youth participating in hunter safety course.

which states that controlled archery hunts were taking place on the refuge but only in the river bottom. Today, 82 percent of the refuge (2,275 acres) land is open to archery hunting for deer. Hunters sign in at each of the five parking and access sites and may use tree stands. Archery hunting in the waterfowl hunt area (see restricted archery deer hunting area in figure 6) is permitted in September except during the youth waterfowl hunt weekend; thereafter, archery hunting is permitted during waterfowl hunting season on Mondays and Thursdays. An average of 949 archery visits have occurred annually between 2005 and 2010 (refuge unpublished data), and the trend is moving upward. The highest documented usage was in the 2009–2010 season at 1,321 hunt visits. An analysis of harvest data collected between 2000 and 2009 revealed an average of 891 visits annually totaling 2,318 hours and resulting in an average harvest of 32 deer per year.

In 1966, the population of white-tailed deer was "about 10 head" (USFWS 1966). In the 1980s, refuge staff began to observe that parts of the refuge were being overbrowsed, resulting in fewer shrubs and little understory in forested areas, both of which are important habitat components for a variety of migratory bird species. It is suspected that the larger number of deer (100–300 deer between 2001 and 2005) (unpublished refuge data) residing on the refuge today may be the cause; however, additional data will be needed to make this determination.

Waterfowl Hunting

The size of the waterfowl hunting area has remained fairly consistent at 654 acres. In 1983 the refuge established 28 hunting blinds within this area. Today 14 blinds remain and 2 blinds (numbers 2 and 7) are reserved for hunters with Montana disability licenses. Hunters with disabilities are allowed to park near these blinds along Wildfowl Lane. All other hunters must enter and exit through the waterfowl hunt area parking lot. Waterfowl hunters may only possess and use nontoxic shot on refuge lands and waters when hunting waterfowl. From 2005 to 2010, an average of 1,029 waterfowl hunting visits occurred annually. Between 2000 and 2009, the average waterfowl harvest was 786 birds per year from an average of 1,299 annual hunt visits totaling 4,111 hours. Refuge staff meet with duck hunters each year to discuss the upcoming season and address issues to improve the quality of the hunt.

Fishing

Refuge anglers must adhere to the fishing regulations designated by MFWP. Designated fishing sites are located in the WVA (figure 6) and include Francois Slough and the Bitterroot River shoreline. A fishing platform is located along the paved Metcalf Trail at a water control structure that moves water from Francois Slough to the Bitterroot River. The area where Francois Slough intersects the Bitterroot River provides shallow water habitat with a solid gravel bottom that is used for fly fishing.

There are no boat launches within the refuge. However, people can float and fish the part of the Bitterroot River that passes through the refuge, but they must remain below the high watermark and must not access the refuge from the river.

It is difficult to obtain an accurate count on the number of anglers. In recent years fishing seems to be less popular within the WVA and Francois Slough.

Wildlife Observation and Photography

Opportunities for wildlife observation and photography are located at or along the following places: (1) the WVA; (2) visitor contact area (3) Kenai Nature Trail; and (4) Wildfowl Lane, a county road that runs through the refuge (figure 6). Visitors must follow refuge regulations to protect wildlife and their habitats while enjoying the opportunity to view and photograph them.

Commercial filmmakers must acquire a special use permit to work on the refuge. Commercial photographers need a permit if they are granted access to areas not normally opened to the general public. The permit specifies regulations and conditions that the permittee must follow to protect the wildlife and habitats they have come to capture on film.

Wildlife Viewing Area

The WVA is about 188 acres and has four pedestrian trails that total 2.5 miles: Ponderosa Trail, Metcalf Trail, Cottonwood Trail, and Slough Trail (figure 6). The trails pass through different vegetation communities, specifically riverfront and gallery forest and persistent emergent wetland. This system of trails is designated as National Recreation Trail. The first 0.55 mile of the trail system is known as Metcalf Trail, a 10-foot-wide paved path that is considered accessible for visitors with disabilities. This paved section of trail

Bob Danley/USFWS

Members of the Audubon Society gather at the refuge to spot birds.

Bob Danley/USFWS

The refuge's visitor contact area provides interpretation of refuge resources.

starts immediately at the trailhead, located at a large parking area, and ends at a turn-around point at the refuge's education pavilion at the edge of the Bitterroot River. Other sections of the trail are soil or gravel. Facilities at the trailhead include an information kiosk and restroom facilities ("porta-potties"). This area is open year-round from dawn to dusk and is probably the most popular area with refuge visitors. Parking at the trailhead is very spacious; motorhomes or buses can easily enter and exit. Dogs on leashes are allowed here but not bicycles or horses.

Visitor Contact Area and the Kenai Nature Trail

Visitors are provided a spotting scope to view waterfowl and other waterbirds and raptors on the ponds adjacent to the visitor contact area. This is one of the most popular wildlife observation and photography sites for visitors, including school groups. The visitor contact area is just over 500 square feet and provides some interpretation of refuge resources, including numerous taxidermy displays of local wildlife species.

The Kenai Nature Trail is a 1.25-mile trail accessed just north of the refuge headquarters (figure 6). At the start of this trail is a 0.25-mile paved loop that is 5 feet wide. This part of the trail meets Americans with Disabilities Act guidelines. A stationary, all-weather spotting scope and viewing bench are also along this section of trail. The remaining trail is a soil footpath that tracks northward, above and parallel to the eastern shorelines of Ponds 8 and 10 (figure 6). The views of the Bitterroot Mountains are spectacular between this point and the end of the trail, where a viewing platform with an all-weather spotting scope is available. This part of the trail travels through a closed area, so visitors are not permitted off this trail and no dogs are allowed.

Two permanent photo blinds are located along the Kenai Nature Trail. Blind 1 is located one-third mile from the visitor contact area on Pond 8; it sits on the edge of 5 acres of open water and marsh land and is sheltered to the east by cottonwood, aspen and alder trees. Blind 2 is located 1.25 miles from the visitor contact area on approximately 85 acres of open water on Pond 10. These blinds are positioned on the edge of two different wetlands and face open water. Photographers who have regularly contributed photos and volunteer time to the refuge helped determine the design, construction, and placement of these photo blinds. Photographers are gently reminded that subjects and habitats are more important than photographs; nevertheless, there is always the potential to disturb wildlife.

The Kenai Nature Trail traverses the following vegetation communities: persistent emergent wetland, floodplain and terrace grassland, and grassland-sagebrush. The plant communities and views differ from those in the WVA, offering visitors a different wildlife viewing experience.

Wildfowl Lane

Wildfowl Lane (figure 8) is a Ravalli County road that travels almost 3 miles through the southern half of the refuge. This road loops through the refuge and connects at both ends to Eastside Highway. It is not an official auto tour route, but all refuge visitors use this road to access the refuge and view wildlife in the adjoining lands and wetland impoundments. Most of the road is gravel, but the southern third is tar and chip pavement, and the first 3,200 feet of the east end is coated with recycled asphalt chipping. Ravalli County is attempting to make the road more maintenance-free so that it requires less summer blading and fewer applications of anti-dust chemical.

A superior feature of this road is the width—greater than 33 feet—so motorists can safely pull over and view wildlife. Automobiles make great wildlife viewing blinds, and with modern optics visitors can easily see wildlife from the road, causing minimal disturbance.

Environmental Education

Environmental education is a process designed to teach citizens and other visitors the history and importance of conservation and share scientific knowledge of our Nation's natural resources. Through this process, we can help develop a citizenry with the awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively towards the conservation of our Nation's environmental resources. Environmental education within the Refuge System incorporates on-site, offsite, and distance learning materials, activities, programs, and products that address the audience's course of study, refuge purpose(s), physical attributes, ecosystem dynamics, conservation strategies, and the Refuge System mission. The refuge headquarters has a conference room (the Okefenokee Room) that can be used for larger groups. There is an amphitheater and an outdoor pavilion for refuge programs and three public restrooms, all within the footprint of the refuge headquarters.

Bob Danley/USFWS

The refuge provides environmental education and research opportunities for students from surrounding schools and universities.

Schools

On average, the refuge hosts 2,309 students annually. Students come from communities as far as Darby to the south and Ronan to the north. Most students are from grades 3 through 5. Most visits occur during May and are usually restricted to one visit per year. Since 2005, the philosophy of the environmental education program has centered on introducing students to common, native wildlife of the refuge. The refuge does not have a dedicated or formal curriculum for student visits. There is no visitor services plan, but one will be produced following the completion of this CCP.

Most onsite environmental education programs take place in the area immediately around the refuge headquarters due to the availability of ample parking, the Okefenokee Room, visitor contact area, restrooms, the outdoor education shelter and amphitheater, habitat diversity, and the Kenai Nature Trail. This infrastructure gives staff opportunities and flexibility for providing quality environmental education. The Okefenokee Room is especially valuable because of its multimedia capabilities; it functions much like a formal classroom space. Environmental education partner organizations and self-guided teachers and school groups also use the WVA. A diverse supply of materials and equipment, including a refuge reference library, is available for these spaces for use in refuge programs or for visiting teachers and students.

Onsite Educators

The refuge outdoor recreation planner is the only staff position dedicated to environmental education. However, all refuge staff participate in environmental education activities when possible. Volunteers also assist with programs and staffing the visitor contact area. Many of these volunteers are self-taught, but the refuge works with volunteers in both formal and non-formal learning settings to augment their wildlife knowledge and associated skills. Without assistance from volunteers and partner organizations, the refuge could not accommodate the often large groups of students or visitors requesting environmental education programs. Nevertheless, there are requests that cannot be met due to a lack of staff. The refuge has been investigating the possibility of recruiting skilled naturalists as volunteers at the refuge.

Teacher Workshops

Teacher workshops were offered many years during the 1990s and in 2006. In 2006 the workshop was based on the "Flying Wild Educator's Guide." The goal of these teacher workshops is to build teachers' wildlife knowledge so they may appreciate and use the refuge appropriately for student learning and become self-directed when using the refuge for environmental education.

Off-Refuge Efforts

Refuge staff have visited local schools and attended community organization meetings to perform environmental education, interpretation, and outreach using established education kits and programs highlighting refuge resources.

Montana Junior Duck Stamp Program

The refuge outdoor recreation planner is also the State coordinator for the Montana Junior Duck Stamp program. Both Houses of Congress passed H.R. 3679, the Junior Duck Stamp Conservation and Design Act in 1994. This is a national program managed by the Service. Its goals are to connect children with nature through science and art.

A national curriculum is available but is currently being updated. Students are asked to depict a North American duck, goose, or swan in its natural habitat. At the State level, the artwork is then judged by a distinguished panel of local wildlife experts, artists and photographers and the entry deemed "best of show" is sent to Washington, DC to compete at the national level. The winner from the Federal competition is then made into the Federal Junior Duck Stamp, available

Bob Danley/USFWS

Attendees of the 2011 Montana Junior Duck Stamp Award Ceremony gather at the refuge amphitheater.

for purchase for $5. All proceeds from the sale of the Federal Junior Duck Stamps support conservation education. Awards include savings bonds, art supplies, and various other gifts.

Nationally, about 25,000 entries are received per year. In Montana, the average annual number of participants in kindergarten through grade 12 is 391 (2000–2010, refuge files). A Montana entry has won the national championship twice between 1994 and 2010. Montana's best of shows have finished in the national top ten in 2009 and 2010, a sign of continued excellence by Montana students.

For program support within Montana, two trunks have been developed that contain a variety of waterfowl reference materials; these trunks can be loaned to schools. A portable exhibit showcases the program and winning entries and is sent to libraries, schools and post offices around the state.

A detailed overview of the program is available at www.fws.gov/juniorduck.

Interpretation

Interpretation provides opportunities for visitors to make their own connections to resources. By providing opportunities to connect to the resource, interpretation provokes participation in resource stewardship. It helps refuge visitors understand their relationships to, and impacts on, those resources. Well-designed interpretive programs can be effective resource management tools. For many visitors, taking part in an interpretive program may be their primary contact with a refuge, the Refuge System, and the Service. It is their chance to learn about refuge resource management objectives and could be their first contact with conservation and wildlife. Through such contact, the Service has the opportunity to influence visitor attitudes about natural resources, refuges, the Refuge System, and the Service and to influence visitor behavior when visiting units of the Refuge System.

Brochures

Refuge brochures contain area maps, public use regulations, and general information. The current refuge brochures are available at the refuge headquarters and at the main kiosk of the WVA.

Most of the public brochures have not been updated to meet Service standards, with the exception of the new hunting and fishing brochure. Brochures that require updating include the general brochure and the wildlife checklist for Lee Metcalf Refuge.

Kiosks

There are five kiosks on the refuge that are used to interpret refuge resources and provide information to visitors including maps and refuge regulations. The kiosk at the WVA has three interpretive panels including a location map, general refuge information, wetland facts, and habitat management techniques. There is a kiosk at each of the entrance points on both the south and east end of Wildfowl Lane that primarily highlight information about the Refuge System. At the start of the Kenai Nature Trail there is a small interpretive kiosk primarily used to distribute refuge brochures (figure 6). There is also a kiosk in the waterfowl hunting area that provides updated hunting regulations.

Visitor Contact Area

The refuge has a 513-square-foot visitor contact area that provides a small library of books, natural history displays (including representations of refuge wildlife), interpretive displays, other environmental education materials, a small bookstore, and a large screen television. There are many interpretive displays on local plant and animal life. The information is updated based on the season or changing refuge activities. The refuge also has a Web site that provides information about resources, programs, and regulations.

Media

The refuge has a Web site (http://leemetcalf.fws.gov), blog, and social media sites (Facebook, Twitter, and Flickr) that provide up-to-date information about refuge resources, programs, upcoming activities, and refuge regulations. Refuge staff provide the three local newspapers with periodic news articles on refuge activities and events and informative articles on the natural resources found throughout the refuge.

4.7 Management Tools

In recent years, the Service has manipulated habitat using various management tools that are carried out under specific, prescribed conditions to meet the needs of wildlife. These management tools have included water level manipulation, prescribed burning, and prescriptive grazing or mowing, and cooperative farming.

Water level manipulation

The refuge manipulates the water levels in 17 wetland impoundments that provide approximately 800 acres of open water and mudflats for migratory waterbirds. The development of these wetland impoundments began in 1964 when levees and berms were constructed to capture and impound water. Water control structures were added to control the inflow and outflow of water in attempt to mimic wetland cycles. Water levels continue to be timed to the needs of wildlife and the season. For example, during the migrating shorebird season, water levels are lowered to create mudflats. For migratory and breeding waterfowl, water levels are raised slowly to create optimum foraging conditions and to provide for brood and roosting habitat. Wetland impoundments are occasionally drained to improve the health and productivity of these impoundments

Bob Danley/USFWS

A variety of methods are used to control cattails on the refuge.

for waterbirds. This also allows the opportunity to reduce cattail monocultures, thereby restoring open water areas.

Prescribed burning

Prescribed burning is a management tool that has been used on the refuge since 1988 to control some invasive plant species or undesirable monotypic vegetation stands, particularly cattails. It is also used to clear ditches of vegetation that may impede waterflow. One of the most widespread uses of prescribed fire on the refuge is to rejuvenate grassland vigor.

Since 2004, the refuge has burned 491 acres to improve grassland habitat and 463 acres to improve wetlands. Each year 3–5 acres of ditches are burned to keep them free of vegetation allowing water to travel more freely.

Prescriptive grazing or mowing

Historically, the Bitterroot River Valley was grazed and browsed by native ungulates such as white-tailed deer, mule deer, moose, and elk. Following Euro-American settlement, these valley lands were used for cattle grazing, primarily as winter range as cattle were moved in the fall from the summer grazing and calving locations in the mountain slopes and foothills (Clary et al 2005). Cattle grazing on the refuge grasslands continued until 1975. Between 1993 and 1997 sheep and goats were brought into the refuge in an attempt to control cattails and invasive species; however, prescriptive cattle grazing was not consistently used as a management tool until 2006. To control monotypic stands of cattails in the wetland impoundments, cattle were brought in to graze primarily on the young cattail plants. This is one part of a multi-step process of thinning cattails.

Cooperative farming

Cooperative farming is an arrangement whereby a farmer is compensated for planting crops on a refuge through keeping a certain percentage of the harvest. The refuge can retain its share (1) as standing cover for wildlife forage, (2) in exchange for additional work from the cooperator such as invasive plant control and grass seeding, or (3) in exchange for supplies from the cooperator such as herbicides and fence materials. Any income received by the refuge is deposited in the Refuge Revenue Sharing Account.

Before cooperative farming can take place, the refuge manager must issue a cooperative farming agreement or a special use permit. Subsequently, cooperators are allowed to (1) till, seed, and harvest small grain, (2) control invasive plants, or (3) harvest hay on the restoration site until native seed can be planted and becomes established. These agreements are generally issued for 2–4 years to achieve a specific management objective, such as preparing a field for restoration to native species. In some cases these agreements may extend longer to allow time for the establishment of native plants.

When the refuge was first established, farming was used to grow grains including wheat and barley. Historically, the 800 pounds of grain that was harvested was sent to Red Rock Lakes National Wildlife Refuge to feed wintering swan. Cooperative farming stopped in 2002, partly due to the difficulty of finding cooperative farmers and partly due to a trend of restoring farmlands to native grasslands.

While cooperative farming can assist with restoration efforts, unfortunately most of these restoration efforts have not succeeded on the refuge, primarily due to competition from invasive species.

4.8 Socioeconomic Environment

Most of the Lee Metcalf Refuge is open to the public for uses including hunting, fishing, wildlife observation, and photography. These recreational opportunities attract outside visitors and bring in dollars to the community. Associated visitor activities—such as spending on food, gasoline, and overnight lodging in the area—provide local businesses with supplemental income and increase the local tax base. Management decisions for the refuge about public use, expansion of services, and habitat improvement may either increase or decrease refuge visitation and, in turn, affect the amount of visitor spending in the local economy.

Population and demographics

The refuge is located approximately 4 miles northeast of Stevensville, Montana in Ravalli County. During the 1990s, Ravalli County was the fastest growing county in Montana and became one of the fastest growing

counties in the entire United States, as measured by percentage change in population. For the period from 1990 to 2009, the county's population increased from 25,010 to 40,431—an increase of 62 percent. A key factor in the character and change of the Bitterroot Area economy is the county's proximity to a mid-size regional center, the city of Missoula, which is located 25 miles to the north in Missoula County. During the 1980s, the county of Missoula grew from 76,016 to 78,687, an increase of only 3.5 percent. However, between 2000 and 2009, Missoula County grew by 13.4 percent.

The communities of the Bitterroot Valley are located on a "peninsula" of largely private lands occupying the valley floor and mountain foothills surrounded by a "sea" of public forest lands. Within the boundaries of Ravalli County itself, there are 1,850 square miles of forest lands administered by the USDA Forest Service, representing about 77 percent of the entire county's land base. Beyond the perimeters of the county, these forest lands and wilderness stretch for many miles. The presence of these public forest lands has heavily influenced the settlement and economic development of the Bitterroot Valley, and wood products manufacturing has been a key component of the area's economic base. Historically, the economic role of these forest lands has been primarily one of a supplier of raw material for lumber processing in the area. However, the role these lands play in the area's development is changing. The Bitterroot Valley's economy is now being increasingly shaped by rapid growth spurred by in-migration. The amenities of this picturesque mountain valley with its surrounding forests appear to be the primary attraction for many of the valley's recent migrants. Similar migration patterns are occurring in non-metropolitan forest land areas like the Bitterroot Valley throughout the west.

The recent rise in population in the Bitterroot Valley has not been evenly shared by various age groups within the population. While Ravalli County's population as a whole grew by 43 percent between 1990 and 1999, the greatest growth occurred among persons in their mid-to-late 40s and 50s. The population 45–54 years of age increased from 2,994 persons to 6,356—a 112 percent increase in less than a decade. The population of age group 55–64 increased by 71 percent. The county's 65-and-older population increased by only 24 percent during this period and actually decreased as a percentage of the population between 1990 and 1999. The area may in fact be losing a disproportionate number of people 65 or older who move away from the area.

The area's population is racially non-diverse, as is the population of the larger region. Of Ravalli County's 40,431 residents in 2009, more than 97 percent were white. The population of Hispanic or Latino origin is the largest racial minority group at 2.8 percent. American Indians, who have a distinct cultural connection to this area, make up only 0.9 percent of the population.

Employment

The unemployment rate in Ravalli County in 2010 was 10.4 percent, which is greater than Montana's average of 7.4 percent. In 2009, the median family income was $45,691, which is close to the rest of State but less than the national 2008 average of $52,029.

The fastest growing industries are administrative and support services, followed closely by waste services, arts, entertainment, and recreation.

Public use of the refuge

During 2010, 166,767 visits were recorded on the refuge. Between 2005 and 2010 (the period after which the new refuge office and visitor contact area opened) annual visits averaged 142,971. During this time period, the maximum visitation was 177,563 in 2005 and the minimum was 90,000 in 2008. These numbers are based on mechanical counters strategically located at the WVA, Wildfowl Lane, and the Kenai Nature Trail. These numbers do not account for the refuge visitors on the Bitterroot River or on refuge lands west of the Bitterroot River. The average number of individuals who actually came into the visitor contact area during this same period was 6,118. Visitors attending special events accounted for 1,741 visitors annually. These latter figures are recorded manually by refuge volunteers. During hunting and fishing seasons from 2005–2010, the visitors participating in these activities accounted for 2 percent of all visits (Carver and Caudill 2007). It is assumed that the remaining visitors were participating primarily in wildlife observation and photography activities along the county road and nature trails. Most wildlife observers visit in the spring and summer, when the greatest numbers of migratory birds inhabit the area.

Camping and fires are not allowed on the refuge; however, the Bitterroot National Forest manages land throughout Ravalli County, including campgrounds, one of which is near Stevensville. There is a motel located in the town of Stevensville, a few in Hamilton and Lolo, and dozens more in Missoula, as well as several recreational vehicle campgrounds.

Baseline economic activity

It is difficult to place a value on the worth of outdoor experiences or the importance of maintaining and preserving habitat vital to migratory birds and a variety of resident wildlife species. One way of defining a refuge's value and the opportunity to experience wildlife-dependent recreation on the refuge may be to ask what the area would be like without the refuge (Carver and Caudill 2007). According to the latest "Banking on Nature" economic analysis (Carver and Caudill 2007), 13 percent of expenditures associated

with a wildlife-dependent recreational visit to a refuge come from local residents, thus 87 percent of revenue comes from outside area visitors. These expenditures include purchases of food, lodging, transportation, and other expenses. In 2007, refuge visits generated approximately $185.3 million in tax revenue at the local, county, State and Federal levels (Carver and Caudill 2007).

Public use is just one way that Lee Metcalf Refuge generates revenue and contributes to the economic engine of the local economy. Other economic benefits include spending by the refuge, spending by refuge employees, payment in lieu of taxes ($13,439 in 2010), the economic value of the function of the refuge's habitats, and the increased value of lands next to the refuge.

U.S. FISH AND WILDLIFE SERVICE EMPLOYMENT

In 2010, Lee Metcalf Refuge was staffed by nine permanent employees and six seasonal employees. Its payroll equaled approximately $601,000. Based on the Bureau of Labor statistics, approximately 79 percent of each employee's annual income is spent locally. Using this figure, refuge employees contribute nearly $475,000 to the local economy.

VISITOR SPENDING

An average of 143,000 visitors enjoy Lee Metcalf Refuge every year though wildlife observation, photography, hiking, and environmental education (sometimes referred to as non-consumptive uses). On Lee Metcalf Refuge it is estimated that more than 97 percent of visitors participate in these activities. The remaining visitors participate in fishing and hunting (often referred to consumptive uses).

According to the 2007 "Banking on Nature" report, 87 percent of refuge visitors travel more than 30 miles to visit a refuge (Carver and Caudill 2007). This same report stated that 77 percent of these visitors engage in non-consumptive activities. Non-resident visitors tend to contribute more money to the local economy. Based on refuge visitor numbers and the estimated percentage of non-resident visitors, it is estimated that Lee Metcalf Refuge could possibly contribute as much as $15 million annually to the local economy from non-resident, non-consumptive users, and nearly $4 million from non-resident consumptive users. Resident non-consumptive users spend an additional $356,000 while resident hunters and anglers spend approximately $140,000.

4.9 Partnerships

Lee Metcalf Refuge has a history of fostering partnerships that help accomplish the refuge mission and implement programs. From 2005 to the present, the Service has entered into various projects and activities with more than 65 organizations including local and national conservation organizations, private companies and businesses, other Federal agencies, State agencies, universities, local schools, and county and city governments. The refuge also has a very active volunteer program that primarily assists visitor services programs. The refuge could not begin to meet the needs of the thousands of refuge visitors without these volunteers.

Bob Danley/USFWS

The Hollingsworth Wetland Project was a collaborative effort among the Service and numerous partner organizations.

These partners have assisted in wildlife and habitat management, visitor services and recreational activities, land protection, law enforcement, and community outreach. Several of these relationships have developed into formalized partnerships with written agreements or memoranda of understanding while others remain more informal.

4.10 Operations

Service operations consist of the staff, facilities, equipment, and supplies needed to administer resource management and public use programs throughout the Lee Metcalf Refuge.

STAFF

Lee Metcalf Refuge provides supervision, logistical support, office space, storage, and supplies to multiple positions that serve a broader set of responsibilities than the mission of the refuge. Current staff at the refuge consists of five permanent full-time employees including a refuge manager, outdoor recreation planner, law enforcement officer, maintenance worker, and an administrative support assistant. There are also four permanent Service employees who are based out of this office, but they are not assigned to exclusively support refuge programs. These positions include

the district fire management officer, fire technician, regional maintenance team member, and the Montana Invasive Species Strike Team leader. These employees and their programs are supported partially or wholly by Lee Metcalf Refuge with logistics, equipment, and materials, and most of these positions are supervised by the refuge manager. The refuge does receive some assistance on refuge projects from these positions if they are not dedicated to other priority projects.

Seasonal employees are often hired each year. In addition to the above refuge positions, the refuge uses its management funding to annually hire one to two seasonal workers, including a biological technician and a maintenance assistant. Additionally, since 2009, the refuge has also hosted a Youth Conservation Corps Crew and leader. In 2010, the refuge coordinated with Ravalli County Weed District to employ three, 5-month seasonal employees to treat invasive species on the refuge.

Facilities

Facilities are used to support habitat and wildlife management and wildlife-dependent public use activities for an estimated 143,000 annual visitors. The refuge's buildings have been updated over the years, yet much of the habitat management infrastructure such as irrigation components, some wetland impoundment levees, and water control structures are in disrepair.

The refuge headquarters and visitor contact area were developed in 2004 from an existing maintenance garage. The current maintenance shop, a metal Butler building, was constructed in 2000, and a cold storage equipment bay building was constructed in 2005. The refuge has a bunkhouse, built in 2005, to provide housing for seasonal workers. The refuge historically had one refuge house but it was recently deemed unsafe for occupancy, and in August 2010 it was removed.

Most of the refuge wetland impoundments were constructed in the late 1960s through the early 1970s. Roads and dikes associated with these wetlands were constructed at that time and many are in need of repair. In addition to the visitor contact area, visitor service facilities include the amphitheater, education shelters and 5 miles of trails.

The following is a list of most of the facilities found on the Lee Metcalf Refuge:

- headquarters and visitor contact area (4,488 square feet)
- maintenance shop (7,200 square feet)
- cold storage building (3,500 square feet)
- outdoor amphitheater (4,000 square feet) and shelter (400 square feet)
- bunkhouse (2,080 square feet)
- hazmat building (390 square feet)
- pole barn (3,000 square feet)
- Grube Barn (3,162 square feet) (poor condition)
- Whaley Homestead (1,416 square feet)
- approximately 23 miles of dikes/roads
- 22 large (greater than 2-foot diameter) water control (stoplog) structures
- 10 small (less than 2-foot diameter) water control (stoplog) structures
- 3 water delivery ditches, totaling 6 miles, plus 2 tile drain ditches
- 3 pumping stations for Fields I–1 through I–7
- 4 domestic wells
- 2 recreational vehicle pads with septic, electrical, and water hookups
- 3 vehicle bridges
- 5 miles of walking trails
- 5 walking bridges
- 2 wooden photo blinds
- wildlife observation deck (Kenai Trail)
- 3 entrance signs
- 5 interpretive kiosks
- universally accessible fishing deck (168 square feet)
- 13 waterfowl hunt blinds (includes 2 blinds for hunters with disabilities)
- 5 archery hunter parking lots

CHAPTER 5—Implementation of the Proposed Action (Draft CCP)

Bob Danley/USFWS

A young visitor participates in a refuge educational program.

This chapter contains the specific objectives and strategies that would be used to carry out the Service's proposed action (alternative B) and reflects the draft CCP for the Lee Metcalf National Wildlife Refuge. The Service recommends this as the alternative that could best achieve the refuge's purposes, vision, and goals while helping to fulfill the Refuge System mission.

If the Regional Director selects alternative B as the preferred alternative, the objectives and strategies presented in this chapter would become the final plan to be carried out over the next 15 years. In addition, the stepdown management plans listed in table 13 (section 5.11 below) would provide implementation details for specific refuge programs.

5.1 Summary of the Draft CCP

The rest of this chapter contains the draft CCP—the objectives and strategies for the refuge resources and programs as identified in alternative B, the proposed action. (Refer to sections 3.2 and 3.4 in chapter 3.)

The focus of the draft CCP is to carry out science-based management of the habitat and wildlife associated with the refuge along with complementary visitor services:

- The Service would use the best available science to determine the most effective methods for conserving, restoring, and enhancing the habitats within the refuge, including grassland and shrubland, gallery and riverfront forests, and wetland impoundments. Providing these habitats for target migratory birds would achieve the purposes of this refuge. A significant part of the restoration proposals would be to control invasive plant species, where possible, and prevent further spread. Grasses and shrubs native to the uplands, including the alluvial fans, would be restored, where appropriate, to provide habitat for native wildlife including grassland-dependent migratory birds. Some wetland impoundments would be removed or reduced in size to allow for river migration or provide restoration sites with an overall long-term goal to restore the gallery and riverfront forest for wildlife that are dependent on riparian areas. Most of the remaining impoundments would be managed to emulate natural conditions for wetland-dependent migratory birds. The Service would provide information to the public on the process and purposes of restoring some of these native habitats.
- The Service would expand and improve the refuge's compatible, wildlife-dependent, public use programs, in particular the wildlife observation, environmental education, and interpretation programs. The visitor contact area and associated headquarters would be expanded into a visitor center, new office space, and a combination conference room and

environmental education classroom. New displays would be professionally planned and produced for the expanded visitor center. Interpretive panels would be located at strategic points on the refuge, highlighting the restoration efforts. These panels would be designed so they could be updated as needed. The refuge would work with the county to designate the public road traveling through the refuge as an auto tour route, which would include pulloffs and interpretation. A seasonal hiking trail would be added and some other existing trails would be improved for wildlife observation and photography and other interpretive and education programs. The hiking trails within the WVA would not be protected from the Bitterroot River's migration. Trails may be relocated if they become impassible. All public use programs would provide visitors with information on the purposes of the refuge and the mission of the Refuge System, ensuring that almost every visitor would know that they are on a national wildlife refuge.

- Increased research and monitoring, staff, funding, infrastructure, and partnerships would be required to accomplish the goals, objectives, and strategies outlined in this chapter.

Sections 5.2 through 5.10 set out the objectives and strategies that serve as the steps needed to achieve the CCP goals for the refuge. While a goal is a broad statement, an objective is a concise statement that reveals what is to be achieved, the extent of the achievement, who is responsible, and when and where the objective should be achieved—all to address the goal. The strategies are the actions needed to achieve each objective. Unless otherwise stated, refuge staff would carry out the actions in the objectives and strategies. The rationale for each objective provides context such as background information, assumptions, and technical details.

Appendix D contains the required compatibility determinations (in draft form) for public and management uses associated with this draft CCP. In addition, appendix F describes the fire management program for the refuge.

Target species selection process

Early in the planning process, the Service selected three groups of target species that will be supported by the objectives and strategies described under the habitat goals for the Bitterroot River floodplain, wetland impoundments, and grassland and shrubland habitat. Part of this process was to review three separate documents focused on sustaining or recovering species in Montana: the "Montana Intermountain West Joint Venture Plan," "Montana State Conservation Plan," and the "Bitterroot River Subbasin Plan." An initial list was developed based on whether a species either

Thomas Barnes/USFWS

Wood duck is a target species for the Bitterroot River floodplain.

occurred on the refuge or could occur on the refuge if its preferred habitat was expanded or restored, as indicated under each goal. Almost all of the species selected are recognized in these three documents. The life history needs of over 100 species were examined for similarities and relevance to the proposed goals. The final lists of 16 species were selected based on their ability to represent guilds or because they were good indicators of the quality of a specific habitat type. The habitats that support the migration, foraging, nesting, and migration needs of these selected species should benefit a much broader group of secondary bird species as well as a variety of other wildlife, both migratory and resident. These target species will be monitored for trends in abundance and distribution to evaluate the effectiveness of these proposed actions. The actions described in these three alternatives were evaluated based on their abilities to support these target species.

5.2 Goal for the Bitterroot River Floodplain and Associated Wildlife

Manage and, where appropriate, restore the natural topography, water movements, and physical integrity of surface water flow patterns across the Bitterroot River floodplain to provide healthy riparian habitats for target native species and to educate visitors about the benefits of sustaining a more natural floodplain.

Target species for the Bitterroot River floodplain

The Service has identified the habitat needs of a diverse group of target floodplain species, including waterbirds, neotropical migrants, and mammals (table 9). Providing for the life history needs of these

Table 9. Target species for the Bitterroot floodplain and their habitat needs.

Habitat	*Vegetation height and cover*	*Structural or foraging requirements*	*Area requirements*	*Nesting or breeding (after 1991)*	*Migration*
Wood Duck					
Creeks, streams, marshes, beaver ponds	Nests in natural cavities or artificial nest boxes; trees for nest site are >24 inches DBH; cavities average 24 feet or higher aboveground	Freshwater wetlands with an abundance of vegetative cover; small areas of open water with 50–75% cover	Not territorial—priority is adequate cover	X	X
Lewis's Woodpecker					
Riparian woodland with ponderosa pine and cottonwood, logged or burned pine, and snags	Uses brushy understory and ground cover; requires snags for nesting (standing dead or partially dead); nest heights vary between 3 and 171 feet	During breeding, eats free-flying insects and fruit found on serviceberry, hawthorn, dogwood, elderberry and sumac	Determined by food and storage-site availability	X	X
Willow Flycatcher					
Riparian woodland with willow and other shrubs and cottonwood; restricted to river and creek corridors	Nests in shrub thickets close to ground (3–5 feet high on average); willow shrubs are favored nesting substrate, but will use other shrubs	Eats primarily insects and occasionally fruit	Wintering home range estimated at 0.25 acre and breeding range at 1 acre	X	X
Vaux's Swift					
Coniferous and deciduous forest; large- diameter hollow trees (dead or alive) and chimneys are favored nesting and roosting sites	Cover not important for nesting; DBH averages 30 inches (17–43 inches); tree height averages 85 feet (30–131 feet); nest height averages 56 feet (30–108 feet)	Forages for flying insects in air over forest canopy and grasslands	Not territorial; nest singly or semi-colonially, when roosting-thousands can roost in a single tree	X	X
Brown Creeper					
Continuous and unfragmented mixed coniferous–deciduous forest, mostly old growth (>100 years); large snags and live trees; high canopy closure and high density of trees preferred	Forages especially on large trees (average >12 inches DBH) and tall trees (>89 feet) with trunks that have deeply furrowed bark that contain higher arthropod densities; nest height ranges between 2 and 45 feet and nest is almost always between trunk and a loose piece of bark on a dead or dying tree in a dense tree stand	Forages on variety of insects and larvae, spiders and their eggs, ants, and a small amount of seeds and other vegetable matter; forages primarily on trunks of live trees and occasionally on large branches, but rarely on the ground	During breeding, average territory size ranges from 0.02 to 0.06 acre; territories break down late in the fledging period	X	X
Hoary Bat					
Summer resident in forested riparian areas and woody wetlands	Roosts on trees 12–40 feet aboveground; dense vegetation above roost preferred	Open-air forager that prefers moths, but also feeds on beetles, wasps, grasshoppers, and occasionally small bats	Solitary with no real defined territory	Unknown	X

Sources: Bull et al. 2007, MFWP 2005, Hejl et al. 2002, Hepp 1995, Montana Bird Distribution Committee 1996, Sedgwick 2000, Texas State Parks and Wildlife 2011, Tobalske 1997.
Abbreviations: DBH = diameter at breast height, X = recorded use on the refuge.

species would provide the natural floodplain habitat diversity and conditions needed not only for these targeted species, but also for a broad suite of other floodplain-associated wildlife. Monitoring would focus on these target species to determine their response to floodplain management actions.

Floodplain Objective 1

Where channel migration of the Bitterroot River is occurring, do not inhibit the river from establishing natural flow patterns during high flow events, where appropriate, to enhance existing riparian woodlands and provide suitable restoration sites for both gallery and riverfront forest vegetation that could provide breeding, nesting, feeding, or migration habitat for target species (over the next 15 years).

Strategies

- Remove or do not replace hard points or riprap along the channel banks of the Bitterroot River unless they protect non-Service property or structures.
- Work with engineers and hydrologists, contracting as necessary, to determine and design overflow channels in the north part of the refuge (Ponds 11, 12, and 13) and remove infrastructure to allow for river movements into these channels. Revegetate exposed soils with gallery and riverfront forest species.
- Do not impede the fluctuations and movements of the Bitterroot River within the WVA. Use interpretation, including signage, and environmental education to inform visitors with information about the benefits of this process and the Service's plans to relocate facilities and eroded trails, as appropriate.
- In areas away from overflow channels and gallery and riverfront forest restoration, continue to allow seasonal flows (including backwater flooding into Francois Slough) of the Bitterroot River into and through North Island and Francois Sloughs. File for changes to existing water rights as directed by the Service's water resources division.
- Allow and promote natural regeneration of native gallery and riverfront forests and plant native trees, shrubs, and grasses, where appropriate.
- Monitor and treat new invaders within channels and on the newly exposed soils.
- Monitor the abundance and distribution of target species to determine the success of management techniques, and use adaptive management to ensure that the refuge is using the most effective methods and proven technologies.

Rationale

The combination of irrigation ditches and associated infrastructure (culverts, water diversion structures), development (bridge crossings, riprapping), and land use changes has significantly altered the Bitterroot River's channel form, structure, and movement within the Bitterroot Valley and its floodplain (Heitmeyer et al. 2010). Notably, existing river stabilization structures on the refuge, including frontline levees and riprap placed along the Bitterroot River in the 1950s, altered the river's physical and hydraulic dynamics and character. Ultimately, these structures may be contributing to potential damage on other stretches or off-refuge lands along the river, both upstream and downstream (Heitmeyer et al. 2010).

Bob Danley/USFWS

The erosion caused by meandering Bitterroot River, adjacent to the wildlife viewing area.

In addition to the possible impacts caused by infrastructure and land use, the Bitterroot River has an inherently unstable hydraulic configuration and high channel instability in the stretch immediately upstream from and at the Lee Metcalf Refuge. The river in this area is characterized by numerous braided channels that spread over a wide area of the Bitterroot Valley floodplain. Many of these channels are evident on Lee Metcalf Refuge.

Since the 1930s, lateral migration of the Bitterroot River channel has apparently accelerated, and the river is actively attempting to cross the floodplain at the refuge in new pathways, including seasonally shifting primary discharge through the North Island Slough. Lateral migration of the river has been discouraged to date by land interests along the river—including those of the refuge—to protect existing roads, agricultural land, and the railroad bed and trestle on the north end of the refuge. Control of river migration has been attempted by channeling and armoring channel banks with riprap and other materials. Eventually, more channel stabilization would be needed to keep the Bitterroot River channel "in place" because hydraulic dynamics from future high-flow events would continue to destabilize the current river channel configuration and destroy or damage existing physical structures. It is not only practical but preferable to balance the Bitterroot River's natural fluctuations with restoration of native refuge conditions and land use interests.

Riverbank erosion has occurred all along the refuge, and several levees have been breached by the river. This erosion has led to some loss of riparian habitats, a community type that provides some of the most productive wildlife habitat in the State and is home to a wide variety of birds, mammals, reptiles, and amphibians (MFWP 2005). Nevertheless, this type of flooding and erosion enriches the soil and creates the conditions necessary for expanding and sustaining riparian habitats across the refuge's floodplain.

The levees impounding Ponds 12 and 13 have been partially eroded by the Bitterroot River's side channel movements into the refuge through North Island Slough. The best use of these areas would be to remove the structures and allow the river to flood and recede. Current climate change models predict lower precipitation and lower river levels, and these historic flooding events may rarely take place. However, if natural flow patterns were restored—even to some degree—there would be opportunities to restore native habitats, such as riverfront and gallery forest, providing areas for target bird species (table 9). As necessary, the refuge would closely monitor and treat newly exposed soils as the river recedes. Although necessary for cottonwood and willow regeneration, newly exposed soil and channels could also create ideal conditions for the downstream movement and spread of existing and new invasive species. An active monitoring and treatment program would prevent this invasion and encourage native vegetation to outcompete less desirable species.

Several trails in the WVA are also subject to erosion caused by the river's migration and flooding. The riverbank alongside the Metcalf Trail has eroded at least 100 feet in since 2008. It would be impossible to prevent further movement of the river without significant cost and possible damage to other refuge resources. The Service would evaluate relocating established trails if they were to become completely eroded and impassible. New trail designs would only be considered if the new trail would not be eroded by the river's movements or impede river movements.

FLOODPLAIN OBJECTIVE 2

Reconnect floodplain habitats with the Bitterroot River to allow natural overbank and backwater flooding into and out of the floodplain during high flow events to support and expand the health, diversity, and extent of the riparian woodlands that could provide breeding, nesting, feeding, or migration habitat for target species (table 9) (over the next 15 years).

Strategies

- Construct wide spillways in or remove artificial levees, roads, and ditches that prohibit overbank and backwater flooding of the Bitterroot River and disrupt natural sheet flow into the central floodplain of the refuge.
- Work with engineers and hydrologists, contracting as necessary, to determine and design the best methods available to remove structures, level ditching, and islands that are impeding natural overbank and backwater flooding on the refuge, including Ponds 11–13.
- Improve high water flow west of Ponds 6–10 into and through historical slough and swale channels by removing obstructions, levees, and dams in and across these drainages. File for changes to existing water rights as directed by the Service's water resources division.
- Monitor and treat invasive species as necessary, particularly on newly exposed soils.
- Monitor the abundance and distribution of target species to determine the success of management techniques and use adaptive management to ensure the refuge is using the most effective methods and proven technologies.

Rationale

The diversity and productivity of the Bitterroot River Valley at and near Lee Metcalf Refuge was created and sustained by a diverse floodplain surface that was seasonally inundated each spring from both flooding of the Bitterroot River and drainage or seepage from surrounding mountain slopes. Occasional overbank and more regular backwater flooding from the river into its floodplain at the refuge historically helped create and sustain communities and basic ecological functions and values of the site. These flooding processes on the refuge are now restricted by levees along the river, levees and dams on constructed wetland impoundments, roads, the railroad bed, and dams or other obstructions on tributary channels.

To restore the floodplain system at the Lee Metcalf Refuge, restoring the capability of the Bitterroot River to overflow its banks and to back water up tributaries and into other floodplain channels is desirable. The seasonal "pulsed" flooding regime provided uninhibited movement of water, nutrients, sediments, and animals between the river and the floodplain and supported life cycle events and needs of both plant and animal communities. Periodic long-term floods are also important floodplain processes that help maintain community dynamics and productivity. For example, overbank flooding deposits silts and nutrients in floodplains that enhance soil development and productivity. Overbank flooding also creates scouring and deposition surfaces critical for germination and regeneration of riparian woodland species, especially cottonwood (Heitmeyer et al. 2010). Backwater flooding provides foraging habitat for pre-spawning native river fish and rearing habitat for larval and juvenile

fishes. Annual backwater flooding recharges water regimes in depressions and shallow floodplain wetlands that serve as productive breeding habitat for amphibians, reptiles, waterbirds, and certain mammals. Subsequent drying of floodplains concentrates aquatic prey for fledgling waterbirds. Collectively, the body of scientific evidence suggests that restoring the hydrologic connectivity between the Bitterroot River and its floodplain at Lee Metcalf Refuge is desirable (Heitmeyer et al. 2010).

The variations in topography and soil created a mosaic of elevations and site-specific hydrology that supported many vegetation and wildlife communities on the Lee Metcalf Refuge. Unfortunately, the topography and flow of water across the floodplain has been altered, initially from land conversion, physical developments, and diversion of water for irrigation and then from construction of water-control infrastructure by the Service in an attempt to create more permanent wetland areas (ponds) for breeding waterfowl. The physical developments on and around the refuge have been detrimental to sustaining the natural functions and processes that made this area so rich and diverse.

Restoration of the physical and biological diversity and productivity of the refuge would require at least some restoration of natural topography, especially reconnecting waterflow pathways or corridors in the floodplain. Restoration of topography and waterflow pathways is important to allow water, nutrients, and animals to move through the system in more natural patterns. Additionally, restoring water pathways can improve both flooding and drainage capabilities to more closely emulate natural hydroperiods that sustained native plant communities (Heitmeyer et al. 2010).

The Service would work with engineers and hydrologists to determine the location, design, and steps needed to effectively restore natural waterflow without damaging other refuge resources or neighboring lands. Some of the options include completely removing levees, breaching them, or constructing a spillway to allow water to pass through a specific area.

One of the areas proposed for restoration is the old residence site on the west-central side of the refuge. This area has several levees that were created to form shallow water ponds. These ponds were abandoned due to an inability to deliver water or because of flooding of the residence due to subsurface waterflows.

There are many levees or berms that are not part of any impoundment. The vegetation on these levees is often a combination of nonnative grasses and invasive species. Keeping these levees and berms could not only inhibit river movements, but it may contribute to the spread of nonnative grasslands and invasive species. Removing these structures, or placing spillways in them, would allow natural backwater flooding and sheet flow to occur, but monitoring backwater areas for invasives would be required. Restored processes would encourage maintenance and propagation of native habitats of the riverfront and gallery forest.

Ponds 11–13 on the north side of the refuge are difficult to manage. These impoundments have fallen into disrepair due to non-operational water control structures and, more importantly, erosion of the impoundment dikes and levees by the Bitterroot River. Maintaining these ponds would be very costly and not very effective in providing habitat for a variety of target migratory floodplain species. The refuge would work with an engineer and hydrologist to transition this area—which currently contains artificial islands, level ditching, cattail monocultures—into riparian woodlands, persistent aquatic vegetation, and uplands to benefit a variety of wildlife species. Initial steps would be to survey topography and design sustainable side channels of the Bitterroot River. Grading and revegetation would follow.

It would be important that the refuge closely monitor and treat newly exposed soils that would provide ideal conditions for the spread of existing and new invasive species. The refuge would have to implement an active treatment and restoration program to prevent this invasion and encourage native vegetation to outcompete less desirable species.

North Burnt Fork Creek Objective (Including Francois Slough)

Within the refuge, reconnect unimpeded flow from North Burnt Fork Creek with flow pathways into the Bitterroot River to reduce creek water temperatures, improve water and nutrient flow, create habitat conditions conducive to native cold-water species and restore riparian woodland habitat that would support target species (within 8 years).

Strategies

- Based on historical channel information (photos, topographical features), reestablish the Burnt Fork Creek entrance into the Bitterroot River where it is sustainable and conducive for native salmonids.
- Work with an engineer and hydrologist to determine the best route for North Burnt Fork Creek to return to the river, considering the requirements of bull trout. Strategically remove water control structures and other obstructions in the tributary and floodplain channels to allow fish and other aquatic animals to use this riparian corridor.
- Through partnerships, attempt to restore river and stream connectivity off the refuge to reestablish natural fish passage and flow pathways in the creek to its upper reaches.
- Monitor and treat invasive species, particularly on newly exposed soils.
- Monitor the changes in water quality to determine the success of management techniques, and use

adaptive management to ensure the refuge is using the most effective methods and proven technologies.

- Monitor the trends in abundance and distribution of target species to evaluate the effectiveness of these proposed actions.

Rationale

North Burnt Fork Creek is a mountain and terrace derived tributary to the Bitterroot River. This stream channel has been altered both off and on the refuge through installation of culverts, bridge crossings, and artificial channels and from using the creek to transport water to wetland impoundments. The refuge has installed water control structures to provide fishing opportunities and has impounded water for waterfowl. Undesirable species, such as cattail and reed canarygrass, formed monocultures along the stream, crowding out and preventing the regeneration of native riparian vegetation such as cottonwood, willow, and dogwood.

Removal of water control structures in the WVA and other areas along the creek would deepen and narrow the streambed, allowing the reconnection of natural streamflows to the Bitterroot River. This reconnection would encourage riparian ecological processes to become reestablished, which may include beaver activity. Additionally, flooding and drainage capabilities would improve and more closely emulate natural hydrological regimes that sustained native plant communities.

Newly exposed soil would provide optimal conditions for invasive species encroachment or monocultures of cattails. The refuge would need to treat cattails and other undesirable vegetation, including invasive species, using various techniques such as prescribed fire and other effective mechanical, biological, and chemical treatments. These methods would also be used to prepare areas for native plant restoration, as needed.

To further encourage riparian habitat restoration, the refuge would plant native vegetation, such as willow and cottonwood, on restored sites. It would be important to monitor the stream's response to the removal of structures and other management actions. Monitoring water chemistry (temperature, dissolved oxygen, total dissolved solids), streamside vegetation, and target species response would help to determine the success of management techniques.

Three Mile Creek Objective

Reestablish a channel to the Bitterroot River that mimics the historical flow pattern of Three Mile Creek to create habitat conditions supporting native coldwater species (cooler water temperature, riffles, deep pools) and the restoration of riparian habitat (within 12 years). This objective would complement the Bitterroot River side channel restoration proposed for Ponds 11–13.

Strategies

- Develop contracts as necessary with engineers and hydrologists to determine and design the best methods available to remove structures, level ditching, and islands. Through partnerships, attempt to restore river and stream connectivity off refuge to reestablish natural fish passages and flow pathways in the creek. File for changes to existing water rights as directed by the Service's water resources division.
- Plant and encourage native vegetation (for example, cottonwood or willow) on restored sites to prevent invasive species encroachment as Ponds 11–13 (see Floodplain Objective 2) dry up and overbank and backwater flow patterns reestablish.
- Treat cattails and other undesirable vegetation using various techniques including disking, prescribed fire, chemical application and other effective mechanical, biological, and chemical treatments to control invasive species and prepare areas for native restoration.
- Monitor the changes in water quality to determine the success of management techniques, and use adaptive management to ensure the refuge is using the most effective methods and proven technologies.
- Monitor the trends in abundance and distribution of target species to evaluate the effectiveness of these proposed actions.

Bob Danley/USFWS

The Service is proposing to restore unimpeded flow from North Burnt Fork Creek and Three Mile Creek into the Bitterroot River.

Rationale

Three Mile Creek is another mountain and terrace derived tributary to the Bitterroot River. Much like North Burnt Fork Creek, this stream channel has been altered both off and on the refuge by the installation of culverts, bridge crossings, irrigation diversions, and artificial channels. This creek contributes a high sediment and nutrient load to the Bitterroot River compared to other tributaries in the Bitterroot watershed (McDowell and Rokosch 2005).

In 1984, three sediment catch pools were built just south of Pond 11 to prevent sediment from entering and filling in Pond 11. The pools were filled to capacity in only 1 year. Then in 1989, as a solution to the sedimentation, Otter Pond was built. The refuge portion of Three Mile Creek was channeled into a bypass directly to the river. Water from Otter Pond was then siphoned under Three Mile Creek to feed Ponds 11-13. Undesirable species, such as reed canarygrass, formed monocultures along the stream, crowding out and preventing establishment of native riparian vegetation such as shrubs and sedges.

Currently, the river's mainstem is directed northward (figure 7), just west of this confluence, and the sediment from Three Mile Creek has created a willow-filled island and beaver ponds within what is now considered part of North Island Slough. Restoring Three Mile Creek to its historical channel would encourage riparian ecological processes to become reestablished. Additionally, overbank flooding capabilities would improve and more closely emulate natural hydrological regimes that sustained native plant communities.

Newly exposed soil would provide optimal conditions for invasive species encroachment. The refuge would need to treat cattails and other undesirable vegetation, including invasive species, using various techniques including prescribed fire and other effective mechanical, biological, and chemical treatments. These methods would also be used to prepare areas for native plant restoration.

To further encourage riparian habitat restoration, the refuge would plant native vegetation, such as hawthorn and dogwood, on restored sites. It would be important to monitor the response of the stream to the removal of structures and other management actions. Monitoring water chemistry (dissolved oxygen, total dissolved solids, and temperature) and streamside vegetation would help to determine the success of management techniques and determine if another method would be more effective.

Riverfront Forest Habitat Objective

Restore regenerating and sustaining mechanisms for riverfront forest communities alongside the Bitterroot River that will provide nesting and migration habitat for target species such as willow flycatcher and Lewis's woodpecker.

Strategies

- Develop a riverfront forest inventory map and compare it with areas where riverfront forest occurred historically. Use this information to determine the most effective and strategic areas for restoration.
- Remove levees, berms, and roads to allow for natural overbank and backwater flooding (see Floodplain Objective 2). These occasional flood events would scour surfaces, deposit sands, and create regeneration sites to restore and sustain riverfront forest vegetation, including cottonwood, along the margins of the Bitterroot River.
- Use prescribed fire and grazing during dry periods to sustain occurrence of grasses and forbs.
- Construct temporary deer exclosures, as needed, to protect newly planted tree areas and regeneration sites.
- Monitor and treat invasive species and promote and restore vegetation native to riverfront forest to provide quality habitat for target species.
- Monitor the abundance and distribution of target species to determine the success of management techniques, and use adaptive management to ensure the refuge is using the most effective methods and proven technologies.

Gallery Forest Habitat Objective

Restore regenerating and sustaining mechanisms for gallery forest communities on higher floodplain elevations (natural levees and benches) in areas with sandy-loam soils, on natural levees, and on other floodplain ridges that have 2- to 5-year flood occurrence intervals in order to sustain and expand nesting and migration habitat for target species such as Lewis's woodpecker, willow flycatcher, and hoary bat.

Strategies

- Develop a gallery forest inventory map to identify its current extent and historical range, particularly along the west side of Ponds 8 and 10. Use this information to determine the most effective and strategic areas for restoration.
- Change the water management of Ponds 8 and 10 to allow for expansion of gallery forest as appropriate on the west side of these impoundments. Utilize prescribed fire, grazing, and chemical applications to manage cattail encroachment, and sustain the occurrence of grasses and forbs.
- Allow for continued natural regeneration of the shrubland component in the gallery forest (hawthorn, alder, wood's rose, and dogwood) while applying and evaluating proven techniques for promoting the shrubland component within the gallery forest.
- Construct deer exclosures to protect newly planted areas and regeneration sites, as needed.

- To protect restoration sites, monitor and treat invasive species using prescribed fire, chemical applications, and mechanical techniques.
- Seed grasses such as bluebunch wheatgrass and Idaho fescue under and between the trees and shrubs to reestablish ground cover and outcompete noxious and invasive plants.
- Survey and monitor the population and response of forest target species prior to and following enhancement and restoration treatments.

Rationale for Riverfront and Gallery Forest Objectives

Historically the Bitterroot River Valley, which includes the Lee Metcalf Refuge, supported a wide diversity of animal species associated with the interspersed riparian forest, wetland, and grassland habitats. The riparian forest is made up of riverfront forest and gallery forest (Heitmeyer et al. 2010).

Riverfront forest includes early succession tree species such as black cottonwood and sandbar willow that are present on newly deposited and scoured gravelly-sand, sand, and fine sandy-loams near the active channel of the Bitterroot River and in sand-outcrop sites next to floodplain drainages. These sites have high water tables for most of the year and are inundated for short periods during high spring river flows almost annually. Regularly scoured soils provide bare soil sites for seed deposition and subsequent germination and growth of willow and cottonwood (Cooper et al. 1999, Heitmeyer et al. 2010)

Gallery forest is dominated by cottonwood and ponderosa pine and is present on higher floodplain elevations along natural levees and point bar terraces adjacent to minor floodplain tributaries. Gallery forest areas often have woody shrubs such as alder, hawthorn, dogwood, and Wood's rose in the understory and mixed grass species such as bluebunch wheatgrass and Idaho fescue under and between the trees and shrubs. The gallery forests were flooded occasionally by overbank or backwater floods from the river and for short durations in the spring (Burkhardt 1996, Fischer and Bradley 1987, Heitmeyer et al. 2010).

Most wildlife species in these forests were seasonal visitors that used resources provided by spring and early summer pulses of water into the system. Riparian woodlands in the Bitterroot Valley were sustained by fertile floodplain soils and seasonal inundation for generally short periods at about 2- to 5-year intervals. Occasional disturbance mechanisms provided suitable substrates for regenerating tree species and shrubs. Riparian woodlands in Montana generally are in poor condition if the shrub components are not present, most commonly due to overgrazing (Heitmeyer et al. 2010).

Collectively, many landscape and hydrological changes in the Bitterroot Valley since Euro-American settlement have dramatically altered the physical nature, hydrology, and vegetation communities of the refuge. Prior to Euro-American settlement, the relatively dry climate of the valley and the migration of the Bitterroot River created a diverse mix of communities including riverfront and gallery forest next to the Bitterroot River and floodplain drainages.

In response to the altered ecological processes, there are now reduced areas of riverfront and gallery forest. Restoration and expansion of the riparian woodlands would be a long-term project that would surpass the life of this plan. Ideally, and over time, using prescribed fire, planting native plants (plugs of dominant tree species and shrubs), treating and controlling invasive species, and restoring hydrological regimes would allow for the restoration of these habitats to support target species.

The refuge does not have a complete forest inventory map. Developing this map would help the refuge determine the extent of this native forest and where it occurred historically; in turn, this would help determine the most effective and strategic restoration areas. However, there are some areas that need immediate attention on the west side of the refuge along the river. Removal of levees and roads would allow overbank and backwater flooding into historical forest areas. This action would scour the surface of the soil and deposit fine sediments, creating conditions to promote cottonwood regeneration—a main vegetative component of the riparian woodlands. The refuge would implement prescriptive fire and grazing in forest areas to allow scarifying of pine cones, which promotes germination of ponderosa pine, another component of riparian woodlands.

Other focus areas would be Ponds 8 and 10. The HGM-derived map of vegetation prior to Euro-American settlement shows this area to be a mixture of gallery and riverfront forest (figure 18). Creating these ponds reduced the amount of native forest habitat. Past water level management has also created very large monocultures of cattails that have reduced the amount of open water available to the waterbirds these ponds were intended to support. Returning gallery and riverfront forest to these historical sites would begin to restore a unique and important habitat to this part of the refuge and the Bitterroot Valley, providing new areas for identified forest target species. The Service would draw down water in Ponds 8 and 10, as needed, to allow for this expansion. The ponds would still be managed for open water, but the water table would be lowered and the amount of cattail surrounding these ponds would be reduced to allow for forest expansion. Reducing cattail is most effective using a variety of methods including prescribed fire, grazing, and chemical applications.

It would be important that the refuge closely monitor and treat newly exposed soils. This newly exposed soil would create ideal conditions for the spread of

existing and new invasive species. The refuge would have to implement an active treatment and restoration program to prevent this invasion and encourage native vegetation to outcompete less desirable species. Additionally, erecting deer exclosures or other plant protectors would help protect tree and shrub plantings from being overbrowsed and killed by deer.

5.3 Goal for Wetland Impoundment Habitat and Associated Wildlife

Where appropriate, manage wetland impoundments to create a diversity of habitats for target waterfowl, shorebirds, and other associated native wetland-dependent species.

Target Wetland Habitat Species

The Service has identified the habitat needs of a diverse group of target waterbird species, including ducks and shorebirds. Providing for the life history needs of these species would provide the natural wetland diversity and conditions needed not only for these target species, but also for an even greater variety of wetland-associated wildlife. Monitoring would focus on these target species to determine their response to wetland management actions.

In the Bitterroot Valley, the Lee Metcalf Refuge is an important refuge for migratory birds during the spring and fall. Waterfowl breeding and brood rearing occurs on Lee Metcalf Refuge with a great variety of waterfowl using the refuge for these life history requirements; however, the refuge is not a major production refuge. The most important habitat management efforts would focus on providing optimal habitat for foraging and resting during migration. Lowering the water levels would serve to increase food availability by concentrating foods in smaller areas and at water depths within the foraging range of target wildlife. The rate and timing of drawdowns have important influences on the production and composition of semi-permanent wetland plants and invertebrates that provide protein-rich food resources (USFWS 1991) for each of these target bird species.

Wetland Impoundment Habitat Objective 1

Over the next 15 years, manage water levels on 628 acres to emulate natural and seasonal water regimes including natural increases in waterflow in the spring followed by rotational drying in the summer and fall. Managed properly, these wetland impoundments, or ponds, could provide a variety of wetland conditions to meet the life cycle requirements of target wetland-dependent species (table 10).

Strategies

- Maintain or replace the water management structures in Ponds 1–6, Ponds 8 and 10, and Otter Pond. The remaining wetland impoundment structures would be maintained as needed.
- Water level management of Pond 8, Pond 10, and Otter Pond would be changed to a more seasonal water regime that emulates natural increases in distribution and depth in spring, followed by drying in summer and fall to encourage the restoration of wetland and shrub habitat. While drawing wetlands down, exposed shorelines would be monitored and treated to prevent invasive species and monotypic stands of cattails from becoming established. File

Table 10. Wetland impoundment target species and their habitat needs.

Species	*Spring migration*	*Forage depth*	*Fall migration*
Birds			
American wigeon	Mid-March to mid-April	5–8 inches	Mid-November to mid-December
Redhead	Mid-March to mid-April	6–30 inches	Mid-November to mid-December
Marbled godwit	Early May to early June	Mudflats, 0–4 inches	Early July to early September
Long-billed dowitcher	Mid May to mid-June	Mudflats, 0–4 inches	Early July to early September
American bittern	May to June	Mudflats, 0–4 inches	July to September
Amphibians			
Species	*Habitat*	*Breeding*	*Active period*
Boreal toad	Wide variety; survive best in shallow ephemeral ponds to avoid American bullfrog predation	April to mid-July	April to October

Sources: Gratto-Trevor 2000, Lowther et al. 2009, Mowbray 1999, MFWP 2005, Montana Bird Distribution Committee 1996, refuge data, Takekawa 2000, Texas State Parks and Wildlife 2011, Woodin et al. 2002.

for changes to existing water rights as directed by the Service's water resources division.

- Prevent invasive species encroachment into newly exposed soil using various mechanical, biological, and chemical treatments to control invasive species and prepare areas for native restoration.
- Manage, or maintain, a hemi-marsh condition of the ponds to create a ratio of 50:50 open-water to emergent vegetation (such as bulrush and cattail), providing optimal breeding and brood rearing habitat for diving ducks and dense emergent vegetation over water 2–8 inches deep for bitterns.
- Manage or maintain dry ground with tall grasses and mixed herbaceous cover for dabbling ducks.
- Provide short, grassy-cover uplands—well away from wetland edges—for shorebird nest sites.
- Emulate long-term patterns of drier conditions in floodplain wetlands in most years including periodic complete drying in some years and occasional prolonged flooding in a few years.
- To determine the water-level targets needed to provide adequate food, cover, and nesting substrate for target waterbird species, install staff gauges in all wetland impoundments.
- Determine the feasibility and methods for restoring the historical flow of the side channel of the Bitterroot River and Three Mile Creek through Ponds 11 through 13 to restore riparian habitat (see Floodplain Goal) and reestablish unimpeded flow to the river.
- Monitor the trends in abundance and distribution of target species to evaluate the effectiveness of these proposed actions.

Rationale

Wetland impoundments on the refuge were constructed and developed to provide open water habitat for migratory waterfowl and shorebirds. However, past management has not consistently emulated seasonal or long-term dynamics of water levels that naturally occur in wetlands. Instead, water regimes have consisted of drawdown in the spring to provide mudflats for shorebirds, followed by flooding the ponds for nesting waterfowl. The ponds would then stay full during the summer until early fall with drawdown again for shorebirds, followed by flooding for migratory waterfowl and to enhance waterfowl hunting opportunities. This water regime occurs only on some ponds while others—notably Pond 6, Pond 8, Pond 10, and Otter Pond—are usually full year-round. These permanently flooded wetlands have experienced algal blooms, encroachment of cattails, and it is assumed, low productivity and nutrients. Overall, it is suspected that the refuge's past water regime has not provided the optimal habitat for target wetland species.

Researchers from the University of Montana have been investigating the contamination of mercury on the refuge and elsewhere in Montana. It is theorized that there has been bioaccumulation of methyl mercury as a result of stagnant water, and mercury concentration in fish on the refuge has been high (Langner et al. 2011). It is possible that mercury may have also contributed to the decline of osprey populations over the years and has prompted concern of contamination in osprey eggs, making some non-viable (Heiko Langner, personal communication, professor of biological sciences, University of Montana, November 2010 and February 2011).

To provide optimal habitat, increase nutrient uptake and plant productivity, and decrease methylization of mercury, the Service would manage Ponds 1–6, Pond 8, Pond 10, and Otter Pond for a more seasonal and annually dynamic water regime by increasing water levels in spring and rotational drying in summer and fall. Rotation of ponds with drawdowns would depend on annual habitat objectives and responses of target wildlife to water regimes. To manage and move water more effectively, the refuge would need to replace old, dilapidated water management structures as well as structures that are not effective due to size. Some of the existing structures are extremely unsafe and require more than one person to operate. Replacement of these structures would provide more cost effective and safe operations. It would also be important for the refuge to manage cattails and prevent their further encroachment into open water. Cattail is very difficult to control, and management would require a variety of methods such as prescribed fire, grazing, and chemical application. It would be important that the refuge closely monitor water levels and quality to evaluate the effectiveness of any water regime. Documenting the response of target species would also help evaluate the effectiveness of this management program while using adaptive management to ensure that the refuge is using the most effective methods and proven technologies.

Wetland Impoundment Habitat Objective 2

Where appropriate, reduce the area of more permanently flooded wetland impoundments and persistent emergent vegetation to restore native plant communities, such as gallery forest, while improving the diversity and productivity of the remaining impoundments for the benefit of target waterbird species (over the next 10 years).

Strategies

- Remove levees, ditches, and water control structures from abandoned wetland impoundments to facilitate the restoration and expansion of the gallery forest (Ponds 7, 7a, 7b, 9, and D) and native grassland (Pair Ponds and Potato Cellar Pond) habitat.

Bob Danley/USFWS

Restoring and expanding gallery and riverfront forest would enhance habitat for species including brown creeper and hoary bat.

- Reduce Pond 8, Pond 10, and Otter Pond in size, as appropriate, to allow for the restoration of gallery forest habitat. File for changes to existing water rights as directed by the Service's water resources division.
- Treat exposed shorelines to prevent invasive species and monotypic stands of cattails from becoming established prior to restoration. Use a variety of management techniques such as prescribed fire, chemical application, livestock grazing, and mechanical means.
- Monitor the trends in abundance and distribution of target species to evaluate the effectiveness of these proposed actions.

Rationale

Refuge lands around and within Ponds 8 and 10 were once a mixture of riverfront and gallery forest, but today this habitat is much less extensive here and in the Bitterroot Valley. Creating these ponds reduced the amount of forest habitat and created open water. Over time, these ponds have been covered by large areas of cattails which reduced the amount of open water available for waterbirds. Managing these permanently flooded ponds for open water is not the highest and best use of this habitat type due in part to a lack of nutrient cycling, a reduction in early successional submergent vegetation, and the spread of monotypic cattail stands. These stands are difficult to control and provide minimal habitat for target wildlife species.

The best use of this area is to restore and expand the gallery and riverfront forest in these historical sites, thereby enhancing the habitat needed by native forest target species such as brown creeper and hoary bat. The Service would draw down water in Ponds 8 and 10 and Otter Pond to allow for this expansion. The ponds would still be managed for open water, but the amount of cattail surrounding these ponds would be reduced to allow for forest expansion and restoration. Some of the most effective methods for reducing cattails are prescribed fire, grazing, and chemical applications; it is important to use the right treatment at the right time to be effective and prevent further spread. In addition to reducing the ponds in size, the refuge would replace the water control structures on Ponds 8 and 10 to allow more effective, productive water level management on the remaining wetland area.

There are several old and abandoned ditches and levees throughout the refuge from former attempts to impound water. These attempts have failed due to lack of water availability and the inability of the soil to hold water. These levees, ditches, and water control structures would be removed to facilitate the restoration of gallery forest in Ponds 7, 7a, 9, and D and native uplands in Pair Ponds and Potato Cellar Pond.

Gravel Pits Objective

Use the gravel pits—created when gravel is harvested east of the Bitterroot River—to provide nursery habitat for amphibians such as the boreal toad, a State species of concern, and the Columbia spotted frog.

Strategies

- Remove vegetation and soil from the artificial gravel pits to restore the desired habitat conditions for amphibians, as appropriate. If necessary, harvest gravel October through March, avoiding disturbance and displacement of any amphibians during breeding season.
- Manage these old gravel pits as ephemeral pools to discourage the American bullfrog, an invasive predator of amphibians and other desirable native species.
- Survey amphibian populations and monitor the response of amphibians to determine the success of management techniques. Adapt management techniques to ensure the refuge is using the most effective methods, research, and proven technologies.

Rationale

Since the 1990s boreal toads have been declining throughout the Rocky Mountains. In Montana, the species status is uncertain, but it has been listed by the State as a species of concern. There are relatively few known breeding populations.

Throughout its life cycle, the boreal toad utilizes a wide variety of habitats including streams, wet meadows, beaver pools, marshes, and lakes. They prefer shallow areas and edges with mud bottoms. These gravel pits have become shallow, disturbed gravel ephemeral pools—desirable breeding habitat for these toads. In 2001, researchers on the refuge found 20,469 eggs from a single female in a refuge gravel pit. This was the largest clutch ever reported for this species (Maxwell et al. 2002).

It is suspected that breeding boreal toads are limited to just a few areas on the refuge, like the gravel pits, due to American bullfrog predation, an invasive species that has been introduced throughout the western United States. Introduced in Montana sometime before 1968, the bullfrogs have been documented all along the Bitterroot River and extensively throughout the refuge. This species is so widespread throughout the Bitterroot Valley, it is almost impossible to control through treatments other than removing their desired habitat, which affects native species. Extremely territorial, they are voracious predators that feed on young birds, fish, snakes, crayfish, invertebrates, and other amphibians. This feeding behavior allows them to displace native species easily (Werner et al. 2004). They have been implicated in extirpations of amphibians and declines in waterfowl production (State of Montana 2011). Any suitable pond habitats available for native amphibians are typically occupied solely by American bullfrogs.

The American bullfrog is highly aquatic and spends much of its life in warmer permanent water. As the gravel pits are fairly shallow and ephemeral in nature, they experience dry periods. This hydrology is not conducive to the life cycle of the American bullfrog. The refuge would continue to manage these old gravel pits as ephemeral pools to discourage American bullfrogs. This would serve to maintain, if not promote, boreal toad populations. Columbia frogs have similar habitat needs as the boreal toad; however, they prefer emergent and aquatic vegetation. Removing too much of this vegetation for boreal toad larval habitat may impact the other native frogs that use these gravel pits.

5.4 Goal for Grassland and Shrubland Habitat and Associated Wildlife

Create the conditions that will allow for the restoration, maintenance, and distribution of native grassland and shrubland species (such as rabbitbrush, needle and thread grass, Junegrass, and hairy golden aster) to provide healthy lands for a diverse group of target native resident and migratory wildlife species and to educate visitors about the historical plant and animal diversity of the valley.

Target grassland and shrubland species

The Service has identified the habitat needs of a diverse group of target upland (grassland and shrubland) species (table 11). Providing for the life history needs of these species would provide the natural upland diversity and conditions needed not only for these targeted species but an even greater variety of upland-associated wildlife. Monitoring would be focused on these target species to determine their response to upland management actions.

Steve Maslowski/USFWS

The bobolink is a target species for the grassland and shrubland areas.

Grassland and shrubland habitat objective

Reduce the presence of invasive species to facilitate the restoration, maintenance, and distribution of native grasslands and shrublands in higher floodplain elevations and terraces and on alluvial fans (over the next 10 years).

Strategies

- Use Service staff and equipment—possibly in combination with cooperative farming—to plant annual grain crops (including glyphosate-tolerant crops) to eliminate invasive species, including the seedbed, and to prepare an area for restoration to native plant species (over 5–10 years).
- As appropriate, keep some fields fallow using repeated disking or chemical applications to continually treat and reduce invasive species. Some fields may also be planted to winter wheat to reduce erosion from wind and runoff.
- Use small tame grassland sites to determine the best methods to restore native plants and shrubs on the refuge both with and without irrigation.
- Continue to implement and evaluate tested techniques for reducing cheatgrass.
- Use fire, grazing, seeding, and other proven techniques to facilitate the spread and distribution of remnant native species into areas surrounding existing native grassland and shrubland sites.
- Systematically convert tame grassland areas to native species of grass, forbs, and shrubs using direct seeding, irrigation (where possible), prescribed fire, and other mechanical, chemical, and biological methods.

Table 11. Target species for the grassland and shrubland areas and their habitat needs.[1]

Habitat	*Vegetation height*	*Vegetation cover*	*Litter and/or residual cover*	*Area requirements*	*Nesting or breeding (after 1991[2])*	*Migration*
Western Meadowlark						
Open, treeless areas with widely dispersed shrubs	Varies—shortgrass prairie to mixed and tallgrass prairie	Nest sites in grass clumps or next to prickly pear	Abundance is positively correlated with litter depth	5–32 acres depending on vegetation height; more abundant on interior plots >656 feet from edge	X	X
Bobolink						
Mixture of grasses and broad-leaved forbs	2–6 inches	Nests beneath the shade of forbs; no nests found where grass is only concealment	Density is higher in areas with low total vegetation cover but with high litter cover (hayfields >8 years old)	2–4 acres depending on habitat quality; on fields >74 acres, there are more than twice the number of males than on fields <25 acres	X	X
Grasshopper Sparrow						
Idle grasslands with clumped vegetation interspersed with bare ground.	Intermediate, >4 inches	Bird numbers are positively correlated with percent grass cover (the more cover, then the more birds)	Moderately deep litter and sparse cover of woody vegetation	Average size is <5 acres but prefers 20–74 acres; more abundant on interior plots >656 feet from edge		X
Brewer's Sparrow						
Considered a sagebrush obligate species; moderate shrub cover	2–5 feet	>10% average shrub cover; abundance decreases as shrub cover falls below 10% and over 50%; nests on shrubs 9–75 inches in height	No information	Usually 1–5 acres		X

[1] *These species do not currently nest on the refuge in great numbers, but with restoration of these desirable habitat qualities, it may allow them to become reestablished.*
[2] *Refuge data.*
Sources: Dechant et al. 2002a, 2002b; Martin et. al 1995; MFWP 2005; Montana Bird Distribution Committee 1996; Texas State Parks and Wildlife 2011; Walker 2004.
Abbreviation: X = recorded use on the refuge.

- Restore intermittent and seasonal water regimes to higher elevation sites within the floodplain and restore patterns of sheet flow surface water movement across the sites by removing unnecessary roads (figure 8), ditches, levees, and other infrastructure.
- Based on soil type, convert higher elevations of current impounded wetlands (that is, Pair Ponds and southwest corner of Field S–1) to native grassland and shrubland by removing levees and water control structures and restoring seasonal water regimes. Seed tame grassland fields with nonnative grasses (not noxious) to outcompete the noxious and invasive weeds. Once these are established, interseed native grasses, forbs, and shrubs.
- Due to a lack of irrigation and moisture, use native seed that can be germinated with minimal moisture.
- Where possible, harvest native seed from plants found on the refuge.
- Based on historical frequencies and the habitat requirements of target species, provide occasional disturbances from fire, mowing, or grazing to recycle nutrients and regenerate grass, shrub, and forb species.
- As saline soils require a different seed mix and management, determine where these soils exist and map them in RLGIS.
- Monitor trends in abundance and distribution to evaluate the effectiveness of these proposed actions.

Rationale

Soil maps reveal that most uplands on the refuge were historically covered with grasses and some scattered shrubs. Some areas experienced occasional flooding and

Bob Danley/USFWS

Service equipment would be used to plant annual grain crops to eliminate invasive species.

had more wet grassland communities interspersed with herbaceous plants such as smartweed and sedges. By contrast, higher floodplain terraces, slopes, and alluvial fans included mixed wet and upland-type grasses and shrubs such as rabbit brush, sage, needle and thread, and Junegrass (Heitmeyer et. al 2010). These uplands were altered by farming and agricultural practices. Very little, if any, native grassland and shrubland was intact when the refuge was established. Some of these agricultural and tame grass fields are heavily infested with invasive species and provide minimal habitat value to upland wildlife, such as grassland birds. Since refuge establishment, the uplands have continued to undergo various management techniques, and there has been no long-term management approach due to a lack of management plans. Since 1873 the soils in these uplands have been altered and disturbed by farming and agricultural practices; they have also been affected by the change in system hydrology due to irrigation practices, impoundments, roads, and levees (Graham 2009). While the refuge retired these tame grasslands and rested them for many years, invasive plants such as spotted knapweed, cheatgrass, and Canada thistle have become widespread in these areas. This has reduced the tame grasses that can provide some habitat value for grassland nesting birds.

There are many challenges to restoring the uplands. Restoration would be costly and time consuming. To begin restoration, the refuge would first focus on treating and eliminating invasive species and testing restoration techniques in small patches of tame grassland sites. Since many of these areas do not have irrigation, it may be challenging to germinate some native grassland seed. Many of the upland field soils receive no moisture or shade from the drying sun. This has resulted in a hard soil cap that is almost impossible for native vegetation to take root in and seed successfully. Grazing or disking may help to break up this soil cap to allow for seeding.

Treatment and restoration would be accomplished through a variety of methods including chemical applications (using the Service's approved chemicals only), cropping for multiple years prior to seeding with natives, mowing, grazing, prescribed fire, and direct planting. Effectively controlling invasive species may require using several of these methods (see section 5.5, "Goal for Invasive and Nonnative Species").

To reduce the invasive weed seedbed, formerly disked and farmed fields with considerable amounts of invasive species would be planted to small grains for several years. Using herbicide-treatable seed and applying herbicide would reduce the weed seedbed that has built up in these soils for years. The small grain crops would also provide an interim wildlife food source for a number of migratory birds and resident wildlife. Some fields would also be kept fallow and disked at strategic times when invasive plants begin to grow. This farming would stimulate the weeds to grow and then they would be mowed and, in some cases disked, prior to seeding. Winter wheat could be used on these fallow fields to reduce erosion from wind and runoff. These fields would be disked again in the spring. Once the resprouting of invasive plants is reduced (after 4–7 years), restoration to native plants would begin and soil disturbance would cease. Upland Fields I–1 through I–7 could potentially be irrigated by a wheel line (figure 7). However, the wheel line is expensive and time consuming to repair and operate. The refuge would use irrigation where it would be beneficial for the transition from small grains to native grasslands. Many of the former agricultural fields are dominated by cheatgrass and smooth brome. Upland Fields S–1 and S–2 are subirrigated units with a high water table that keeps the soil somewhat moist. These fields have more of a mixture of grasses but still have considerable invasive species. Canada and musk thistle are rapidly invading these fields in the south part of the refuge.

Other potential treatment and restoration sites include formerly impounded areas and proposed restoration sites where the Service would remove levees, berms, and water control structures by the old residence site; Ponds 7, 7a, 9, and D; and Pair Ponds (see section 5.3, "Goal for Wetland Impoundment Habitat and Associated Wildlife," and figure 7).

5.5 Goal for Invasive and Nonnative Species

Prevent, reduce, and contain the invasion and spread of noxious, invasive, and harmful nonnative species within the refuge while working with partners to address off-refuge infestations within the surrounding landscape.

New invasive species objective

Within 5 years, establish a baseline inventory of all invasive plants including noxious weeds for the refuge to develop thresholds or triggers for management actions and priority management areas.

Prevent, monitor, and treat all new invaders or small infestations for early detection and rapid response (for example, blueweed, hoary alyssum, and Dalmatian toadflax) to prevent establishment and additional management burden for invasive species.

Strategies

- Recruit one biological science technician to coordinate the IPM program.
- Continue to map known locations of early invaders and continue to update the database as areas are treated.
- Train and/or certify employees and cooperators (including the Service's strike team) in invasive species identification, mapping techniques, mechanical techniques (shovel, hand pulling, and netting) and chemical application.
- Prioritize treatment in those areas where restoration is occurring and in heavy public use areas.
- Through partnerships, determine the presence of known and new harmful wildlife and insect species and treat them as needed. Through partnerships, develop a program to treat and monitor off-refuge sources of early invaders.
- Actively include volunteers, cooperators, and community support groups in new invader treatment and restoration programs.
- Develop a partnership with MFWP and Ravalli County to monitor aquatic invaders.
- Use geographic information system (GIS) technologies to map treated sites and monitor and retreat areas to prevent reintroduction and spread.

Established invasive species objective

Reduce infestations of Canada thistle, spotted knapweed, common tansy, houndstongue, reed canarygrass, cheatgrass, and musk thistle by at least 20–30 percent (measured by canopy cover) over 15 years. Reduce infestations of tall buttercup, yellowflag iris, leafy spurge, St. Johnswort, oxeye daisy, yellow toadflax, and common bugloss on the refuge by at least an average of 45–50 percent (measured by canopy cover) over 15 years.

Strategies

- Using RLGIS, continue to monitor invasive species distribution and abundance and use this information to prioritize treatment, monitor treatment sites for effectiveness, and re-treat as needed.
- Train and/or certify employees and cooperators (including the Service's strike team) in invasive species identification, mapping techniques, mechanical techniques (shovel, hand pulling) and chemical application.
- Monitor and re-treat areas to reduce patch sizes and to prevent reintroduction.
- Continue to use partnerships to treat known invasive species areas, including off-refuge sources of invasive plants.
- Expand capabilities to treat and restore identified priority areas to create contiguous blocks of native habitat for native wildlife species.
- As soil is disturbed for restoration and management activities, treat these areas for invasive plants and restore them to desirable or native species.
- Only purchase gravel for the refuge that is certified weed-free.
- Review and update the IPM plan.
- Through partnerships, attempt to prevent the reinvasion of treated areas from off-refuge sources.
- Actively involve volunteers and community support groups in education and outreach to increase awareness and prevent establishment of invasives.
- Work cooperatively with the Whitetail Golf Course, located within the refuge boundary, to address invasive species that can be transported to the refuge.

Rationale for New and Established Invasive Species

Due to changes in the refuge's landscape—including conversion of native habitat to agriculture (prior to refuge establishment) and the advancing of nonnative species across the landscape—the refuge is infested with at least 15 invasive plant species. These invasive species are so widespread that the refuge is challenged in fulfilling its wildlife conservation mission with respect to biological diversity and biological integrity.

These invasive plants can displace native vegetation over large areas and form nearly monotypic stands in the absence of management—accordingly, they threaten native biodiversity (Bedunah 1992, Hutchison 1992). The control or elimination of invasive plants on Service lands would comply with State and Federal laws for invasive and noxious species, including all Service policies pertaining to chemical treatments.

The treatment of weeds requires two different tactics. The first, Early Detection and Rapid Response, focuses on treating new invaders to prevent establishment, which would add to the existing management burden. New invaders are species that are present in small infestations or which have recently been documented on the refuge and are not widespread or well documented. The second tactic involves continual treatments to reduce the size of larger, established

infestations. These areas would be targeted repeatedly in multiple-year treatment plans. All invasive species treatments would require monitoring to measure their effectiveness and allow adaptive management as necessary.

Invasive plant management requires baseline information of size, canopy cover, location relative to priority wildlife habitat areas, and rate of spread to be able to determine the most cost-effective management strategies. An inventory would help prioritize management areas and strategies for eliminating new and isolated infestations, containing them, or reducing larger infestations. Using IPM techniques, the refuge would develop both short- and long-term plans to target and reduce the low, medium, and high ranking infestations of weeds. Montana Department of Agriculture ranks invasive noxious weeds on the degree of infestation and threat to the State. Using these rankings and the degree of threat to refuge lands, the refuge has developed high, medium, and low rankings for treatment. High ranking species are those that are just arriving on the refuge in very small infestations—that is, new invaders. Targeting these species before they become more established is critical. Medium ranking species are those that are more abundant and a bit more established than high ranking species. Finally, low ranking species are those that are well established and cover a lot of acreage, making their control and eradication more challenging, much more costly, and often less successful than smaller infestations.

Controlling invasive species must start on the ground level with education and training because prevention is the most cost-effective management method. Employees, volunteers, and cooperators would be trained in species identification including how to identify new invaders. Each would be trained on how to treat invasive species and which technique (chemical, mechanical, biological, or cultural) is most effective for each species, including timing and duration.

Employees travel all around the refuge, and thus they are highly likely to transport weeds; therefore, the refuge would make sure that all employees can identify weeds and at least one employee maintains a pesticide applicator's license. Steps would be taken to reduce the probability of transporting weeds, such as washing equipment before transporting it to another location. Additionally, any dirt work that is performed would be immediately followed by reseeding of desired species and treatment of invasives.

Infestations of invasive species from adjoining lands have increased in recent years. The refuge would continue to develop its partnership with the Ravalli County Weed District to provide education to adjoining landowners on weeds and their detrimental effects on habitat. A program would be developed to treat and monitor off-refuge sources of new invaders.

As more established and larger infestations are targeted, such as those in upland fields, focus areas would be developed to maintain consistent treatment and monitoring over several years in one area to prevent reintroduction of invasive species. The refuge would recruit volunteers and youth groups for this effort.

Invasive species treatment is an important step in habitat restoration; however, once native plant species become established, they should resist reinvasion.

5.6 Goal for Research

Pursue and maintain compatible research projects that would provide information on refuge resources and address refuge issues to assist management in making decisions based on the best available information and science.

Research Objective

Identify and support research projects that substantially benefit the refuge and species conservation and management (for example, floodplain restoration, target species studies, and public use).

Strategies

- Evaluate all current research projects to determine their value in addressing refuge management objectives and concerns.
- Focus wildlife research on assessments of species–habitat relationships.
- Identify, design, and conduct issue-driven research and work with universities to develop senior thesis projects, graduate projects, or other research proposals that would address identified issues or provide useful data for management actions and adaptive management. Continue to participate with other Service divisions and the State in researching wildlife diseases on the refuge.

Bob Danley/USFWS

A bird on Lee Metcalf Refuge is banded for research purposes.

- Evaluate impacts on both ground and surface water quality from off-refuge water sources including supply ditches, creeks, and other public inputs (for example, subdivisions, septic systems, and underground tile). Continue to participate in the Montana Bureau of Mines and Department of Environmental Quality research on ground water quality impacts.
- Work with partners, including universities, to research methyl mercury contamination and the potential correlation with the osprey population on the refuge.
- Work with partners to provide opportunities to research the best methods and net effects of restoring refuge habitats, particularly gallery and riverfront forest, and reconnecting waterways to the Bitterroot River.
- Complete a forest inventory (baseline) and upland inventory (baseline) prior to major restoration activities to better understand and monitor the response of those vegetative communities to restoration efforts and other management actions.
- Investigate the relationship of how water moves through the refuge by recording data such as the arrival of irrigation water, ground water movements, water level management, and the fluctuating water levels of the Bitterroot River.
- Through partnerships, investigate the impacts and monitor changes to refuge habitats and wildlife as a result of climate change. Use these results to adapt refuge management programs to the changing environment.
- Seek out grant opportunities to fully or partially fund research projects.
- Use an adaptive management approach to incorporate ongoing research and monitoring results into management options and decisions.

Rationale

Past research conducted on the refuge has been beneficial in understanding resources and making management decisions. However, no concerted effort has been made to design a research program based on the refuge's most pressing issues or to provide missing data for effectively managing and restoring habitats. The habitat-based goals and objectives in this CCP would form the basis for establishing research and monitoring priorities for the refuge. The restoration proposals would provide a number of research opportunities to both develop restoration methods and study their effects.

To ensure that research proposals address refuge issues and inform management decisions, research proposals would be evaluated to determine if they support refuge research objectives and needs. The refuge would also present research opportunities to other partners such as universities. Partnerships are critical for achieving the research goal and objectives. Cooperative efforts—such as shared funding, lodging, vehicles, equipment, knowledge, and expertise—are needed to accomplish research projects.

5.7 Goal for Cultural Resources

Provide opportunities for visitors to learn about the unique glacial, Native American, and Euro-American history of the Bitterroot Valley while maintaining and protecting the integrity of the refuge's cultural and historical resources.

Cultural Resources Objective 1 (Protection)

Through partnerships, systematically develop a comprehensive cultural resource inventory for the refuge, giving priority to proposed habitat restoration sites, and preserve and protect all known cultural resources while ensuring future activities comply with Section 106 of the National Historic Preservation Act.

Strategies

- Work with the zone archeologist, contractors, local tribes, the State Historic Preservation Office, universities, and other partners, to start developing a comprehensive cultural resource inventory.
- Use the Montana statewide cultural resource inventory list to determine sensitive sites before conducting activities (such as construction or excavation) that may disturb these sites.
- Document discovered cultural resource sites and ensure their protection.
- Continue to comply with Section 106 of the National Historic Preservation Act before starting projects.

Bob Danley/USFWS

Volunteers help restore the Whaley Homestead, which is listed on the National Register of Historic Places.

- Collaborate with universities and anthropology students looking for projects and inventory opportunities.
- Develop a partnership with the Native American studies program at the Salish Kootenai College to better understand the significance and cultural history of the refuge area to the Salish and other tribes.

Rationale

The Bitterroot Valley has a rich history and a dynamic culture. Ideally, a comprehensive inventory would help better describe that history on the refuge and ensure the protection of cultural resources. However, these types of inventories are time consuming. Throughout the life of this 15-year CCP, refuge staff would work with partners and the regional archaeologist to begin documenting cultural sites, focusing first on any areas proposed for restoration or other developments.

Prior to Euro-American settlement, the Salish people called this valley home for several centuries, and literature shows that there were several Salish campsites on the refuge. Within decades of the passage of Lewis and Clark through the Bitterroot Valley in 1805 and 1806, other Euro-Americans followed. The first Euro-American settlers were fur traders who built a fort and later Jesuit priests who built a mission. The area surrounding the mission became the oldest community in Montana: what is now the town of Stevensville. As more Euro-Americans settled in the valley, the land and waters that had provided the Salish people with their traditional supplies and foods, such as the bitterroot plant, were converted to grazing and agriculture. In 1891, the United States Government relocated the Salish people to a reservation in the Jocko Valley. Since that time, almost all of their traditional sites for gathering native plants in the Bitterroot Valley have been developed.

The arrival of Euro-American settlers forever changed the landscape and the uses of this valley from traditional harvesting of native plants and wildlife to intensive agriculture. One of the earliest homesteads in the valley was the Whaley Homestead, located on the refuge and listed on the National Register of Historic Places. This homestead was established by Indian Agent Peter Whaley in 1885 and survives as an outstanding example of frontier architecture. Weatherboard siding conceals a massive, complicated understructure of square-hewn logs. The Service would continue to weatherproof and seal this structure to prevent physical deterioration from climate and animals.

Federal laws and policies mandate the identification and protection of cultural resources on Federal lands. Section 106 of the National Historic Preservation Act requires Federal agencies to consider the effects on cultural resources before conducting any Federal action. Without a complete inventory, the refuge's identification of all cultural resources is incomplete. Until the inventory is completed, the staff would continue to work with the regional archaeologist and State Historic Preservation Office on a case-by-case basis to evaluate projects with the potential to cause impacts.

Cultural Resources Objective 2 (Interpretation)

Through partnerships, develop a multimedia education and interpretation program that provides visitors with information about the unique history and culture of the Bitterroot Valley and the refuge. Topics would include the Salish, Pend d'Oreille, and Nez Perce tribes; Lewis and Clark expedition; Euro-American settlement; and the Whaley Homestead. These displays and programs would also highlight the effects—both positive and negative—of these peoples, events, and land uses on the resources and ecology of this area.

Strategies

- Work with tribal, State, and other partners to create professionally planned and produced displays at kiosks and at the expanded visitor center that interpret the unique culture and early history of the refuge and the Bitterroot River Valley, including the traditional uses of native plants.
- Partner with volunteers and other interested organizations to restore and interpret the Whaley Homestead site. Once restored, consider creating a visitor contact area and history displays, including period furniture.
- Working with Salish Cultural Committee, incorporate traditional Native American place names and the history of place names in interpretive signage, as appropriate.
- Work with refuge partners to determine what degree of interpretation and accompanying restoration is needed for the Whaley Homestead.
- Develop a set of education kits highlighting the unique history of the refuge and the Bitterroot Valley.
- The refuge would continue to identify and interpret historical and nationally designated trails that pass through the refuge including the Nez Perce (National Historic Trail) and Ice Age (National Geologic Trail).

Rationale

Cultural resources interpretation communicates important messages about the area's history, context, and resources to diverse audiences. A tremendous opportunity exists to work with partners, including the Confederated Salish and Kootenai Tribes culture committee and other State and Federal agencies, to develop a comprehensive interpretive program that adequately describes the significance and history of this valley and the refuge. Thousands of Native Americans

once lived throughout the valley, although many of their traditional sites have been lost to development. The refuge contained many of the resources that would have been needed to live and survive, including the Bitterroot River and native plants; however, no known traditional sites have been identified on the refuge. The refuge and the surrounding Bitterroot Valley also have a rich history of Euro-American settlement, including the earliest town in Montana, Stevensville.

Several major historical and cultural sites occurred or occur on or within 5 miles of the refuge: Salish camps, Lewis and Clark National Historic Trail, St. Mary's Mission, Fort Owen, Whaley Homestead, and Nez Perce National Historic Trail. The buildings of St. Mary's Mission, Fort Owen, and the Whaley Homestead are all on the National Registry for Historic Places. Additional signage and interpretation programs would need to be developed to interpret these sites.

Very little interpretation of the Whaley Homestead has been completed because of its current condition. The structure is not safe enough to allow visitors to regularly walk through the building, despite the resources and time the refuge and other partners have dedicated to maintaining it. A National Register of Historic Places sign does provide some history of the site. The interior has been updated by the occupants over the years but does not match the period of the late 1800s. To properly interpret this site while protecting the structure and visitors, the refuge would need to determine what level of interpretation is appropriate and then work with partners to restore and interpret this historical homestead based on these guidelines. To date many refuge partners have expressed enthusiasm and willingness to help restore the site (in part by providing period furniture). Such efforts could ultimately allow visitors to enter this home and interpret the history of early settlers. Nevertheless, these efforts would be costly, and the Service must ensure that this historical structure remains protected.

The overarching interpretive theme for the Whaley House would be land use and its effects on wildlife. Topics would include hydrological changes, agricultural practices, grassland conversion, lumber and forest ecology, and native plant usage, all of which have and would continue to affect refuge resources.

5.8 Goal for Visitor Services

Provide visitors of all abilities with opportunities to participate in and enjoy quality, compatible wildlife-dependent recreation, environmental education, and interpretation programs that foster an awareness and appreciation of the importance of protecting the natural and cultural resources of the refuge, the Bitterroot Valley, and the National Wildlife Refuge System.

Hunting Objective

Continue to provide and improve the quality of waterfowl and deer hunting opportunities, facilities, and access points to provide for the safety and enjoyment of refuge hunters of all abilities and work with the State to determine if additional opportunities for hunting white-tailed deer hunting opportunities could be provided.

Strategies

- Continue to provide a quality white-tailed deer (archery only) hunt on designated lands according to State regulations. Continue to provide a quality waterfowl hunt from designated blinds on the southeast part of the refuge, according to State regulations.
- Work with the State to determine the viability of allowing hunters to use muzzleloaders and shotguns to harvest white-tailed deer (depending on the deer population) within this archery-only hunting district (currently Hunting District 260). Consider rotating the areas where firearms are permitted depending on management objectives. Limit the number of hunters permitted to use firearms.
- Continue to work with local hunters to rebuild, prepare, and maintain waterfowl hunting blinds. Upgrade the current blinds that are available to hunters with disabilities.
- Allow archery hunters with disabilities to access refuge roads near the Whitetail Golf Course (within the refuge boundary).
- Produce a large print version of the hunting and fishing brochure.
- Provide an annual "tear sheet" outlining the specific refuge regulations for all hunting programs.
- Post a sign at the beginning of the Kenai Nature Trail to make trail users aware of their potential proximity to archery hunters.
- Provide spent-shell deposit sites near hunting areas.
- Continue to monitor hunter satisfaction and harvest information.
- Manage submergent aquatic and upland vegetation within waterfowl hunt areas to improve the hunt quality.
- Enforce waterfowl hunt regulations, including shoot times and access.
- Continue to collaborate with the State to provide hunter education programs to youth.
- Provide a limited number of waterfowl decoys for checkout from the refuge headquarters.

Rationale

White-tailed deer and waterfowl hunting were permitted soon after the refuge was established. Today, hunting is one of the most popular compatible wildlife-dependent activities offered on the refuge. As practiced on Lee Metcalf Refuge, hunting does not pose a threat to the wildlife populations, and in some instances it is necessary for sound wildlife management. The refuge works with the State to carefully regulate its hunting program and maintain equilibrium between population levels and wildlife habitat.

On the refuge there is a lack of regeneration of native trees and shrubs, which are important components for migratory bird habitat. White-tailed deer browse heavily and may be the cause of this lack of regeneration and plant diversity. Although the refuge is open to hunting, it lies within Hunting District 260, an archery-only hunting area. Archery hunting does remove some of these deer; however, the challenges associated with this type of hunting (for example, animals must be in close range) affect the success rate of hunters. Adding a limited firearm season, during which shotguns and muzzleloaders could be used, would provide opportunities for non-archery hunters; it may also improve harvest rates and better disperse the deer during the long archery season (currently over 4 months). The refuge would work with the State and collect data on white-tailed deer numbers to help determine the need for expanding this hunting opportunity.

The refuge maintains 15 designated waterfowl hunting blinds, two of which are reserved for hunters with disabilities. The labor and cost associated with maintaining the blinds would continue to be offset by volunteer assistance, particularly from waterfowl hunters.

Fishing Objective 1

Following State and Federal regulations, continue to provide opportunities for anglers of all abilities to fish within the WVA, including the associated banks of the Bitterroot River and Francois Slough.

Strategies

- Continue to permit fishing on Francois Slough after the riparian habitat is restored.
- Maintain the accessible fishing (and wildlife observation) platform in the WVA.
- Prohibit boats anywhere on the refuge (except the Bitterroot River). No boats can be launched on the refuge.
- Prohibit boaters from accessing the refuge from the Bitterroot River.
- Continue to provide updated fishing regulations in a combined hunting and fishing brochure, following Service graphic standards.
- Restore instream and riparian habitat on North Burnt Fork Creek to improve the quality of the creek's cold-water fishery.

Rationale

Compatible and accessible recreational fishing opportunities are available at Francois Slough and the Bitterroot River, both within the designated WVA. The remainder of the refuge is closed to fishing, except for special events.

Most anglers come to the refuge not only to fish but also to appreciate the wildlife and beautiful scenery of the Bitterroot Valley. Fishing, like hunting, can serve as the foundation for an individual's appreciation of conservation efforts and environmental ethics. Once people begin to appreciate and care about the wildlife they enjoy and experience firsthand, they take this appreciation and awareness back to their own communities and backyards.

Currently some anglers use the fishing platform to access Francois Slough and its largely nonnative fishery. The restoration proposed for Francois Slough (associated with North Burnt Fork Creek) would restore a natural stream that could improve the quality of the habitat for native fish. The existing accessible fishing platform could still be used by anglers to access this restored stream.

Thousands of anglers and boaters float the Bitterroot River. In many areas, the refuge property includes the entire existing channel of the Bitterroot River along with the uplands west of the river. Recent land surveys indicate that lands through and west of the Bitterroot River are part of the refuge. The refuge would seek to open the areas west of the river for public uses, including fishing.

Fishing Objective 2

Provide an opportunity for children of all abilities to learn about the techniques and enjoyment of catching fish.

Strategies

- Work with partners to host an annual accessible fishing event and others, if possible. Consider holding these events within areas closed to public fishing (to increase fishing success) if they do not violate the policy requirements of appropriate use and compatibility or inhibit restoration efforts.
- As part of the environmental education program, provide students at these events with educational materials on the impacts of nonnative fish—particularly largemouth bass, which dominates many refuge impoundments.
- As appropriate, provide an opportunity for MFWP to transfer captured largemouth bass to existing State closed-basin, warm-water fisheries.

- At events, deliver presentations on the refuge, its purposes and resources, and the values of the Refuge System.

Rationale

The Service's wildlife recreation policy promotes the enjoyment and techniques of fishing, particularly among children and their families. The refuge has an opportunity to work with partners, including the State, to provide opportunities for students to learn about the enjoyment and proper methods and ethics for catching fish while fostering a desire to continue fishing on refuges and other State waters. This initiative has an even broader purpose of teaching children about the outdoors so they may be able to appreciate it.

The greatest opportunities to catch fish on the refuge—particularly largemouth bass—are in Ponds 8 and 10. These ponds are closed to all other public fishing, so allowing any public events requires a compatibility determination (appendix D). Also, since largemouth bass are not native to this area, students would be provided information on the impacts of nonnative fish on native species and their habitats. The State would assist with this education and may be permitted to transfer these captured nonnative fish to other State warmwater fisheries. These State waters already contain populations of largemouth bass. The State uses these closed basin nonnative fisheries to take pressure off more sensitive fishing areas that may contain threatened cold-water species, such as bull trout.

Wildlife observation and photography objective

Without impeding the migration of the Bitterroot River, maintain and create additional facilities and programs for wildlife observation and photography for visitors of all abilities. These additional opportunities would provide visitors with a new and exciting perspective that would enhance the visitor's appreciation and connection to the wildlife and the habitats of the refuge and the Bitterroot Valley.

Strategies for Wildlife Observation

- Continue to maintain and manage the WVA; however, do not add artificial structures to protect the WVA's trails and structures from the movements of the Bitterroot River. Relocate threatened facilities and eroded trails to other areas, as appropriate.
- Continue to maintain all walking trails not impacted by river movements, and one viewing and fishing platform and associated facilities, keeping two of these trails and the viewing platform accessible to visitors with disabilities (figure 6).
- Improve the WVA entrance for wheelchair use, replacing the gate with bollards that allow wheelchairs to pass between.
- Continue to provide spotting scopes, binoculars, and bird books for wildlife observers at the expanded visitor center.
- Add signage to ensure that visitors remain on designated trails.
- As appropriate, relocate portions of the Kenai Nature Trail to the adjacent upper road to provide a more level walking surface and to reduce disturbance to waterfowl and other waterbirds using the wetlands below the trail. Upgrade the road to this trail. Maintain the closed area immediately east of this trail.
- Add a seasonal walking trail around Pond 8 (figure 6). This trail would be opened seasonally, as appropriate, to protect waterfowl and other waterbirds using this pond.
- Replace the stationary spotting scopes located along existing trails and add an additional spotting scope within the WVA.
- Treat invasive species along designated trails.
- Add interpretation to new and existing trails, including information on the wildlife species that visitors may encounter.
- Work with the county to develop Wildfowl Lane—the county road that travels through the refuge—as an auto tour route with pulloffs and accompanying interpretation.
- Update and reprint the refuge's current wildlife species list, including a large print version that meets the Service's graphic standards.
- Add recommendations for wildlife viewing etiquette to the general brochure and wildlife list.
- Consider installing a remote camera on a nest area; this image could be streamed not only in the visitor contact area but also on the refuge's Web site.
- Provide wildlife observation information through the internet via the refuge's homepage, blog, and social media sites.

Strategies for Photography

- Continue to maintain two stationary photography blinds.
- Require a special use permit (approved by the refuge manager) for commercial photography proposals that benefit the refuge and provide the photographer access or privileges not afforded to the general public. Commercial photography proposals not benefitting the refuge or Refuge System would not be allowed.
- Require a special use permit (approved by the refuge manager) for commercial filming.
- All permitted commercial photography and film would be made available for Service use (excluding

that which is provided to other parties for commercial uses).

- Through partnerships, work with photographers to build the refuge's photo library.
- Make two portable photo blinds available for use in areas currently open to the public.
- Through partnerships, conduct an annual wildlife photography workshop highlighting how to photograph wildlife while causing minimal disturbance.
- Upgrade waterfowl hunting Blind 2 to provide a photo blind for photographers with disabilities.
- Work with photography schools to build the refuge's photo library and assist with the annual photography workshops while providing wildlife photography opportunities to their students.

Rationale

Most visitors to the refuge come to view and photograph wildlife and the beautiful scenery of the Bitterroot Valley. Wildlife observation has been found compatible on the refuge. Wildlife observation often serves as the foundation for an individual's environmental ethics. Once people begin to appreciate and care about the wildlife they enjoy and experience firsthand, they take this appreciation and awareness back to their own communities and backyards.

Currently most visitors view wildlife from Wildfowl Lane, a county road that travels through the refuge. However, this is not an official tour route and offers no interpretation. Working with the county to turn Wildfowl Lane into an auto tour route, if appropriate, may take some effort, particularly for any improvements such as pulloffs and accompanying interpretation.

The proposed trail around Pond 8 would be 1.25 miles in length and provide visitors with another opportunity to independently explore the refuge and view wildlife. This trail would extend the Kenai Nature Trail westward using the Pond 8 dike road (near Potato Cellar Pond); it would then loop south, travel just north of a former residence site, and then connect to Wildfowl Lane (figure 6). This trail would be located close to an existing heron rookery and waterfowl migration areas. To protect these species, the trail would be closed seasonally. These and other proposed improvements to the photography and wildlife viewing areas within the refuge would enhance the visitors' experiences, provide better opportunities for viewing and photographing wildlife, and help foster their connection to the area's unique habitat and wildlife. This connection may result in a greater understanding and appreciation of the refuge and its resources including the wildlife species found within the Bitterroot River Valley. By working with partners, including commercial photographers, the refuge would continue to build a photo library that could be used in publications and education and outreach tools, including interpretive displays and the refuge's Web site. There is almost always some disturbance to wildlife in areas open to the public, particularly when visitors approach too closely or don't follow refuge regulations (for example, by traveling off designated trails or removing vegetation for a photo). To reduce these impacts, visitors would be provided refuge-specific materials (brochures, podcasts, and education programs) to facilitate wildlife friendly behaviors that minimize disturbance. This would not only reduce the impacts on refuge wildlife and their habitats but improve the overall quality of opportunities for all visitors.

Environmental Education Objective

Continue and expand environmental education programs and activities on and off the refuge for at least 1,500 adults and 4,000 students of all abilities. These programs would focus on the values and importance of the natural, historical, and cultural resources of the refuge and the Bitterroot Valley, including the refuge's efforts to maintain, enhance, and restore native plant and wildlife communities on the refuge.

Strategies

- Recruit a visitor services specialist to and develop and present programs.
- Develop programs and materials that could be used year-round and encourage teachers and students to explore the refuge beyond the popular spring season.
- Through partnerships, continue to organize and provide at least 15 on- and off-refuge annual and special events for adults and students.
- Conduct teacher workshops annually to better orient and equip teachers to independently explore and learn about the refuge resources.
- Establish and widely publicize field trip planning procedures for teachers.
- Use current and new education kits to provide at least five offsite school presentations annually.

Bob Danley/USFWS

The refuge's amphitheater is a good venue for environmental education and visitor services events.

- Continue to allow teachers and students to independently explore the refuge's public use areas, determining if any participants require special assistance due physical limitations. Provide an orientation on where and how to best explore the refuge, and provide teachers with background information prior to their arrival.
- Develop exploration backpacks that can be checked out and used by students; these backpacks would include suggested projects, species they would see, along with some field supplies such as invertebrate sampling nets, water testing kits, and binoculars.
- Working with local teachers, continue to maintain, develop, and provide multimedia educational kits related to refuge resources and make them available to local teachers and students for use in onsite visits or in their classrooms.
- Develop an education program that focuses on climate change in the Bitterroot Valley.
- Work with local teachers to develop a refuge-specific curriculum that meets State standards.
- Develop an education kit that explains the history and value of the restoration efforts proposed under this alternative.
- Continue to serve as the coordinator for the State Junior Duck Stamp Program.
- Expand opportunities to collaborate with universities to provide outdoor classrooms for students wanting to learn about the refuge, its management programs, its current issues, and the values of the Refuge System.
- Develop a partnership with local universities to provide opportunities for students to conduct research and monitoring projects that are beneficial to the refuge, and provide an opportunity for students work with refuge staff.
- Add a classroom and associated supplies to the expanded visitor center for environmental education programs.
- Organize or participate in five additional annual environmental education events on and off the refuge.
- Pursue partnerships and grants to acquire additional resources for environmental education programs.
- Expand the refuge's online presence (social media, blog, Web site) to include interactive educational opportunities and help teachers plan field visits.
- Provide training opportunities for added staff and volunteers to improve their capabilities and knowledge in developing and presenting environmental education programs.
- Meeting Service graphic standards, use both the refuge's Web site and a tearsheet to list all the educational resources available through the refuge and the Service, and make this available to schools and other interested groups.
- Continue to collaborate with the State to provide hunter education training.
- Provide assistance to students interested in completing school science projects related to the natural resources found on the refuge, including mentoring and project development.
- Collaborate with the State, universities, the Salish Tribe, and other entities to create focused activities (environmental education and other visitor uses) for environmental education and visitor service programming, including special events.
- Participate in events sponsored by the Confederated Salish and Kootenai Tribe, including the River Honoring event for students. Provide information on refuge resources and the Bitterroot River Valley, where the Salish Tribe had lived for centuries.

Bob Danley/USFWS

Under the proposed alternative, the refuge would continue to coordinate the State Junior Duck Stamp Program.

Rationale

Environmental education is a learning process that increases people's knowledge and awareness about the environment and associated challenges; develops the necessary skills and expertise to address the challenges; and fosters attitudes, motivation, and commitments to make informed decisions and take responsible action (United Nations Educational, Scientific and Cultural Organization 1978). Through environmental education, the Service can help develop a citizenry with the awareness, knowledge, attitudes, skills, and drive to work cooperatively toward the conservation of environmental resources. Environmental education within the Refuge System incorporates onsite, offsite, and distance-learning materials, activities, programs, and products. These educational tools describe the refuge's purposes, physical attributes, ecosystem dynamics, and conservation strategies as well as the Refuge System mission. They also provide some history and perspective on this area prior to Euro-American settlement,

including the native vegetation, natural waterways, and the unique culture and importance of this area to Native American people.

Since today's children are tomorrow's land stewards, it is essential to help them become aware of the natural world and how they can protect and restore it. Today, most students learn about their natural world online, through books, or highly structured programs. These methods do provide educational benefits, but it is also effective simply to allow students to explore on their own. Refuge programs must not be so rigid that children cannot learn by using their own imaginations and senses.

Environmental education is one of six wildlife-dependent recreational uses identified in the Improvement Act as a priority public use for the Refuge System, and it has been emphasized and supported on Lee Metcalf Refuge for many years. Given the refuge's proximity to some of the more urban areas in Montana, including Missoula, there is a tremendous opportunity to do even more, including promoting the refuge as a conservation learning center where adults and children can learn about refuge resources, the unique history and importance of the Bitterroot Valley, and the values of the Refuge System. The refuge has focused most of its efforts on schools and groups that travel to the refuge, but with additional staff, greater opportunities would exist to travel offsite and reach a broader audience.

Providing teacher workshops and materials for independently exploring the refuge would make even more teachers and students feel welcome while learning why the refuge is here, how it benefits them, and why it should be protected for future generations to enjoy and appreciate.

INTERPRETATION OBJECTIVE

Improve, maintain, and create additional interpretive opportunities for the public that focus on refuge purposes; the natural, cultural, and historical resources of the refuge and Bitterroot Valley; and management programs and challenges, including future habitat restoration projects. These enhanced facilities and universally accessible programs would encourage visitors to independently explore and learn more about not only the values of this refuge, but also about how they can be part of protecting and restoring native and productive habitats to this refuge, the Bitterroot Valley, and other lands within the Refuge System.

Strategies

- Recruit a full-time permanent General Schedule (GS)–7 (could be upgraded to 9) visitor services specialist to work with volunteers, manage the visitor center, and develop and present programs.
- Identify interpretive themes for the refuge and use them to develop professionally planned and produced interpretive panels and brochures; these themes would be used in future interpretive programs to consistently highlight the most important and unique aspects of the refuge, its history and purposes, current management and challenges, and proposed habitat restoration projects.
- Develop a theme and message for the visitor center that focuses on floodplain restoration, wetland impoundment management, native wildlife, migratory birds, the refuge's cultural and natural resources, and the role of the Refuge System.
- Update interpretive panels to provide a variety of information including rules and regulations, the natural and cultural resources of the refuge and the Bitterroot Valley, habitat restoration projects, and the value of the Refuge System. Design panels to have a consistent appearance and to allow refuge staff to easily update them with dynamic and timely information.
- Continue to maintain and update the current five kiosks, including three with interpretive panels. Locate an additional interpretive panel along the river trail within the WVA that explains the migration of the Bitterroot River.
- Ensure that all current and future refuge brochures meet Service graphic standards and provide up-to-date information that is useful for interpretive programs and better orients visitors.
- Train volunteers to provide interpretive programs on the natural, historical, and cultural resources of the refuge and the Bitterroot Valley.
- Make online resources (podcasts, Web site, blog, social media) available that interpret refuge resources along the public roads and trails.
- Restore native habitat around entrance areas and kiosks and provide identification and interpretation of this native vegetation.
- Provide interpretation along the Kenai Nature Trail, within the WVA, and along the auto tour route.
- Participate in events highlighting the history of the Lewis and Clark expedition in the Bitterroot Valley.
- Through partnerships, develop a new refuge video highlighting the history and resources of the refuge.
- Construct a kiosk at the parking lot on the north end of the refuge, used by refuge hunters, that provides regulations as well as information on refuge purposes and resources.

Rationale

Interpretation is the identification and communication of important messages about natural and cultural resources to diverse audiences. Interpretation is designed to reveal relationships about the nature, origin, and purpose of a resource, landscape, or site in a way that forges connections between the interests of the audience and meanings inherent in the resource (National

Association for Interpretation 2011). Interpretation is a resource management tool that can be designed to develop understanding, and through understanding comes appreciation, and through appreciation comes protection of our natural resources.

Interpretation is one of six wildlife-dependent recreational uses identified in the Improvement Act as a priority public use for the Refuge System. The refuge already contains some facilities and displays that interpret refuge resources, provide regulations, and orient visitors. The refuge hosts over 143,000 visitors annually and predicts that number would increase over the next 15 years. Tremendous opportunity exists to further educate these and future visitors about the importance of maintaining, restoring, and enjoying the natural and cultural resources of the refuge and the Refuge System.

Signage Objective

Maintain an effective network of signs that meet the Service's standards and notify the public of refuge boundaries, public use areas, and closed areas by annually reposting, replacing, and/or maintaining 20 percent of the refuge signs.

Strategies

- Determine the opportunity to add directional signage along Interstate 90 and improve it along Highway 93.
- Develop an entrance sign on or near the environmental education shelter in the WVA to notify river floaters that they are entering the refuge.
- Add and maintain more consistent boundary signage—particularly along the west side of the refuge (and the river)—so the public is aware that they are entering the refuge.
- Ensure that electronic directional devices, Web sites, and other printed materials correctly identify the location and information for refuge.
- Ensure that signage has a similar appearance, meets Service graphic standards, and provides a consistent message or theme.
- Mark the west boundary of the refuge with signage and open or maintain closure for public use.
- Post a sign at the beginning of the Kenai Nature Trail to make visitors aware of appropriate uses of the trail and their potential proximity to archery hunters.
- Establish the refuge's primary point of entry as the east entrance, which would be closest to the expanded visitor center; a directional sign at the refuge boundary would include the distance to the visitor center and WVA.
- Develop an entrance sign for the northeast corner of the refuge within easy view of the East Side Highway.
- Place a directional sign at the east and south entrances identifying the distance to the visitor center.
- In areas open to public use, such as the WVA, exchange "unauthorized entry" signs for "refuge boundary" signs.
- Develop new panels for the two entrance kiosks including an orientation panel with regulations, a Refuge System panel, and a system for displaying changing information including current events.
- Develop new panels for the kiosk in the WVA to include an orientation panel, a panel with a map and information about this part of the refuge, and a system for displaying changing information.
- Develop a 2-foot by 3-foot orientation panel at refuge headquarters to provide information for after-hours visitors.
- Move the single-paneled kiosk from behind the visitor center out to the front of the building for after-hours visitors.
- Develop a sign that guides visitors to the WVA from the visitor center, and provide a directional sign to the visitor center at the road where the Whitetail Golf Course begins.
- Work with the community of Stevensville to install interpretative and regulation signage at the Bitterroot River boat launch.
- Add a Service logo to the side of the headquarters building that faces the parking area.
- Update publications to show the same hours of operation that are posted at the visitor center.
- Post the law enforcement officer's phone number at kiosks and instruct visitors to call 911 for emergencies.

Rationale

Overall, the refuge boundaries are well signed, and directional signage orients visitors. However, opportunities exist to improve boundary, directional, and informational signage for the refuge's 143,000 visitors. Maintaining and replacing these signs is time-consuming but critical for orienting visitors, welcoming visitors, protecting refuge habitats, and preventing trespass. The refuge is surrounded by private, State, and some USDA Forest Service land. There are issues with trespassing that could be resolved with additional boundary signage and outreach. Most trespass occurs on the western boundary, particularly by boaters who leave their boats, unaware that they are entering the refuge.

5.9 Goal for Partnerships

Maintain and cultivate partnerships that help achieve the vision and supporting goals and objectives of the Lee Metcalf National Wildlife Refuge Comprehensive Conservation Plan and support other initiatives designed to protect and restore habitats for Federal trust species within the Bitterroot River Valley.

PARTNERSHIP OBJECTIVE

Foster a strong and effective working relationship with existing partners and new partners for the purpose of protecting cultural and historical resources, developing and providing visitor services programs, and managing and restoring the refuge's habitats for target species. The refuge may participate in other partnerships that support refuge and Service initiatives including providing additional habitat for Federal trust species within the Bitterroot River Valley.

Strategies

- Continue to work with conservation organizations, communities, schools, State and Federal agencies, and tribes to collaborate on projects of mutual interest.
- Work with partners to restore the connectivity of North Burnt Fork Creek for native fish species and riparian habitat.
- Continue to participate in the interagency weed group to address invasive and nonnative species on and near the refuge.
- Expand efforts to recruit and support volunteers for the refuge's visitor services and biological programs.
- Continue to work with partners to restore and preserve the Whaley Homestead.
- Work with universities to incorporate various disciplines into refuge programs to address issues concerning visitor services and refuge resources.
- Continue to participate in valley-wide efforts to protect habitat and wildlife corridors on private lands surrounding the refuge.
- Work with the Whitetail Golf Course, located within the refuge boundary, to address wildlife habitat and impacts on adjoining refuge lands and waters.

Rationale

Partnerships are vital to achieving the Service's mission, including the vision for Lee Metcalf Refuge. Many of the refuge's wildlife, habitat, and public use programs and habitat projects could not continue without the funding and support from refuge partners, including volunteers.

The Service must emphasize working cooperatively with others; develop a more integrated approach to problem-solving and share resources to get the job done; and make choices and find efficiencies in both resource and business management practices. This focus reinvigorates the refuge's current intergovernmental coordination efforts. Numerous Federal, State, tribal, and local agencies and private citizens could be considered partners for the refuge. However, more could be done to inform and educate the partners about the refuge's value and goals. In the same vein, the Service is willing to help other agencies with issues, such as invasive plant control and specific wildlife conservation issues. Much of this coordination could be accomplished through regular meetings and by developing personal relationships with individuals within other agencies and surrounding communities.

5.10 Goal for Operations and Facilities

Prioritize wildlife first and emphasize the protection of trust resources in the utilization of staff, volunteers, funding, and facilities.

STAFF OBJECTIVE

Recruit additional staff and volunteers needed to fully carry out the proposed actions in this draft CCP, including actions concerning public use, habitat management, inventory and monitoring, and research.

Strategies

- Retain the current permanent, full-time refuge positions: refuge manager, outdoor recreation planner, law enforcement officer, administrative assistant, and maintenance worker.
- Continue to provide office space and support for zone and state-wide support staff, including a fire management officer, range (fire) technician, business team staff member, regional maintenance team member, and IPM strike team leader and team.
- Recruit a GS–7 (could upgrade to 9) visitor services specialist to manage the visitor center, develop and conduct programs, and recruit and supervise volunteer staff.
- Recruit a GS–9 (could upgrade to 11) deputy refuge manager.
- Recruit a GS–5 (could upgrade to 7) biological science technician.
- Recruit one GS–5 career seasonal biological science technician.

- Continue to work with Montana universities to develop a volunteer program by providing college credits in exchange for volunteer work experience.
- Actively recruit additional volunteers to assist with expanded visitor services programs and habitat management and restoration projects.

Rationale

Lee Metcalf Refuge supports several other State and regional Service programs, including fire, regional maintenance team, business team, and invasive species programs. Although 14 full-time and seasonal Service employees are stationed at Lee Metcalf, only five are specifically assigned to conduct refuge programs. The State and regional resource employees do provide some support for the refuge's maintenance and habitat projects, but their regional duties take precedence.

To accomplish the proposed goals and objectives described in this draft CCP, additional staff, partnerships, and volunteers would be needed. One of the most significant needs is in the refuge's visitor services program. Currently the refuge has over 143,000 visitors annually. The refuge has one outdoor recreation planner who is able to provide onsite programs, but there is a tremendous opportunity to do more outreach, interpretation, and education with students and adults, both on- and off-refuge. The vision for the refuge is to serve as an ambassador for not only the refuge but also the Refuge System. To accomplish this goal, additional staff would be needed to develop and provide programs, work with local schools and communities, and develop partnerships that could expand the refuge's capabilities and outreach.

Restoring refuge habitats, particularly gallery and riverfront forests only, is possible if the refuge can complete much of the restoration and subsequent monitoring using Service equipment and staff including (1) monitoring the response of target species; (2) planting and maintaining restoration sites; (3) monitoring the spread of invasive plants; (4) removing levees, ditches, and other structures; and (5) working with other partners, including volunteers, universities, State and Federal agencies, and conservation organizations interested in studying and assisting with this restoration. At a minimum, a biological science technician, under the direction of refuge management, would be required to conduct much of this monitoring, along with partners, such as universities.

Current staff at the refuge consists of five permanent full-time employees including a refuge manager, outdoor recreation planner, law enforcement officer, maintenance worker, and an administrative assistant. There are also five zone and regional Service employees who are based out of this office, but they are not assigned to exclusively support refuge programs. Table 12 shows the current staff and proposed additional staff required to fully implement the CCP. If all requested projects and positions were funded, the refuge would be able to carry out all aspects of this CCP, which would provide the most benefit to wildlife, improve facilities, and significantly enhance public use programs. In the interim, projects that have adequate funding and staffing would receive priority for accomplishment. Staffing is requested for the 15-year life of this CCP.

Facilities, Equipment, and Supplies Objective

Maintain and acquire the facilities, equipment, and supplies needed to support all current and proposed biological, visitor services, and maintenance programs proposed in this draft CCP including support for added staff.

Strategies

- Expand the current visitor contact area into a visitor center including added space for professionally planned and produced displays, office space, a restroom available during closed hours, and a combined environmental education classroom and conference room.
- Relocate the pole barn closer to the maintenance area.
- Purchase or build a seed storage bin for storing native seed.
- Construct a duplex to provide housing for seasonal, transitional, and detailed staff.

Table 12. Current and proposed staff for Lee Metcalf National Wildlife Refuge, Montana.

Program	*Current positions*	*Proposed additional staff*
Management	GS–485–12 refuge manager	GS–485–9 (could upgrade to 11) deputy refuge manager
Biology	None	GS–404–5 (could upgrade to 7) biological science technician GS–404–5 career seasonal biological science technician
Administration	GS–0303–7	None
Law enforcement	GS–0025–7 (could upgrade to 9)	None
Maintenance	WG–4749–08 maintenance worker	None
Visitor services	GS–025–11 outdoor recreation planner	GS–025–7 (could upgrade to 9) visitor services specialist

Abbreviations: GS = General Schedule, WG = Wage Grade.

Bob Danley/USFWS

The refuge's existing headquarters would be expanded to include additional office space and a combined classroom and conference room.

- Through partnerships, rehabilitate and maintain the historical Whaley Homestead.
- Incorporate green technology and power sources into all new construction and rehabilitation.
- Purchase an excavator to complete proposed restoration projects.
- Recruit an additional Wage Grade (WG)–6 maintenance worker to maintain current and proposed refuge facilities.
- Add a wash bay and containment area for washing equipment and vehicles to reduce the spread of invasive species.

Rationale

A large portion of refuge facilities, equipment, and supplies are adequate to support the current refuge operations; however, most facilities are fully utilized and some are in need of modifications to support even current programs, particularly the public use facilities. The refuge hosts over 143,000 visitors annually. Currently, most visitors are greeted in the small visitor contact area, which is inadequate for supporting refuge visitors and for housing an effective interpretive program. Expanding this area to include a combined environmental education classroom and conference room would allow the refuge to develop more effective and dynamic interpretation and education programs for adults and children. This expansion would also include additional offices for proposed added staff.

The bunkhouse remains full throughout the field season, supporting refuge and regional programs based out of the refuge. Additional seasonal and transitional staff housing is needed. Availability of this housing would be critical to recruitment of seasonal staff, because rental housing is very limited and costly in the surrounding rural communities. This would be even more critical if the refuge does not receive support for permanent staff, as more seasonal employees would be required.

Recruiting an additional maintenance worker would not only ensure the current and future facilities and equipment are maintained, but it would provide the support needed to complete the extensive proposed restoration projects, including a significant amount of dirtwork and planting of native seed and plants. Acquiring the necessary equipment and supplies to support these restoration and maintenance programs would also be essential to completing and maintaining the projects described in this proposed action.

Refuge vehicles and equipment can be a source of transport for seeds and plant materials from invasive species. This can allow these plants to spread into other areas of the refuge. Installing a wash station where each piece of equipment could be cleaned after use in the field or before being transported to other areas could help prevent some of this spread.

5.11 Stepdown Management Plans

The CCP is a broad umbrella plan that provides general concepts and specific objectives for habitat, wildlife, public use, cultural resources, partnerships, and operations over the next 15 years. The purpose of the stepdown management plans is to provide details to Service staff for carrying out specific actions and strategies authorized by the CCP. Table 13 lists the stepdown plans needed for the refuge, status, and next revision date.

5.12 Research, Monitoring, and Evaluation

Appendix D contains the draft compatibility determination for research that supports refuge objectives and programs. Furthermore, the Service proposes to most efficiently deal with the uncertainty surrounding restoration and habitat management with adaptive resource management (figure 25; Kendall 2001, Lancia et al. 1996, Walters and Holling 1990). This approach provides a framework within which objective decisions can be made and the uncertainty surrounding those decisions reduced at the time that they are made. The key components of an adaptive resource management plan, such as this draft CCP and proposed stepdown plans, follow:

- clearly defined management goals and objectives
- a set of management actions with associated uncertainty as to their outcomes

Table 13. Stepdown management plans for Lee Metcalf National Wildlife Refuge, Montana.

Plan	*Completed plan (year approved)*	*New or revised plan (completion year)*
Disease contingency plan	—	2015
Chronic wasting disease	2005	2015
Avian influenza	2006	2015
Fire management	2011	Revised when HMP is completed
Habitat management plan	—	2014
Inventory and monitoring plan	—	2014
Integrated pest management	—	2015
Wildlife inventory	1991	2018
Refuge safety	—	2013
Occupant emergency	1995	2014
Spill prevention	—	2013
Water management	2002	2014
Visitor services	—	2016

- a suite of models representing various alternative working hypotheses describing the response of species or communities of interest
- monitoring and assessment of the response of target organisms
- use of monitoring and assessment information to direct future decision-making through the selection of a best model

The first three components—goals, actions, and models—are largely defined before initiation of an adaptive resource management plan. The latter two components, monitoring and directed decision-making, compose a repetitive process whereby each year the predictive ability of models is tested against what was observed during monitoring. This may result in a new best model, greater support for the existing best model, or new models constructed from emerging hypotheses. In this way, management can evolve as more information about the refuge is gained and uncertainty is reduced.

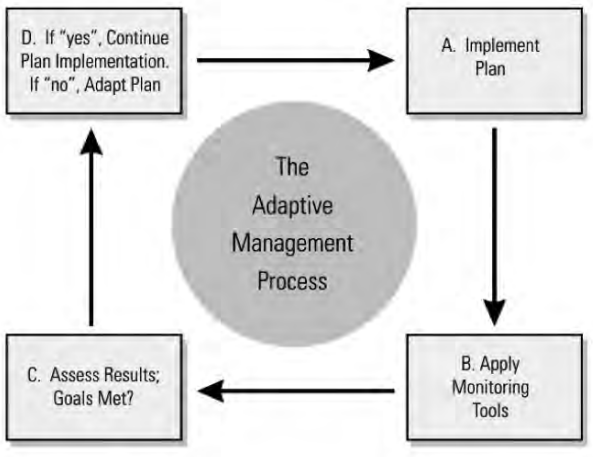


Figure 25. Adaptive management process.

Development of adaptive resource management plans for habitat management would allow refuge staff to "learn by doing" and adapt to a changing climate while focusing on management objectives. Knowledge gained from assessing management actions is as integral to the process as the management actions themselves. This emphasis on gaining knowledge about the refuge creates a situation whereby the staff can refine its habitat management with feedback between management and assessment.

5.13 Plan Amendment and Revision

The Service would annually review the final CCP to determine the need for revision. A revision would occur if and when significant information became available such as a change in ecological conditions. Revisions to the CCP and the stepdown management plans would be subject to public review and compliance with NEPA. At a minimum, the Service would evaluate the plan every 5 years and revise it after 15 years.

Glossary

accessible—Pertaining to physical access to areas and activities for people of different abilities, especially those with physical impairments.

adaptive resource management—The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. It is a process that uses feedback from research, monitoring, and evaluation of management actions to support or modify objectives and strategies at all planning levels. It is also a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plans. 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.

alluvial fan—A sedimentary deposit where a fast-flowing stream has flown into a flatter plain.

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 (Draft Service Manual 602 FW 1.5).

amphibian—A class of cold-blooded vertebrates that includes frogs, toads, and salamanders.

anastomosis—Reconnection of two streams that formerly had been separated.

annual—A plant that flowers and dies within 1 year of germination.

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 (Service Manual 052 FW 1.12B). The National Wildlife Refuge System's focus is on indigenous species, biotic communities, and ecological processes.

breeding habitat—Habitat used by migratory birds or other animals during the breeding season.

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.

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 National Wildlife Refuge System or the purposes of the refuge (Draft 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 National Wildlife Refuge System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

concern—See issue.

conservation—Management of natural resources to prevent loss or waste. Management actions may include preservation, restoration, and enhancement.

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.

dense nesting cover—Composition of grasses and forbs that allows for a dense stand of vegetation that protects nesting birds from the view of predators, usually consisting of one to two species of wheatgrass, alfalfa, and sweetclover.

disturbance—Significant alteration of habitat structure or composition. May be natural (for example,

fire) or human-caused events (for example, timber harvest).

drawdown—The act of manipulating water levels in an impoundment to allow for the natural drying-out cycle of a wetland.

duck, dabbling—Duck that mainly feeds on vegetable matter by upending on the water surface, or by grazing, and only rarely dives.

duck, diving—Duck that mainly feeds by diving through the water.

EA—See environmental assessment.

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 U.S. Fish and Wildlife 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.

ecotype—A subspecies or race that is especially adapted to a particular set of environmental conditions.

EIS—Environmental impact statement.

Elderhostel—A not-for-profit organization established in 1975 that allows senior citizens to travel and take educational programs in the United States around the world.

emergent—A plant rooted in shallow water and having most of the vegetative growth above water. Examples include cattail and hardstem bulrush.

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.

environmental assessment (EA)—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).

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 of America 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.

fee title—Acquisition of most or all of the rights to a tract of land.

Federal land—Public land owned by the Federal Government, including lands such as national forests, national parks, and national wildlife refuges.

flora—All the plant species of an area.

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.

FMP—Fire management plan.

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.

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 (Draft Service Manual 620 FW 1.5).

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 type, also vegetation type, cover type—A land classification system based on the concept of distinct plant associations.

head cuts—abrupt changes in streambed elevation.

hemi-marsh—The emergent phase of a seasonal or semipermanent wetland where the ratio of open-water area to emergent vegetation cover is about 50:50, and vegetation and open-water areas are highly interspersed.

hydrogeomorphic methodology (HGM)—An interdisciplinary science that focuses on the interaction and linkage of hydrologic processes with landforms or earth materials and the interaction of geomorphic processes with surface and subsurface water in temporal and spatial dimensions.

hydroperiod—Period of time during which soils, waterbodies, and sites are wet.

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—See National Wildlife Refuge System Improvement Act of 1997.

indigenous—Originating or occurring naturally in a particular place.

integrated pest management (IPM)—Methods of managing undesirable species such as invasive plants; includes education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods.

interseed—Mechanical seeding of one or several plant species into existing stands of established vegetation.

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 species—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.

inviolate sanctuary—Place of refuge or protection where animals and birds may not be hunted.

IPM—See integrated pest management.

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 (Draft Service Manual 602 FW 1.5).

level ditching—Ditches developed to improve water distribution, provide open water for waterfowl, furnish nesting islands, and encourage aquatic vegetation for waterfowl and furbearers. The material removed and piled along the ditch edge provides nesting and loafing sites for waterfowl. The production of waterfowl from level ditching is dependent upon the suitability of the wetland.

management alternative—See alternative.

management plan—Plan that guides future land management practices on a tract of land.

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 bird—Bird species that 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.

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 chance that a nest will hatch at least one egg.

nongovernmental organization—Any group that is not composed of Federal, State, tribal, county, city, town, local, or other governmental entities.

North American Waterfowl Management Plan—The North American Waterfowl Management Plan,

signed in 1986, recognizes that the recovery and perpetuation of waterfowl populations depends on restoring wetlands and associated ecosystems throughout the United States and Canada. It established cooperative international efforts and joint ventures comprised of individuals; corporations; conservation organizations; and local, State, Provincial, and Federal agencies drawn together by common conservation objectives.

noxious weed—Any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, natural resources of the United States, public health, or the environment.

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 provides 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 (Draft Service Manual 602 FW 1.5).

obligate—Necessary for survival.

palustrine—Relating to a system of inland, nontidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation (vegetation that is rooted below water but grows above the surface). Palustrine wetlands range from permanently saturated or flooded land to land that is wet only seasonally.

Partners in Flight program—Western Hemisphere program designed to conserve Neotropical migratory birds and officially endorsed by numerous Federal and State agencies and nongovernmental organizations; also known as the Neotropical Migratory Bird Conservation Program.

partnership—Contract or agreement entered into by two or more individuals, groups of individuals, organizations or agencies in which each agrees to furnish a part of the capital or some in-kind service, such as labor, for a mutually beneficial enterprise.

patch—An area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

perennial—Lasting or active through the year or through many years; a plant species that has a life span of more than 2 years.

planning team—Team that prepares the comprehensive conservation plan. Planning teams are interdisciplinary in membership and function. A team generally consists of a planning team leader; refuge manager and staff biologist; staff specialists or other representatives of Service programs, ecosystems or regional offices; and State partner wildlife agencies, as appropriate.

planning team leader—Typically a professional planner or natural resource specialist knowledgeable of the requirements of National Environmental Policy Act and who has planning experience. The planning team leader manages the refuge planning process and ensures compliance with applicable regulatory and policy requirements.

planning unit—Single refuge, an ecologically or administratively related refuge complex, or distinct unit of a refuge. The planning unit also may include lands currently outside refuge boundaries.

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.

preferred alternative—The selected final alternative that becomes the final plan. It can be the proposed action, the no-action alternative, another alternative, or a combination of actions or alternatives discussed in the draft comprehensive conservation plan and National Environmental Policy Act document.

prescribed fire—The skillful application of fire to natural fuels under conditions such as weather, fuel moisture, and soil moisture that allow confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

pristine—Typical of original conditions.

private land—Land that is owned by a private individual, a group of individuals, or a nongovernmental organization.

private landowner—Any individual, group of individuals, or nongovernmental organization that owns land.

private organization—Any nongovernmental organization.

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.

proposed action—The alternative proposed to best achieve the purpose, vision, and goals of a refuge (contributes to the National Wildlife 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;

Native American tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have expressed an interest in Service issues and those who do or do not realize that Service decisions may affect them.

public involvement or scoping—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, refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

raptor—A carnivorous bird such as a hawk, falcon, or vulture that feeds wholly or chiefly on meat taken by hunting or on carrion (dead carcasses).

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 or wildlife—A species inhabiting a given locality throughout the year; nonmigratory species.

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 corridor—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.

runoff—Water from rain, melted snow, or agricultural or landscape irrigation that flows over the land surface into a waterbody.

scoping—The process of obtaining information from the public for input into the planning process.

sediment—Material deposited by water, wind, and glaciers.

Service—See U.S. Fish and Wildlife Service.

shelterbelt—Single to multiple rows of trees and shrubs planted around cropland or buildings to block or slow down the wind.

shorebird—Any of a suborder (Charadrii) of birds, such as a plover or snipe, that frequent the seashore or mud flat areas.

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 general 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. Species that (1) are documented or have apparent population declines, (2) are small or restricted populations, or (3) depend on restricted or vulnerable habitats.

stand—Any homogenous area of vegetation with more or less uniform soils, landform, and vegetation. Typically used to refer to forested areas.

stepdown management plan—A plan that provides the details necessary to implement management strategies identified in the comprehensive conservation plan (Draft 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 (Draft Service Manual 602 FW 1.5).

submergent—Vascular or nonvascular hydrophyte, either rooted or nonrooted, that lies entirely beneath the water surface, except for flowering parts in some species.

temporal—Of or relating to time.

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.

tile drainage—In agricultural, a method of draining the soil subsurface to reduce moisture.

trust resource—See Federal trust resource.

trust species—See Federal trust species.

U.S. Fish and Wildlife Service (Service or USFWS)—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 that comprises 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—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.

ungulate—A hoofed mammal.

vision statement—A concise statement of the desired future condition of the planning unit, based primarily on the National Wildlife Refuge System mission, specific refuge purposes, and other relevant mandates (Draft Service Manual 602 FW 1.5).

wading birds—Birds having long legs that enable them to wade in shallow water; includes egrets, great blue herons, black-crowned night-herons, and bitterns.

waterbird—Birds dependent upon aquatic habitats to complete portions of their life cycles (for example, breeding).

waterfowl—A category of birds that includes ducks, geese, and swans.

watershed—Geographic area within which water drains into a particular river, stream or body of water. A watershed includes both the land and the body of water into which the land drains.

wetland—Land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.

WG—Wage Grade Schedule (pay rate schedule for certain Federal positions).

wildland fire—A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

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 general public uses of the Refuge System.

wildlife management—Practice of manipulating wildlife populations either directly through regulating the numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors.

woodland—Open stands of trees with crowns not usually touching, generally forming 25–60 percent cover.

Appendix A

Key Legislation and Policy

This appendix briefly describes the guidance for the National Wildlife Refuge System and other key legislation and policies that guide management of the Lee Metcalf National Wildlife Refuge.

A.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 Refuge 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 general public use of the Refuge System established by Executive Order No. 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 general 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.

A.2 Legal and Policy Guidance

Management actions on national wildlife refuges and wetland management districts are circumscribed by many mandates including laws and Executive orders. Regulations that affect refuge and district management the most are listed below.

American Indian Religious Freedom Act (1978)—Directed 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)—Prohibited discrimination in public accommodations and services.

Antiquities Act (1906)—Authorized 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)—Directed the preservation of historic and archaeological data in Federal construction projects.

Archaeological Resources Protection Act (1979), as amended—Protected 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)—Required federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977)—Required consultation with the U.S. Army Corps of Engineers (404 permits) for major wetland modifications.

Section 404 (of the Clean Water Act)—Authorized the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearing, for discharge of dredged or fill material into navigable waters of the United States, including wetlands, at specified disposal sites. Required selection of disposal sites be in accordance with guidelines developed by the Administrator of the Environmental Protection Agency in conjunction with the Secretary of the Army. Stated that the Administrator can prohibit or restrict use of any defined area as a disposal site whenever she or he determines, after notice and opportunity for public hearings, that discharge of such materials into such areas will have an unacceptable adverse effect on municipal water supplies, shellfish beds, fishery areas, wildlife, or recreational areas.

Dingell–Johnson Act (1950)—Authorized the Secretary of the Interior to provide financial assistance for State fish restoration and management plans and projects. Financed by excise taxes paid by manufacturers of rods, reels, and other fishing tackle. Known as the Federal Aid in Sport Fish Restoration Act.

Emergency Wetlands Resources Act (1986)—Promoted wetland conservation for the public benefit to help fulfill international obligations in various migratory bird treaties and conventions. Authorized the purchase of wetlands with Land and Water Conservation Fund monies.

Endangered Species Act (1973), as amended—Required all Federal agencies to carry out programs for the conservation of threatened and endangered species.

Environmental Education Act of 1990—Established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a Federal environmental education program. Responsibilities of the office include developing and supporting programs to improve understanding of the natural and developed environment and the relationships between humans and their environment, supporting the dissemination of educational materials, developing and supporting training programs and environmental education seminars, managing a Federal grant program, and administering an environmental internship and fellowship program. Required the office to develop and support environmental programs in consultation with other Federal natural resource management agencies including the Service.

Executive Order No. 11644, Use of Off-road Vehicles on Public Lands (1972)—Provided policy and procedures for regulating off-road vehicles.

Executive Order No. 11988, Floodplain Management (1977)—Required 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. Prevented Federal agencies from contributing to the "adverse impacts associated with occupancy and modification of floodplains" and the "direct or indirect support of floodplain development." In the course of fulfilling their respective authorities, Federal agencies "shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains."

Executive Order No. 11990, Protection of Wetlands (1977)—Directs Federal agencies to (1) minimize destruction, loss, or degradation of wetlands and (2) preserve and enhance the natural and beneficial values of wetlands when a practical alternative exists.

Executive Order No. 12996, Management and General Public Use of the National Wildlife Refuge System (1996)—Defined the mission, purpose, and priority public uses of the Refuge System; presented four principles to guide management of the Refuge System.

Executive Order No. 13007, Indian Sacred Sites (1996)—Directed Federal land management 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 No. 13443, Facilitation of Hunting Heritage and Wildlife Conservation (2007)—Directed Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

Federal Noxious Weed Act (1990)—Required 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)—Required the preservation of evidence of the Government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Federal Water Pollution Control Act of 1972—Required any applicant for a Federal license or permit to conduct any activity that may result in a discharge into navigable waters to obtain a certification from the State in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over navigable waters at the point where the discharge originates or will originate, that the discharge will comply with applicable effluent limitations and water quality standards. Required that a certification obtained for construction of any facility must also pertain to subsequent operation of the facility.

Fish and Wildlife Act (1956)—Directed the Secretary of the Interior to develop the policies and procedures necessary for carrying out fish and wildlife laws and to research and report on fish and wildlife matters. Established the U.S. Fish and Wildlife Service within the Department of the Interior, as well as the positions of Assistant Secretary for Fish and Wildlife and Director of the Service.

Fish and Wildlife Coordination Act (1958)—Allowed the U.S. Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes. Also required consultation with the U.S. Fish and Wildlife Service and State fish and wildlife agencies where the waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted , or otherwise controlled or modified by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of preventing loss of and damage to wildlife resources.

Fish and Wildlife Improvement Act of 1978)—Improved the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. Authorized the Secretary to accept gifts and bequests of real and personal property on behalf of the United States. Authorized the use of volunteers for Service projects and appropriations to carry out volunteer programs.

Historic Sites, Buildings and Antiquities Act (1935), known as the Historic Sites Act, as amended (1965)—Declared a national policy to preserve historic sites and objects of national significance, including those located at refuges and districts. Provided procedures for designation, acquisition, administration, and protection of such sites and for designation of national historic and natural landmarks.

Junior Duck Stamp Conservation and Design Act (1994)—Directed the Secretary of the Interior to create a junior duck stamp and to license and market the stamp and the stamp design. The proceeds from these efforts are used to support conservation education awards and scholarships. In 2000, Congress preauthorized the Junior Duck Stamp Conservation and Design Program Act for another five years, and expanded the conservation education program throughout the United States. and its territories. Since that time, all 50 states, the District of Columbia, American Samoa, and the U.S. Virgin Islands have joined the program.

Land and Water Conservation Fund Act of 1965—Provided money from leasing bonuses, production royalties, and rental revenues for offshore oil, gas, and sulphur extraction to the Bureau of Land Management, the USDA Forest Service, the U.S. Fish and Wildlife Service, and State and local agencies for purchase of lands for parks, open space, and outdoor recreation.

Migratory Bird Conservation Act (1929)—Established 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)—Authorized the opening of part of a refuge to waterfowl hunting and requires each waterfowl hunter 16 years of age or older to possess a valid Federal hunting stamp. Receipts from the sale of the stamp are deposited in a special Treasury account known as the Migratory Bird Conservation Fund and are not subject to appropriations.

Migratory Bird Treaty Act (1918)—Designated the protection of migratory birds as a Federal responsibility and enabled the setting of seasons and other regulations including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

National Environmental Policy Act (1969)—Required 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. Required Federal agencies to integrate this act with other planning requirements and prepare appropriate documents to facilitate better environmental decisionmaking (40 CFR 1500).

National Historic Preservation Act (1966), as amended—Established policy that the Federal Government is to

provide leadership in the preservation of the Nation's prehistoric and historical resources.

National Wildlife Refuge System Administration Act (1966)—Defined the National Wildlife Refuge System and authorized 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—Set the mission and administrative policy for all refuges in the National Wildlife Refuge System. Mandated comprehensive conservation planning for all units of the Refuge System (amendment to the National Wildlife Refuge System Administration Act).

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998—Encouraged the use of volunteers to help the Service in the management of refuges within the Refuge System. Facilitated 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 those resources. Encouraged donations and other contributions by persons and organizations to the Refuge System.

Native American Graves Protection and Repatriation Act (1990)—Required Federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

North American Wetlands Conservation Act (1989)—Provided for the conservation of North American wetland ecosystems, waterfowl and other migratory birds, fish, and wildlife that depend on such habitats.

Pittman–Robertson Act (1937)—Taxed the purchase of ammunition and firearms and earmarks the proceeds to be distributed to the States for wildlife restoration. Known as the Federal Aid in Wildlife Restoration Act or P–R Act.

Refuge Recreation Act (1962)—Allowed the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient money is available to manage the uses.

Refuge Revenue Sharing Act, Section 401 (1935)—Provided for payments to counties in lieu of taxes using revenues derived from the sale of products from refuges.

Refuge Trespass Act of June 28, 1906—Provided the first Federal protection for wildlife at national wildlife refuges. Made it unlawful to hunt, trap, capture, willfully disturb, or kill any bird or wild animal, or take or destroy the eggs of any such birds, on any lands of the United States set apart or reserved as refuges or breeding grounds for such birds or animals by any law, proclamation, or Executive order, except under rules and regulations of the Secretary. Protected Government property on such lands.

Rehabilitation Act (1973)—Required 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.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948—Provided that, upon determination by the Administrator of the General Services Administration, real property no longer needed by a Federal agency can be transferred without reimbursement to the Secretary of the Interior if the land has particular value for migratory birds or to a State agency for other wildlife conservation purposes.

U.S. Department of the Interior Order No. 3226 (2001)—Directed bureaus and offices of the Department to analyze the potential effects on climate change when undertaking long-range planning, setting priorities for scientific research, and making major decisions about use of resources.

Volunteer and Community Partnership Enhancement Act (1998)—Encouraged the use of volunteers to help in the management of refuges within the Refuge System. Facilitated 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 encouraged donations and other contributions.

Wilderness Act of 1964—Directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within the Refuge System and National Park Service for inclusion in the National Wilderness Preservation System.

Appendix B

List of Preparers, Consultation, and Coordination

This document is the result of extensive, collaborative, and enthusiastic efforts by the members of the planning team shown below.

Team member	*Position*	*Work unit*
Mike Artmann	Wildlife biologist and GIS specialist	U.S. Fish and Wildlife Service, Region 6, Division of Refuge Planning, Lakewood, Colorado
Bob Danley	Outdoor recreation planner	Lee Metcalf National Wildlife Refuge, Stevensville, Montana
Teresa Giffen	Editor	ICF International, Sacramento, California
Deborah Goslin	Biological science technician	Lee Metcalf National Wildlife Refuge, Stevensville, Montana
Erin Holmes	Refuge manager	Tualatin National Wildlife Refuge, Sherwood, Oregon (transferred April 2011)
Laura King	Refuge program specialist (planning team leader)	U.S. Fish and Wildlife Service, Region 6, Division of Refuge Planning, Lakewood, Colorado
Tom Reed	Refuge manager	Lee Metcalf National Wildlife Refuge, Stevensville, Montana

Many organizations, agencies, and individuals provided invaluable assistance with the preparation of this CCP. The Service acknowledges the efforts of the following individuals and groups toward the completion of the plan. The diversity, talent, and knowledge contributed dramatically improved the vision and completeness of this document.

Contributor	*Position*	*Work unit*
Neil Anderson	Biologist	Montana Fish, Wildlife & Parks Laboratory, Bozeman, Montana
Diane Borgreen	Biological science technician	U.S. Fish and Wildlife Service, Wildlife Health Office, Bozeman, Montana
Rob Brassfield	Fisheries biologist	USDA Forest Service, Stevensville, Montana
Dan Brewer	Fish and wildlife biologist	U.S. Fish and Wildlife Service, Ecological Service, Missoula, Montana
Chris Clancy	Fisheries biologist	USDA Forest Service, Hamilton, Montana
Rick Coleman	Assistant regional director, National Wildlife Refuge System	U.S. Fish and Wildlife Service, Region 6, Lakewood, Colorado
Vivica Crowser	Information and education manager	Montana Fish, Wildlife & Parks, Missoula, Montana
Patti Fiedler	Hydrologist	U.S. Fish and Wildlife Service, Region 6, Lakewood, Colorado
Sheri Fetherman	Chief, Division of Education and Visitor Services	U.S. Fish and Wildlife Service, Region 6, Lakewood, Colorado
Sean Fields	Wildlife biologist	U.S. Fish and Wildlife Service, Habitat and Population Evaluation Team, Great Falls, Montana
Leigh Fredrickson	Wetland ecologist and retired professor	Wetland Management and Education Services, Puxico, Missouri
Lindy Garner	Regional invasive species coordinator	U.S. Fish and Wildlife Service, Region 6, Great Falls, Montana
Todd Graham	Biologist and owner	Aeroscene Land Logic, Bozeman, Montana
Louis Hartjes	Fire management officer	Lee Metcalf National Wildlife Refuge, Stevensville, Montana

Contributor	*Position*	*Work unit*
Shannon Heath	Outdoor recreation planner	U.S. Fish and Wildlife Service, Region 6, Helena, Montana
Mickey Heitmeyer	Wetland ecologist and owner	Greenbrier Wetland Services, Advance, Missouri
Sandy Hutchcroft	Information technology specialist	U.S. Fish and Wildlife Service, Region 6, Lakewood, Colorado
Brett Husong	Facilitator	Belt Collins West, Boulder, Colorado
Ladd Knotek	Fisheries management biologist	Montana Fish, Wildlife & Parks, Missoula, Montana
David Lucas	Chief, Division of Refuge Planning	U.S. Fish and Wildlife Service, Region 6, Lakewood, Colorado
Mimi Mather	Facilitator and planner	Belt Collins West, Boulder, Colorado
Pam Okland	Teacher	Lone Rock School, Stevensville, Montana
Dale Pfau	Range and fire technician	Lee Metcalf National Wildlife Refuge, Stevensville, Montana
Dean Rundle	Refuge zone supervisor	U.S. Fish and Wildlife Service, Region 6, Lakewood, Colorado
Julie Schreck	Conservation education specialist	Bitterroot National Forest, Hamilton, Montana
Dean Vaughan	Private lands biologist	U.S. Fish and Wildlife Service, Partners for Fish and Wildlife, Moiese, Montana
George Wasser	Teacher	Stevensville Public Schools, Stevensville, Montana
Germaine White	Information and education specialist	Natural Resources Department, Confederated Salish and Kootenai Tribes Pablo, Montana

Appendix C

Public Involvement

A notice of intent to prepare the draft comprehensive conservation plan (CCP) and environmental assessment (EA) was published in the Federal Register on September 30, 2009. The Service compiled a mailing list of more than 270 names during preplanning. The list included private citizens; local, regional, and State government representatives and legislators; other Federal agencies; and interested organizations. Public scoping was announced through news releases and a mailed planning update; it provided information on the history of the refuge, an overview of the CCP process, and invitations to two public scoping meetings. The planning update included a form for providing written comments. Emails were also accepted at the refuge's email address: leemetcalf@fws.gov.

Two public meetings were held in the communities of Stevensville and Missoula, Montana on September 29 and October 1, 2009, respectively. There were 12 attendees, primarily local citizens and staff from Senator Max Baucus's local office. Following a presentation about the refuge and an overview of the CCP and National Environmental Policy Act processes, attendees were encouraged to ask questions and offer comments. Verbal comments were recorded, and each attendee was given a comment form to submit additional thoughts or questions in writing.

All written comments were due November 13, 2009; 20 emails and letters were received in addition to the verbal comments recorded at the public scoping meeting. All comments were shared with the planning team and considered throughout the planning process. In addition to 200 private individuals, the following organizations and agencies were given the opportunity to provide comments about this planning process.

C.1 Federal Officials

U.S. Representative Dennis Rehberg, Washington, DC
U.S. Senator Jon Tester, Washington, DC
U.S. Senator Max Baucus, Washington, DC

C.2 Federal Agencies

Bitterroot National Forest, USDA Forest Service, Hamilton, Montana
Lewis and Clark National Trail, National Park Service, Omaha, Nebraska
National Park Service, Denver, Colorado
Northern Rocky Mountain Science Center, Missoula, Montana
USDA Forest Service, Bitterroot National Forest, Stevensville, Montana
USDA Forest Service, Regional Office and Lolo National Forest, Missoula, Montana

C.3 Tribal Officials

Confederated Salish and Kootenai Tribal Council, Pablo, Montana
Nez Perce Tribal Executive Council, Lapwai, Idaho

C.4 State Officials

Governor Brian Schweitzer, Helena, Montana
Representative Ray Hawk, Florence, Montana
Representative Gary MacLaren, Victor, Montana
Representative Bob Lake, Hamilton, Montana
Senator Rick Laible, Darby, Montana
Senator Jim Shockley, Victor, Montana

C.5 State Agencies

Travelers Rest State Park, Lolo, Montana
Montana Department of Environmental Quality, Helena, Montana
Montana Fish, Wildlife & Parks, Missoula, Montana
Montana Fish, Wildlife & Parks, Hamilton, Montana
Montana Fish, Wildlife & Parks, Helena, Montana
Montana Historical Society, Helena, Montana
Montana State Historic Preservation Office, Helena, Montana
Ravalli County Extension Office, Hamilton, Montana
Ravalli County Weed District, Stevensville, Montana

C.6 Local Government

Mayor of Stevensville, Stevensville, Montana
Ravalli County Commissioners, Hamilton, Montana

C.7 Organizations

American Bird Conservancy, The Plains, Virginia
American Bird Conservancy, Kalispell, Montana
American Legion Post #94, Stevensville, Montana
Audubon Society, Helena, Montana
Audubon Society, Hamilton, Montana
Audubon Society, Missoula, Montana
Audubon Society, Washington, DC
Bitterroot Water Forum, Hamilton, Montana
Defenders of Wildlife, Washington, DC
Ducks Unlimited, Clancy, Montana
Ducks Unlimited, Memphis, Tennessee
Family of Peter Whaley, Missoula, Montana
Five Valleys Audubon Society, Missoula, Montana
Friends of Lee Metcalf National Wildlife Refuge, Stevensville, Montana
Institute for Bird Populations, Point Reyes Station, California
Isaak Walton League, Gaithersburg, Maryland
Missoula Convention & Visitors Bureau, Missoula, Montana
Montana Conservation Science Institute, Missoula, Montana
Montana Natural Heritage Program, Helena, Montana
Montana Natural Heritage Program, Missoula, Montana
Montana Natural History Center, Missoula, Montana
Montana Preservation Alliance, Helena, Montana
National Trappers Association, New Martinsville, West Virginia
National Wildlife Federation, Reston, Virginia and Helena, Montana
National Wildlife Refuge Association, Washington, DC
The Nature Conservancy, Helena, Montana
Ravalli County Fish & Wildlife Association, Hamilton, Montana
Ravenworks Ecology, Stevensville, Montana
Sierra Club, San Francisco, California
Stevensville Historical Museum, Stevensville, Montana
Stevensville Main Street Association, Stevensville, Montana
The Teller, Corvallis, Montana
Watershed Education Network, Missoula, Montana
The Humane Society, Washington, DC
The Wilderness Society, Washington, DC
Trout Unlimited, Missoula, Montana
The Wildlife Society, Townsend, Montana

C.8 Universities and Schools

Colorado State University Libraries, Fort Collins, Colorado
Northwestern University, Evanston, Illinois
University of Montana, Missoula, Montana
Stevensville Public Schools, Stevensville, Montana

C.9 Media

Billings Gazette Online, Billings, Montana
The Billings Outpost, Billings, Montana
Bitterroot Star, Stevensville, Montana
Great Falls Tribune, Great Falls, Montana
The Missoulian, Missoula, Montana
Montana Public Radio, Missoula, Montana
Ravalli Republic, Hamilton, Montana
Stonydale Press, Stevensville, Montana
Yellowstone Public Radio, Billings, Montana

C.10 Individuals

200 private individuals

Appendix D

Draft Compatibility Determinations

D.1 Refuge Information

Refuge name

Lee Metcalf National Wildlife Refuge

Date established

February 4, 1964

Establishing and acquisition authorities

Migratory Bird Conservation Act (16 United States Code [U.S.C.] 661–667e)
Refuge Recreation Act (16 U.S.C. 460k–1)
State of Montana approval under provisions of Public Law 87–383 (75 Stat. 813)

Refuge purposes

"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 715d (Migratory Bird Conservation 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, as amended (16 U.S.C. 460k–460k–4)

D.2 National Wildlife Refuge System Mission

The mission of the 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.

D.3 Description of Uses

The following uses are evaluated for compatibility within the Lee Metcalf National Wildlife Refuge:

- hunting
- fishing
- wildlife observation and noncommercial photography
- environmental education and interpretation
- commercial filming, audio recording, and still photography
- cooperative farming and prescriptive grazing
- research and monitoring

Hunting

Hunting is one of six wildlife-dependent priority public uses specified in the Improvement Act. Hunting occurs in two forms on the refuge: waterfowl (by shotgun) and white-tailed deer (by bow). In addition to the site-specific regulations mentioned below, State hunting regulations would apply to all Lee Metcalf Refuge lands open to hunting. Hunters may only possess and use U.S. Fish and Wildlife Service (Service)–approved, nontoxic shot shells on the refuge, and vehicle travel and parking is restricted to public roads, pulloffs, and parking areas. The refuge Web site and public use brochures provide guidance on site-specific regulations. The general hunting regulations are available from Montana Fish, Wildlife & Parks (MFWP).

Waterfowl hunting is restricted to the southeast part of the refuge. This 628-acre area of the refuge encompasses five wetlands and is closed to the general public. Waterfowl hunters access this area from one parking area. According to 2005–2009 records, fourteen blinds together accommodate an average of 965 visits per year. Waterfowl hunting is conducted during the State hunting season, which usually occurs from the first week of October through first week of January. Waterfowl hunting is available on a first-come, first-served basis except for opening weekend, during which blinds are allocated by drawing.

Archery hunters access 2,275 acres of refuge lands from five archery hunting access parking areas. According to 2005–2009 records, archery hunting for white-tailed deer draws an average of 1,030 visits annually and an average of 33 deer are harvested each

year. Deer hunting season starts in early September and ends the second week in January. In addition to providing a compatible recreational activity, deer hunting assists the refuge in managing overbrowsing of native habitats.

The comprehensive conservation plan (CCP) for the Lee Metcalf National Wildlife Refuge proposes to continue the hunting uses described above.

Availability of Resources. Hunting would be administered by the refuge staff. Currently, refuge staff does not include a dedicated or collateral duty law enforcement officer or a refuge biologist to monitor deer populations. It is anticipated that the refuge would rely on the zone law enforcement officer or staff from other refuges. Also, the regional inventorying and monitoring biologist would assist with analysis and trend monitoring.

Infrastructure in place on the refuge includes the following:

- hunt information kiosk
- five parking area and check-in stations
- 14 waterfowl blinds (2 are universally accessible)

Anticipated Impacts of Use. The hunting program on Service lands would continue to provide hunters ample quality hunting opportunities without materially detracting from the mission and goals of the National Wildlife Refuge System (Refuge System) or from the establishing purposes of refuge lands. Public use brochures and the refuge Web site would be kept up-to-date and made readily available to hunters. Hunter success and satisfaction would continue to be monitored using the hunter registration kiosk sign-in sheet along with random contacts with hunters in the field and in the refuge office.

The National Wildlife Refuge System Act of 1966, other laws, and the Service's policy permit hunting on a national wildlife refuge when it is compatible with the purposes for which the refuge was established and acquired. Habitat that normally supports healthy wildlife populations produces harvestable surpluses that are a renewable resource. As practiced on Lee Metcalf Refuge, hunting does not pose a threat to the wildlife populations and, in some instances, is necessary for sound wildlife management. However, by its very nature, hunting creates a disturbance to wildlife and directly affects the individual animal being hunted. Nonetheless, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. Furthermore, despite the potential impacts of hunting, a goal of Lee Metcalf Refuge is to provide opportunities for quality wildlife-dependent recreation. Hunting would be designed and monitored to offer a safe and quality program and to keep adverse effects within acceptable limits.

Although hunting directly affects the hunted animal and may indirectly disturb other animals, limits on hunting access and harvest would ensure that populations do not fall to unsustainable levels. Closed areas on the refuge provide sanctuary to migratory birds during the hunting season. In some cases, hunting can be used as a management tool to control elevated populations that are negatively affecting wildlife habitat (for example, through overbrowsing).

Additional impacts from hunting include conflicts with individuals participating in wildlife-dependent, priority public uses such as wildlife observation and photography.

Determination. Hunting is a compatible use on Lee Metcalf Refuge.

Stipulations Necessary to Ensure Compatibility

- Visitors participating in hunting would be provided the Service's public use regulations, including site-specific regulations and State hunting regulations.
- Hunters would continue to use approved nontoxic shot for waterfowl hunting.
- Vehicles would be restricted to county and designated public roads and parking areas in the refuge.
- Signage and brochures would be used to provide hunters information on where and how to hunt on the refuge to ensure compliance with public use regulations.

Justification. A secondary goal of the Refuge System is to provide opportunities, when found compatible, for the public to develop an understanding and appreciation for wildlife. Hunting is identified as a priority public use in the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and would help meet the above secondary goal with only minimal conflicts. Hunting can instill, in citizens of all ages, a greater appreciation for wildlife and its habitat. This appreciation may extend to the Refuge System, other conservation agencies, and to the individual personal land conservation ethic.

Based on anticipated biological impacts described above and in the environmental assessment (EA) that accompanied the draft CCP for Lee Metcalf Refuge, the Service has determined that hunting within the refuge would not interfere with the Service's habitat goals and objectives or purposes for which the refuge was established. Limiting access and monitoring the use would help limit any adverse effects.

Mandatory 15-year Reevaluation Date:

Recreational Fishing

Recreational fishing is one of six wildlife-dependent priority public uses specified in the Improvement

Act. Fishing is allowed within the wildlife viewing area (WVA) (145 acres), specifically along Francois Slough and the Bitterroot River. Fishing is available year-round, though limited in winter and during spring flooding. Fishing would be conducted in accordance with the rules and regulations set by the State of Montana. Additional refuge-specific regulations are printed in the refuge fishing brochure.

The draft CCP does not call for the implementation of any new fishing programs.

Availability of Resources. The refuge would continue to work with MFWP to conduct fish and creel surveys. The regional inventorying and monitoring biologist would assist with analysis and trend monitoring. The refuge would rely on the law enforcement officer, stationed at the refuge, and law enforcement staff from other refuges to enforce fishing regulations.

Anticipated Impacts of Use. Fishing and other human activities cause disturbance to wildlife and trampling of vegetation along the bank of rivers and streams. There would also be some mortality to those fish caught and then released. Refuge-specific regulations would assist in managing anglers and minimizing disturbance.

Determination. Fishing is a compatible use at designated fishing areas on Lee Metcalf Refuge.

Stipulations Necessary to Ensure Compatibility

- Visitors participating in fishing would follow the Service's public use regulations and State fishing regulations and limits. Rules specific to the refuge are published in the refuge fishing brochure.
- Vehicles would be restricted to county and designated public roads and parking areas.
- No boats may be used or launched at the WVA or anywhere else on the refuge, with the exception of boats launched off- refuge that then travel through the refuge on the Bitterroot River. Public fishing on the Bitterroot River by boat is restricted to below the high watermark, and boats cannot be launched onto the river from refuge lands.
- Boats, fishing equipment, and all other personal property must be removed at the end of each day.

Justification. Fishing is a priority public use identified in the Improvement Act. No long-term or significant adverse impacts of wildlife resources are expected from the primary or supporting uses. Based on the biological effects addressed above and in the EA that accompanied the draft CCP for Lee Metcalf Refuge, the Service has determined that fishing would not interfere with the Service's habitat goals and objectives or purposes for which the refuge was established.

Mandatory 15-year Reevaluation Date:

Wildlife observation and noncommercial photography

Wildlife observation and photography are two of six wildlife-dependent priority public uses identified in the Improvement Act. Wildlife observation and photography on the refuge are conducted at the following public use areas: (1) the WVA; (2) outside the visitor contact area; (3) the Kenai Nature Trail; and (4) Wildfowl Lane, a county road that runs through the refuge.

The WVA, located in the southwest corner of the refuge, has four trail segments that total 2.5 miles. The area is open to off-trail hiking and observation. The 0.55-mile accessible Metcalf Trail segment is 10 feet wide and paved and has three concrete benches. The three other trail segments are soil or gravel and vary in width. The gravel parking area is three-quarters of an acre, large enough to accommodate recreational vehicles. There is also a designated paved parking area for visitors with disabilities. Additional facilities include an information kiosk, porta-potties, and an education shelter.

At the visitor contact area, visitors are provided a spotting scope to view waterfowl and other waterbirds and raptors on the adjacent ponds. This is one of the most popular wildlife observation and photography sites for visitors, including school groups.

The Kenai Nature Trail is 1.25 miles long (figure 6). It starts at refuge headquarters and parallels the eastern edge of Ponds 6, 8, and 10. The areas immediately next to the trail are closed, so visitors must remain on the trail. The first quarter mile of this trail is asphalt and meets accessibility guidelines. Five benches and one spotting scope are positioned along this paved section of trail. The remaining trail is bare soil and is not considered accessible. An additional four benches, one overlook platform with spotting scope, boardwalk, two wooden bridges, and two permanent photo blinds are located along this part of the Kenai Nature Trail.

Two permanent photo blinds are located along the Kenai Nature Trail (figure 6). Blind 1 is located one-third mile from the visitor contact area on Pond 8; it sits within 55 acres of open water and marsh land and is sheltered to the east by cottonwood and alder trees. Blind 2 is located one-third mile from the visitor contact area on approximately 85 acres of open water on Pond 10.

An "L"-shaped 2.8-mile section of Wildfowl Lane travels through the refuge on a south-central to east-central direction and has informally serves as the refuge auto tour route. The southern and easternmost miles of the road are paved or covered with recycled asphalt. The remaining road is gravel. The road is wide—at least 33 feet in width—allowing motorists to pull over safely and observe wildlife.

Wildlife observation and photography would be conducted year-round at the WVA, the visitor contact area, Kenai Nature Trail, and Wildfowl Lane.

The CCP proposes to continue the above wildlife observation and noncommercial photography activities and add the following to improve opportunities for these uses:

- The refuge would work with the county to develop the 2.8 miles of Wildfowl Lane, described above, as an auto tour route, with observation sites and accompanying interpretation.
- The existing footprint of the Kenai Nature Trail would be moved east in select areas by 10–30 yards to lessen disturbance to waterbirds using the slough portion of Pond 8.
- The Kenai Nature Trail would be extended westward using the Pond 8 dike road (near Potato Cellar Pond); it would then loop south, travel just north of a former residence site, and then connect to Wildfowl Lane (figure 6). This trail addition measures 1.25 miles in length. The trail may be open seasonally for public use. The closure would provide refuge for migrating and nesting waterfowl and other waterbirds. This spur to the Kenai Nature Trail would provide additional opportunities for wildlife viewing and photography, environmental education, and interpretation.
- Through partnerships, the refuge would conduct an annual wildlife photography workshop highlighting how to photograph wildlife while minimizing disturbance.
- Waterfowl hunting Blind 2 would be upgraded to provide a photo blind for photographers with disabilities. At least two portable photo blinds would be purchased and available for visitor use.

Availability of Resources. Wildlife observation and photography would be administered by refuge staff. The refuge would rely on the zone law enforcement officer and staff from other refuges for law enforcement. Signage and law enforcement would be used to keep visitors from crossing into areas closed to public use.

The porta-potties would be maintained twice a week, and paved trails would be sealed periodically to maintain a smooth surface.

The proposed extension of the Kenai Nature Trail may require the construction of a boardwalk in wet areas.

Anticipated Impacts of Use. There would be temporary disturbance to wildlife near the WVA and along trails. This disturbance would be minimized through refuge regulations and education including brochures, signage, and staff- or volunteer-led wildlife walks that highlight the ethics of wildlife observation and photography.

Determination. Wildlife observation and photography are compatible uses on Lee Metcalf National Wildlife Refuge.

Stipulations Necessary to Ensure Compatibility

- Visitors participating in wildlife observation and photography would be strongly encouraged to follow all public use regulations.
- All users of the Kenai Nature Trail would be required to stay on the trail.
- Non–Fish and Wildlife Service vehicles would be restricted to county and public access roads in the refuge.
- Viewing areas would be designed to minimize disturbance impacts on wildlife and all refuge resources while providing good opportunities to view wildlife in their natural environments.
- Visitors using permanent or portable observation and photography blinds would be provided with information on properly using these structures to minimize disturbance to wildlife, habitats, and other refuge visitors.
- Photography outside of public use sites is not allowed.
- Dogs are allowed only on leashes and only on trails in the WVA.
- Bicycles, horses, and off-road vehicles are not allowed on the refuge.

Justification. Wildlife observation and photography is a wildlife-dependent, priority public use. No unacceptable, long-term or significant adverse impacts on wildlife resources are expected from the primary or supporting uses.

Mandatory 15-year Reevaluation Date:

Environmental Education and Interpretation

Environmental education and interpretation are two of six wildlife-dependent priority public uses specified in the Improvement Act.

Most environmental education programs would be conducted at sites near refuge headquarters: (1) the visitor contact area, (2) Okefenokee Room, (3) outdoor education shelter, (4) outdoor amphitheater, and (5) Kenai Nature Trail. The WVA would also be used for staff-led programs but even more so by self-directed environmental education partner organizations and school groups. Environmental education can be both formal and informal, and it can range from presentations to special events like festivals or fishing clinics. However, certain programming, usually special events, may involve additional refuge lands outside the headquarters area. The refuge would continue to organize and provide at least 15 on- and off-refuge annual and special events for adults and students.

The refuge has hosted an average of 2,300 students annually. Students come from communities as far as Darby to the south (approximately 40 miles) and Ronan to the north (about 85 miles). Most students are from grades 3–5. Environmental education would be conducted year-round; however, most students visit the refuge in May, and these visits are typically limited by the individual schools to one visit per year.

Interpretation of the natural and cultural resources of the refuge and the Bitterroot Valley would be provided year-round in the same designated environmental education and wildlife observation and photography areas. Interpretation would be conducted through interpretive panels, revolving displays, videos, online materials, brochures, flyers, handouts, and booklets. New displays would be professionally planned and produced.

Interpretive panels and brochures would be maintained and updated to reflect changes in information or policy and to meet the Service's graphic standards.

The CCP proposes to continue environmental education and interpretation and add the following to improve these programs:

- The Service would expand the programs and opportunities for environmental education and interpretation, reaching additional students and visitors. These programs would focus on the values and importance of the natural, historical, and cultural resources of the refuge and the Bitterroot Valley, including the refuge's efforts to maintain, enhance, and restore native plant and wildlife communities on the refuge.
- Partnerships would be developed with local universities to provide opportunities for students to conduct research and monitoring projects that are beneficial to the refuge, that help address management needs, and that provide an opportunity for students to work on the refuge and with refuge staff.
- The Service would expand opportunities to collaborate with universities to provide outdoor classrooms for students interested in the refuge, its management programs, its current issues, and the values of the Refuge System.
- A classroom and associated supplies would be added to the expanded visitor center for environmental education programs.
- The Service would continue to maintain and update the current five kiosks, including three with interpretive panels. An additional interpretive panel would be located along the river trail within the WVA explaining the migration of the Bitterroot River.
- Interpretation would be provided along the Kenai Nature Trail, within the WVA, and along the auto tour route.
- On the north end of the refuge, a kiosk would be constructed at a parking lot used by hunters; it would provide regulations as well as information on refuge purposes and resources.

Availability of Resources. The refuge's outdoor recreation planner and volunteers, supplemented by other current Service staff, would continue to develop and lead these programs. Expanding current programs may require additional visitor services staff and volunteers.

Funding for environmental education and interpretation activities, directional signs, and brochures would be mainly supported by annual operation and maintenance money. Funding from other sources such as grants, regional project proposals, challenge cost-share agreements, and other temporary funding sources would also be sought and used as they became available.

Anticipated Impacts of Use. The bulk of environmental education and interpretation would take place in the refuge headquarters area. The use of the refuge for onsite activities by groups of teachers and students for environmental education or interpretation may impose a short-term, low-level impact on the immediate and surrounding area. Impacts may include trampling of vegetation and temporary disturbance to nearby wildlife species during the activities.

Refuge brochures, interpretive panels, and other educational materials would continue to be updated as needed to meet Service requirements. The Service would continue to promote a greater public understanding and appreciation of the refuge resources, programs, and issues through interpretive, outreach, and environmental educational programs. Presentations, both on and off Service lands, would be provided to refuge visitors, school groups, and organizations, allowing the Service to reach a broader audience. Onsite presentations would be managed to minimize disturbance to wildlife, habitat, and cultural resources.

Determination. Environmental education and interpretation are compatible uses on Lee Metcalf Refuge.

Stipulations Necessary to Ensure Compatibility. Onsite activities would be held where minimal impact on wildlife and habitats would occur. The Service would review new environmental education and interpretation activities to ensure that these activities meet program and refuge management objectives and are compatible.

- Visitors participating in environmental education and interpretation programs would follow all Service regulations. Compliance with regulations would be achieved through education, signage, and law enforcement and would minimize negative impacts on refuge habitat and wildlife.

- Environmental education would be restricted to daylight hours.
- Environmental education may be limited to reduce disturbance to wildlife, particularly during the nesting seasons. The refuge manager would evaluate and, if appropriate, approve additional environmental education sites on the basis of potential impacts on wildlife. Access should be restricted around active bird nests and during other sensitive life history phases of refuge resources.
- Educational activities would be commonly held in the Okefenokee Room, outdoor education shelter, outdoor amphitheater, WVA, and the Kenai Nature Trail. On occasion and by special use permit only, environmental education activities may occur near dikes along Ponds 8 and 10, Grube Barn, and management areas I–4 and I–5 A number of stipulations would cover special events:
  - The Bitterroot and Five Valleys Audubon Societies' bird walk activities would be held on refuge-approved dates and times and located in public use areas.
  - The Great Backyard Bird Count in mid-February—a national "citizen science" event that promotes knowledge of native birds—would take place in areas open to the public. Event activities must be approved by the refuge manager.
  - Ground Hog Day, February 2, would include information and activities that emphasize the natural history of mammals, ecology, habitat, community processes, and the Refuge System; event activities must be approved by the refuge manager, and the location of this event would be restricted to the area around the Grube Barn. Other proposed locations would need to be approved by the refuge manager.
  - Montana Junior Duck Stamp Program activities (mid-April to early May) would take place at the outdoor amphitheater and education shelter. The program would highlight the integration of science with the arts. Event activities must be approved by the refuge manager.
  - The Weed Pull in mid-May is a public event targeting the removal of noxious weeds, which is compatible with refuge and management purposes. Staff would work with partners employing environmental education curriculum and outreach to educate visiting public on noxious weed identification and management. Event locations must be approved by the refuge manager.
  - For the Kid's Fishing Clinic, held in both June and September, all fishing and environmental education stations would be positioned for the purpose of safety and minimizing resource disturbance. Activities would primarily be located surrounding the Refuge Headquarters area, but may occur, with issuance of a special use permit, in areas currently closed to public use. Event locations and times must be approved by the refuge manager.
  - The spring and summer Hunter Safety Courses would be held at the Okefenokee Room, Kenai Nature Trail, Grube Barn, and parts of management units I–4 and I–5 with issuance of a special use permit. Activities would be planned to ensure safety and minimize wildlife and visitor disturbance. Event activities and optional locations must be approved by the refuge manager.
  - The Stevensville Audubon Christmas Bird Count is held in December or January every year. Refuge staff escort Audubon volunteers, counting and identifying all birds encountered on the refuge. Most bird identification activities would be conducted from refuge roads and dikes, minimizing wildlife disturbance; event activities and locations must be approved by the refuge manager. Unaccompanied individuals may not enter areas closed to the public without a Special Use Permit.

Justification. A secondary goal of the Refuge System is to provide opportunities, when found compatible, for the public to develop an understanding and appreciation for wildlife.

Environmental education and interpretation can be used to help citizens of all ages build a land ethic and act responsibly in protecting wildlife and habitats, which in turn can enrich a person's life, provide an incentive for outdoor activity with associated health benefits, and potentially lessen the likelihood of that person violating laws protecting wildlife. Additionally, environmental education and interpretation are important tools for the refuge to provide visitors with an awareness of its purposes, values, and specific issues such as invasive species, habitat management, restoration of natural processes, and migratory bird management. These tools would provide visitors and students with a greater understanding of the mission and importance of the Refuge System to the American people.

Based on anticipated biological impacts described above and in the EA that accompanies the draft CCP for Lee Metcalf National Wildlife Refuge, the Service determines that environmental education and interpretation would not significantly detract from the Service's implementation of wildlife habitat goals and objectives, or with the purposes for which the refuge was established. Managing areas used for conducting environmental education and interpretation, monitoring those areas, and mitigating impacts would help minimize potential adverse effects.

Mandatory 15-year Reevaluation Date:

COMMERCIAL FILMING, AUDIO RECORDING, AND STILL PHOTOGRAPHY

Commercial filming is the digital or film capture of a visual image. Commercial audio recording is the capture of sound. Commercial still photography is the digital or film capture of a still image. Each of these activities is conducted by a person, business, or other entity for a market audience for use in a documentary, television program, feature film, advertisement, or similar project. It does not include news coverage or visitor use.

Lee Metcalf Refuge provides opportunities for commercial filming and still photography of migratory birds and other wildlife. Requests from commercial persons, businesses, or entities to conduct commercial activities would be evaluated on their merit in educating the public about the resources and purposes of the refuge and the Refuge System. Any issued special use permit for filming or photography would designate the specific areas that may be accessed and the activities that are allowed (refer to "Stipulations Necessary to Ensure Compatibility" below).

In rare cases the Service may permit access to areas closed to the public. The public benefit, as determined by the refuge manager, must outweigh the potential disturbance to wildlife resources.

Availability of Resources. Current staff would evaluate requests for commercial photography, filming, or audio recording. Administrative costs for reviewing applications, the issuance of subsequent special use permits, and staff time to monitor compliance may be offset by a fee.

Anticipated Impacts of Use. Wildlife filmmakers and photographers tend to create the greatest disturbance of all wildlife observers (Dobb 1998, Klein 1993, Morton 1995). While observers frequently stop to view wildlife, photographers are more likely to approach animals (Klein 1993). Even a slow approach by photographers tends to have behavioral consequences on wildlife (Klein 1993). Photographers often remain close to wildlife for extended periods of time in an attempt to habituate the subject to their presence (Dobb 1998). Furthermore, photographers with low-power lenses tend to get much closer to their subjects (Morton 1995). This usually results in increased disturbance to wildlife as well as habitat, including the trampling of plants. Handling of animals and disturbing vegetation (such as cutting plants and removing flowers) or cultural artifacts is strictly prohibited on Service lands.

Issuance of special use permits with strict guidelines and monitoring by refuge staff for compliance may help minimize or avoid these impacts. Permittees who do not follow the stipulations of their special use permits could have their permits revoked, and further applications for filming or photographing on refuge lands would be denied.

Determination. In rare circumstances, commercial filming, audio recording, and still photography would be compatible uses on Lee Metcalf Refuge.

Stipulations Necessary to Ensure Compatibility. Commercial filming or photography must (1) demonstrate a means to increase the public's knowledge, appreciation, and understanding of the purposes of Lee Metcalf National Wildlife Refuge, the National Wildlife Refuge System, or the wildlife resources that are managed on these lands. Failure to fully demonstrate a measurable means to meet this criterion would likely result in a denial of the special use permit request.

Any commercial filming and audio recording would require a special use permit that would (1) identify conditions that protect the refuge's values, purposes, resources, and public health and safety and (2) prevent unnecessary disruption of the public's use and enjoyment of the refuge. Such conditions may be, but are not limited to, specifying road conditions when access would not be allowed, establishing time limitations, identifying routes of access, limiting the number of participants, and specifying the exact location participants are allowed. These conditions would be identified to prevent excessive disturbance to wildlife, damage to habitat or refuge infrastructure, or conflicts with other visitor services or management activities.

The special use permit would stipulate that imagery produced on refuge lands would be made available for use in environmental education and interpretation, outreach, internal documents, or other suitable uses. In addition, any commercial products must include appropriate credits to the Lee Metcalf National Wildlife Refuge, the National Wildlife Refuge System, and the U.S. Fish and Wildlife Service.

Still photography requires a special use permit (with specific conditions as outlined above) if one or more of the following would occur:

- It takes place at locations where or at times when members of the public are not allowed.
- It uses models, sets, or props that are not part of the location's natural or cultural resources or administrative facilities.
- The Service would incur additional administrative costs to monitor the activity.
- The Service would need to provide management and oversight to avoid impairment of the resources and values of the site, limit resource damage, or minimize health and safety risks to the visiting public.
- The photographer intends to intentionally manipulate vegetation to create a shot (for example, cutting vegetation to create a blind).

To minimize the impact on Service lands and resources, refuge staff would ensure that all commercial filmmakers and commercial still photographers comply with policies, rules, and regulations. The staff would monitor and assess the activities of all filmmakers, audio recorders, and still photographers.

Justification. Commercial filming, audio recording, and still photography are economic uses that, if allowed, must contribute to the achievement of the refuge purposes, mission of the Refuge System, or the mission of the Service. Providing opportunities for these uses should result in an increased public awareness of the refuge's ecological importance as well as advancing the public's knowledge and support for the Refuge System and the Service. The stipulations outlined above and conditions imposed in the special use permits issued to commercial filmmakers, audio recorders, and still photographers would ensure that these wildlife-dependent activities occur with minimal adverse effects on resources or visitors.

Mandatory 10-year Reevaluation Date:

Cooperative farming and prescriptive grazing

The Service has used cooperative farming and prescriptive livestock grazing in the past as a management tool to manage a variety of upland, riparian, and seasonal wetland habitats. These tools would be used to meet habitat objectives, control vegetative litter, promote native plant production and diversity, control the spread of invasive plant species, and help convert disturbed grasslands back to native plant species.
Cooperative farming is usually done on a share basis where the Service and the cooperator each receive a share of the crop. The Service would retain its share as standing cover for wildlife forage or in exchange for additional work from the cooperator such as invasive plant control, grass seeding, or provision of supplies such as herbicides and fence materials for habitat protection and improvement on the management unit. Any income received by the Service would be deposited in the Refuge Revenue Sharing Account. Cooperative farming would primarily be used to treat invasive species by continually farming specific areas until seedbed is reduced. Following this process, these areas would be restored to native species found on that site. The site would continue to be monitored for reinvasion.

Grazing by livestock has been a preferred management tool because the effect on habitat is controllable and measurable. Grazing may occur throughout the year as management needs dictate. For wetland units, the purpose of grazing would be to consume portions of emergent vegetation and to break root rhizomes with hoof action. This would likely result in enhanced aeration of soils, removing portions of monotypic emergent vegetation. For upland units, grazing would be used to mimic the historical grazing patterns, most likely employing short-duration, intense grazing pressure with extended rest periods.

Fencing and controlling livestock is the responsibility of the cooperating rancher. The Service provides instruction and guidance within the special use permit for placement of fences, water tanks, and livestock supplements to ensure that sensitive habitats or refuge assets are protected. A temporary electric fence is used in most grazing applications. Current forage conditions, habitat objectives, and available water determine stocking rates in each grazing unit.

The draft CCP proposes to continue using cooperative farming and prescriptive livestock grazing to meet habitat objectives. Furthermore, the draft CCP establishes goals and objectives for specific habitat types where these tools may be used. In addition, the Service has identified target wildlife species (for example, grasshopper sparrow and marbled godwit) and their habitat requirements, which has resulted in objectives that guide these programs to achieve the habitat needs of these target species. The refuge would improve the monitoring and research programs for vegetation and wildlife to assess habitat and wildlife population responses to prescriptive livestock grazing.

Availability of Resources. Current refuge staff and funding resources are sufficient for the purposes of monitoring habitats and implementing research needs to understand the impacts of grazing on refuge habitats. One biological technician would be necessary to carry out the on-the-ground monitoring. These programs would continue to be conducted through special use permits or cooperative farming agreements, which minimize the need for staff time and Service assets to complete work. Permittees would be selected on their ability to accomplish refuge habitat goals and minimize expenditures of staff time and resources. Fencing, caring for, and all animal husbandry tasks are the responsibility of the permittee. The permittee is also responsible for keeping all animals within the management unit and preventing them from roaming at large. The Service provides direction on the placement of temporary fences, water tanks, livestock supplements, loading and off-loading panels and chutes to ensure the protection of sensitive habitats and refuge resources.

Anticipated Impacts of Use. The cooperative farming and prescriptive livestock-grazing program is used to meet habitat- and species-specific goals and objectives identified in the draft CCP. This program is intended to maintain and enhance habitat conditions for the benefit of a wide variety of migratory birds and other wildlife that use the refuge.

Some wildlife disturbance may occur during operation of noisy farming equipment, and some animals may be temporarily displaced. Wildlife would receive

the short-term benefit of standing crops or stubble for food and shelter and the long-term benefit of having historical cropland or other poor-quality habitat converted to native grasses and shrubs. Reducing the number of invasive species and the existing seedbed would support future restoration efforts.

Some trampling of areas by livestock occurs around watering areas. It is anticipated that grazing will continue to be used to manage vegetative monocultures on a rotational basis. Grazing, as well as fire, is known to increase the nutrient cycling of nitrogen and phosphorous (Hauer and Spencer 1998, McEachern et al. 2000). Hoof action may break up the soil cap on upland fields, allowing moisture to infiltrate the soil and allowing native plant seeds to become established. However, cattle grazing would also increase the risk of invasive plants becoming established. Grazing in the spring could have adverse effects on grassland-bird nests due to trampling and loss of vegetation. In addition, the presence of livestock may disturb some wildlife species and some public users. The long-term benefits of this habitat management tool should outweigh the short-term negative effects.

Determination. Cooperative farming and prescriptive grazing as habitat management tools are compatible uses on Lee Metcalf National Wildlife Refuge.

Stipulations Necessary to Ensure Compatibility. To ensure consistency with management objectives, the Service would require general and specific conditions for each cooperative farming and grazing permit.

To minimize impacts on nesting birds and other wildlife, the refuge manager would determine and incorporate any necessary timing constraints on the permitted activity into the cooperative farming agreement or special use permit.

The cooperative farming agreement or special use permit would specify the type of crop to be planted. Farming permittees would be required to use Service-approved chemicals that are less detrimental to wildlife and the environment.

Control and confinement of livestock are the responsibility of the permittee, but the Service would continue to determine where fences, water tanks, and livestock supplements (if necessary) are placed within the management unit. Temporary electric fences are used to retain livestock within grazing cells as well as to protect sensitive habitat areas and refuge assets such as water control structures. Cooperators would be required to remove fences at the end of the grazing season.

When grazing fees are assessed, they are based on the current-year U.S. Department of Agriculture Statistics Board publication, "Grazing Fee Rates for Cattle by Selected States and Regions." Standard deductions for labor associated with the grazing permit may be included on the special use permit.

The refuge would monitor vegetation and soils to assess if habitat requirements of target species are being met. A minimum of one temporary biological technician is necessary to monitor and document these activities.

Justification. Habitat management needs to occur to maintain and enhance habitat for migratory birds and other wildlife in this altered landscape. When properly managed and monitored, cooperative farming and prescriptive livestock grazing can rejuvenate native grasses and help control the spread of some invasive plant species and some undesirable monoculture species like cattail. Prescriptive grazing is controlled and the results monitored (for example, vegetation monitoring) so that adjustments in the grazing program are made to meet habitat goals and objectives. The cooperative farming program would be monitored to determine the effectiveness and necessary duration and frequency of farming needed to control and reduce invasive species.

Using local cooperators to perform the work is a cost-effective method to accomplish habitat objectives. The long-term benefits of habitat restoration and management far outweigh any short-term impacts caused by grazing.

Mandatory 10-year Reevaluation Date:

Research and Monitoring

Lee Metcalf Refuge receives approximately 8–12 requests each year to conduct scientific research or monitoring on Service lands. Priority is given to studies that contribute to the enhancement, protection, preservation, and management of the refuge's native plant, fish, and wildlife populations and their habitats. Non–Fish and Wildlife Service applicants must submit a proposal that outlines the following:

- objectives of the study
- justification for the study
- detailed methodology and schedule
- potential impacts on wildlife and habitat including disturbance (short- and long-term), injury, or mortality
- description of measures the researcher would take to reduce disturbances or impacts
- staff required and their qualifications and experience
- status of necessary permits such as scientific collection permits and endangered species permits
- costs to the Service including staff time requested, if any
- anticipated progress reports and endproducts such as reports or publications

Refuge staff would review research and monitoring proposals on a case-by-case basis and issue special use

permits if approved. Criteria for evaluation include, but are not limited to, the following:

- Research and monitoring that contribute to specific refuge management issues would be given higher priority over other requests.
- Research and monitoring that would cause undue disturbance or would be intrusive would likely not be approved. The degree and type of disturbance would be carefully weighed when evaluating a research request.
- Research projects that can answer the same questions yet be conducted off-refuge are less likely to be approved.
- Evaluations would determine if effort has been made to minimize disturbance through study design, including adjusting location, timing, scope, number of researchers, study methods, and number of study sites.
- If staffing or logistics make it impossible for the refuge to monitor researcher activity, this may be a reason to deny the request.
- The length of the project would be considered and agreed upon prior to approval. Projects would be reviewed annually.

Availability of Resources. Current resources are minimally adequate to administer research and monitoring efforts. A full-time biological science technician would assist in monitoring research proposals and projects. It is anticipated that approximately $4,000 per year is required to administer and manage current research and monitoring projects. Coordination with a Service inventorying and monitoring biologist would be necessary to administer large or long-term projects, which generally require more in-depth evaluation of applications, management of permits, and oversight of projects. The refuge would work with this biologist to identify research and monitoring needs and work with other Service staff, universities, and scientists to develop studies that would benefit the refuge and address the goals and objectives in the draft CCP.

Anticipated Impacts of Use. Some degree of disturbance is expected with research activities, because most researchers enter areas and use Service roads that are closed to the public. In addition, some research requires collecting samples and/or handling wildlife. However, the overall impact on wildlife and habitats is expected to be minimal with research studies when special use permits include conditions to minimize those impacts.

Determination. Research and monitoring are compatible uses on the Lee Metcalf Refuge.

Stipulations Needed to Ensure Compatibility

- Extremely sensitive wildlife habitats and species are sufficiently protected from disturbance by limiting research activities in these areas.
- All refuge rules and regulations are followed unless otherwise exempted by refuge management.
- Refuge staff use the criteria for evaluating research and monitoring proposals as outlined above ("Description of Use") when determining whether to approve a proposed project on the refuge. If proposed research methods are evaluated and determined to have potential impacts on refuge wildlife or habitat, it must be demonstrated that the research is necessary for refuge resource conservation management. All projects are reviewed annually.
- Measures to minimize potential impacts would need to be developed and included as part of the project and study design. These measures, with potential modifications and/or additions, would be listed as conditions on the special use permit.
- The length of the project would be considered and agreed on before approval.
- Projects would be reviewed annually and any modifications made as appropriate.
- Refuge staff would monitor research and monitoring activities to ensure compliance with all conditions of the special use permit. At any time, refuge staff may accompany the researchers to determine potential impacts. Staff may determine that previously approved research and special use permits be terminated due to observed impacts.
- No unauthorized individuals may accompany the researcher without prior consent from the refuge.
- The special use permit is non-transferrable from one researcher to any other individual.
- The refuge manager would have the ability to cancel a special use permit if the researcher is out of compliance or to ensure wildlife and habitat protection.

Justification. The program as described is determined to be compatible. Potential impacts of research activities on refuge resources would be minimized through restrictions included as part of the study design, and research activities would be monitored by refuge staff. Results of research projects would contribute to the understanding, enhancement, protection, preservation, and management of the refuge's wildlife populations and their habitats.

Mandatory 10-year Reevaluation Date:

D.4 Signatures

SUBMITTED:

Tom Reed, Refuge Manager — Date
Lee Metcalf National Wildlife Refuge
Stevensville, Montana

REVIEWED:

Dean Rundle, Refuge Supervisor — Date
U.S. Fish and Wildlife Service, Region 6
National Wildlife Refuge System
Lakewood, Colorado

APPROVED:

Richard A. Coleman, Ph.D., Assistant Regional Director — Date
U.S. Fish and Wildlife Service, Region 6
National Wildlife Refuge System
Lakewood, Colorado

Appendix E

Species Lists

This appendix contains the common and scientific names of animals and plants that have been recorded on Lee Metcalf National Wildlife Refuge or the surrounding Bitterroot Valley. The bird and plant lists are from surveys, annual narratives (USFWS 1988–1993), and the 2009 Lee Metcalf Refuge Bioblitz event held in 2010. Species of concern were determined from global, Federal, and State of Montana listings (Montana Natural Heritage Program 2009).

Class Amphibia

Common name	*Scientific name*
Frogs	
American bullfrog†	*Rana catesbeiana*†
Columbia spotted frog	*Rana luteiventris*
Toads and Salamanders	
Boreal toad*	*Bufo boreas**
Long-toed salamander	*Ambystoma macrodactylum*

Class Reptilia

Common name	*Scientific name*
Snakes	
Common garter snake	*Thamnophis sirtalis*
Terrestrial garter snake	*Thamnophis elegans*
Rubber boa	*Charina bottae*
Eastern racer	*Coluber constrictor*
Western rattlesnake	*Crotalus viridis*
Gopher snake	*Pituophis catenifer*
Turtles	
Painted turtle	*Chrysemys picta*

Class Aves

Common name	*Scientific name*
Swans, Geese, and Ducks	
Snow goose	*Chen caerulescens*
Ross's goose	*Chen rossii*
Greater white-fronted goose	*Anser albifrons*
Canada goose	*Branta canadensis*
Trumpeter swan*	*Cygnus buccinator**
Tundra swan	*Cygnus columbianus*
Wood duck	*Aix sponsa*
Gadwall	*Anas strepara*
American wigeon	*Anas americana*
Eurasian wigeon	*Anas penelope*

Common name	*Scientific name*
Mallard	*Anas platyrhynchos*
Blue-winged teal	*Anas discors*
Cinnamon teal	*Anas cyanoptera*
Northern shoveler	*Anas clypeata*
Northern pintail	*Anas acuta*
Green-winged teal	*Anas crecca*
Canvasback	*Aythya valisineria*
Redhead	*Aythya Americana*
Ring-necked duck	*Aythya collaris*
Lesser scaup	*Aythya affinis*
Greater scaup	*Aythya marila*
Bufflehead	*Bucephala albeola*
Common goldeneye	*Bucephala clangula*
Barrow's goldeneye	*Bucephala islandica*
Hooded merganser	*Lophodytes cucullatus*
Common merganser	*Mergus merganser*
Red-breasted merganser	*Mergus serrator*
Ruddy duck	*Oxyura jamaicensis*
White-winged scoter	*Melanitta fusca*
Long-tailed duck	*Clangula hyemalis*
Surf scoter	*Melanitta perspicillata*
Black scoter	*Melanitta nigra*
Upland Gamebirds	
Ring-necked pheasant†	*Phasianus colchicus*†
Gray partridge†	*Perdix perdix*†
Ruffed grouse	*Bonasa umbellus*†
Wild turkey†	*Meleagris gallopavo*†
California quail†	*Callipepla californica*†
Loons	
Common loon*	*Gavia immer**
Grebes	
Pied-billed grebe	*Podylimbus podiceps*
Horned grebe	*Podiceps auritus*
Red-necked grebe	*Podiceps grisegena*
Eared grebe	*Podiceps nigricollis*
Western grebe	*Aechmophorus occidentalis*
Clark's grebe*	*Aechmophorus clarkii**
Pelicans	
American white pelican*	*Pelecanus erythrocephalus**
Cormorants	
Double-crested cormorant	*Phalacrocorax auritus*
Herons	
American bittern*	*Botaurus lentiginosus**
Great blue heron*	*Ardea herodias**
Great egret	*Ardea alba*

Common name	*Scientific name*
Snowy egret	*Egretta caerulea*
Black-crowned night-heron*	*Nycticorax nycticorax**
Cattle egret	*Bubulcus ibis*
Ibis	
White-faced ibis	*Plegadis chihi*
Vultures	
Turkey vulture	*Cathartes aura*
Hawks and Eagles	
Osprey	*Pandion haliaetus*
Bald eagle*	*Haliaeetus leucocephalus**
Northern harrier	*Circus cyaneus*
Sharp-shinned hawk	*Accipiter striatus*
Cooper's hawk	*Accipiter cooperii*
Northern goshawk*	*Accipiter gentilis**
Swainson's hawk	*Buteo swainsoni*
Red-tailed hawk	*Buteo jamaicensis*
Ferruginous hawk	*Buteo regalis*
Rough-legged hawk	*Buteo lagopus*
Golden eagle*	*Aquila chrysaetos**
White-tailed kite	*Elanus leucurus*
Falcons	
American kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine falcon*	*Falco peregrinus**
Prairie falcon	*Falco mexicanus*
Gyrfalcon	*Falco rusticolus*
Rails	
Virginia rail	*Rallus limicola*
Sora	*Porzana carolina*
American coot	*Fulica americana*
Cranes	
Sandhill crane	*Grus canadensis*
Plovers	
Killdeer	*Charadrius vociferous*
Semipalmated plover	*Charadrius semipalmatus*
American golden plover	*Pluvialis dominica*
Black-bellied plover	*Pluvialis squatarola*
Avocets	
American avocet	*Recurvirostra americana*
Black-necked stilt*	*Himantopus mexicanus**
Sandpipers	
Greater yellowlegs	*Tringa melanoleuca*
Lesser yellowlegs	*Tringa flavipes*
Solitary sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmatus*

Common name	*Scientific name*
Spotted sandpiper	*Actitis macularia*
Whimbrel	*Numenius phaeopus*
Long-billed curlew*	*Numenius americanus**
Marbled godwit	*Limosa fedoa*
Long-billed dowitcher	*Limnodromus scolopaceus*
Short-billed dowitcher	*Limnodromus griseus*
Wilson's snipe	*Gallinago delicata*
Ruddy turnstone	*Arenaria interpres*
Wilson's phalarope	*Phalaropus tricolor*
Red-necked phalarope	*Phalaropus lobatus*
Sandpipers	
Stilt sandpiper	*Calidis himantopus*
Sanderling	*Calidris alba*
Semipalmated sandpiper	*Calidris pusilla*
Western sandpiper	*Calidris mauri*
Least sandpiper	*Calidris minutilla*
White-rumped sandpiper	*Calidris fuscicollis*
Pectoral sandpiper	*Calidris melanotos*
Dunlin	*Calidris alpina*
Baird's sandpiper	*Calidris bairdii*
Gulls and Terns	
Ring-billed gull	*Larus delawarensis*
Franklin's gull*	*Larus pipixcan**
California gull	*Larus californicus*
Bonaparte's gull	*Larus philadelphia*
Forster's tern*	*Sterna forsteri**
Black tern*	*Sterna niger**
Caspian tern*	*Sterna caspia**
Common tern*	*Sterna hirundo**
Herring gull	*Larus argentatus*
Least tern*	*Sternula antillarum**
Pigeon and Doves	
Mourning dove	*Zenaida macroura*
Rock dove	*Columbia livia*
Eurasian collared-dove†	*Streptopelia decaocto*†
Cuckoos	
Black-billed cuckoo*	*Coccyzus erythropthalmus**
Yellow-billed cuckoo*	*Coccyzus americanus**
Owls	
Great horned owl	*Bubo virginianus*
Burrowing owl*	*Athene cunicularia**
Long-eared owl	*Asio otus*
Short-eared owl	*Asio flammeus*
Northern saw-whet owl	*Aegolius acadicus*
Northern pygmy-owl	*Glaucidium gnoma*

Common name	*Scientific name*
Western screech-owl	*Megascops kennicottii*
Great gray owl*	*Strix nebulosa**
Flammulated owl*	*Otus flammeolus**
Snowy owl	*Bubo scandiacus*
Nighthawks	
Common nighthawk	*Chordeiles minor*
Swifts	
White-throated swift	*Aeronautes saxatalis*
Vaux's swift	*Chaetura vauxi*
Black swift*	*Cypseloides niger**
Hummingbirds	
Rufous hummingbird	*Selasphorus rufus*
Calliope hummingbird	*Stellula calliope*
Black-chinned hummingbird	*Archilochus alexandri*
Kingfishers	
Belted kingfisher	*Ceryle alcyon*
Woodpeckers	
Lewis's woodpecker*	*Melanerpes lewis**
Downy woodpecker	*Picoides pubescens*
Hairy woodpecker	*Picoides villosus*
Pileated woodpecker*	*Dryocopus pileatus**
Northern flicker	*Colaptes auratus*
Red-naped sapsucker	*Sphyrapicus nuchalis*
Flycatchers	
Western kingbird	*Tyrannus verticalis*
Eastern kingbird	*Tyrannus forficatus*
Say's phoebe	*Saynoris saya*
Willow flycatcher	*Empidonax traillii*
Dusky flycatcher	*Empidonax oberholseri*
Hammond's flycatcher	*Empidonax hammondii*
Cordilleran flycatcher	*Empidonax occidentalis*
Least flycatcher	*Empidonax minimus*
Olive-sided flycatcher	*Contopus cooperi*
Western wood-pewee	*Contopus sordidulus*
Shrikes	
Loggerhead shrike*	*Lanius ludovicianus**
Northern shrike	*Lanius excubitor*
Vireos	
Warbling vireo	*Vireo gilvus*
Cassin's vireo	*Vireo cassinii*
Plumbeous vireo	*Vireo plumbeus*
Red-eyed vireo	*Vireo olivaceus*
Jays, Crows, and Magpies	
Steller's jay	*Cyanocitta stelleri*
Clark's nutcracker	*Nucifraga columbiana*

Common name	*Scientific name*
Black-billed magpie	*Pica hudsonia*
American crow	*Corvus brachyrhynchos*
Pinyon jay*	*Gymnorhinus cyanocephalus**
Common raven	*Corvus corax*
Larks	
Horned lark	*Eremophila alpestris*
Swallows	
Tree swallow	*Tachycineta bicolor*
Violet-green swallow	*Tachycineta thalassina*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Bank swallow	*Riparia riparia*
Cliff swallow	*Petrochelidon pyrrhonota*
Barn swallow	*Hirundo rustica*
Chickadees	
Black-capped chickadee	*Parus atricapillus*
Mountain chickadee	*Parus gambeli*
Nuthatches	
Red-breasted nuthatch	*Sitta canadensis*
White-breasted nuthatch	*Sitta carolinensis*
Pygmy nuthatch	*Sitta pygmaea*
Creepers	
Brown creeper*	*Certhia americana**
Wrens	
House wren	*Troglodytes aedon*
Winter wren*	*Troglodytes troglodytes**
Marsh wren	*Cistothorus palustris*
Dipper	
American dipper	*Cinclus mexicanus*
Kinglets	
Golden-crowned kinglet	*Regulus satrapa*
Ruby-crowned kinglet	*Regulus calendula*
Thrushes	
American robin	*Turdus migratorius*
Townsend's solitaire	*Myadestes townsendi*
Swainson's thrush	*Catharus ustulatus*
Hermit thrush	*Catharus guttatus*
Veery*	*Catharus fuscescens**
Mountain bluebird	*Sialia currucoides*
Western bluebird	*Sialia mexicana*
Varied thrush	*Ixoreus naevius*
Thrashers, Mockingbirds, and Catbirds	
Gray catbird	*Dumetella carolinensis*
Sage thrasher*	*Oreoscoptes montanus**
Starlings	
European starling	*Sturnus vulgaris*

Common name	*Scientific name*
Pipits	
American pipit	*Anthus rubescens*
Waxwings	
Bohemian waxwing	*Bombycilla garrulous*
Cedar waxwing	*Bombycilla cedrorum*
Warblers	
Nashville warbler	*Vermivora ruficapilla*
Orange-crowned warbler	*Vermivora celata*
Yellow warbler	*Dendroica petechia*
Yellow-rumped warbler	*Dendroica coronata*
Townsend's warbler	*Dendroica townsendi*
Northern waterthrush	*Seiurus noveboracensis*
Common yellowthroat	*Geothlipis trichas*
MacGillivray's warbler	*Oporornis tolmiei*
Wilson's warbler	*Wilsonia pusilla*
Black-and-white warbler	*Mniotilta varia*
American redstart	*Setophaga ruticilla*
Yellow-breasted chat	*Icteria virens*
Blackpoll warbler	*Dendroica striata*
Sparrows	
American tree sparrow	*Spizella arborea*
Clay-colored sparrow	*Spizella pallida*
Chipping sparrow	*Spizella passerina*
White-crowned sparrow	*Zonotrichia laucophrys*
Spotted towhee	*Pipilo maculatus*
Harris' sparrow	*Zonotrichia querula*
Song sparrow	*Melospiza melodia*
Lincoln sparrow	*Melospiza lincolnii*
Vesper sparrow	*Pooecetes gramineus*
Fox sparrow	*Passerella iliaca*
Savannah sparrow	*Passerculus sandwichensis*
LeConte's sparrow*	*Ammodramus leconteii**
Swamp sparrow	*Melospiza georgiana*
Dark-eyed junco	*Junco hyemalis*
House sparrow	*Passer domesticus*
Snow bunting	*Plectrophenax nivalis*
Tanagers, Cardinals, and Buntings	
Western tanager	*Piranga ludoviciana*
Black-headed grosbeak	*Pheucticus melanocephalus*
Lazuli bunting	*Passerina amoena*
Blackbirds	
Bobolink*	*Dolichonyx oryzivorus**
Western meadowlark	*Sturnella neglecta*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Red-winged blackbird	*Agelaius phoeniceus*

Common name	*Scientific name*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
Common grackle	*Quiscalus quiscula*
Rusty blackbird	*Euphagus carolinus*
Finches	
House finch	*Carpodacus mexicanus*
Pine grosbeak	*Pinicola enucleator*
Evening grosbeak	*Coccothraustes vespertinus*
Common redpoll	*Carduelis flammea*
Pine siskin	*Carduelis pinus*
American goldfinch	*Carduelis tristis*
Red crossbill	*Loxia curvirostra*

Class Mammalia

Common name	*Scientific name*
Shrews	
Vagrant shrew	*Sorex vagrans*
Common (masked) shrew	*Sorex cinereus*
Yellow-pine chipmunk	*Tamias amoenus*
Bats	
California myotis	*Myotis californicus*
Western small-footed myotis	*Myotis ciliolabrum*
Western long-eared myotis	*Myotis evotis*
Little brown bat	*Myotis lucifugus*
Fringed myotis*	*Myotis thysanodes**
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis ymanensis*
Townsends big-eared bat*	*Corynorhinus townsendii**
Hoary bat*	*Lasiurus cinereus**
Big brown bat	*Eptesicus fuscus*
Silver-haired bat	*Lasionycteris noctivagans*
Beavers	
American beaver	*Castor canadensis*
Porcupines	
Common porcupine	*Erethizon dorsatum*
Pocket Gophers	
Northern pocket gopher	*Thomomys talpoides*
Mice, Voles, and Rats	
Deer mouse	*Peromyscus maniculatus*
Meadow vole	*Microtus pennsylvanicus*
Bushy-tailed woodrat	*Neotoma cinerea*
Common muskrat	*Ondatra zibethicus*
Squirrels	
Red squirrel	*Tamiasciurus hudsonicus*

Common name	*Scientific name*
Columbian ground squirrel	*Spermophilus columbianus*
Northern flying squirrel	*Glaucomys sabrinus*
Eastern fox squirrel	*Sciurus niger*
Yellow-bellied marmot	*Marmota flaviventris*
Wolves, Coyotes, and Foxes	
Red fox	*Vulpes vulpes*
Coyote	*Canis latrans*
Gray wolf*	*Canis lupus**
Cats	
Bobcat	*Lynx rufus*
Mountain lion	*Puma concolor*
Skunks	
Striped skunk	*Mephitis mephitis*
Weasels	
Short-tailed weasel	*Mustela erminea*
Northern river otter	*Lontra canadensis*
American badger	*Taxidea taxus*
Mink	*Mustela vison*
Raccoons	
Raccoon	*Procyon lotor*
Bears	
Black bear	*Ursus americanus*
Deer, Moose, and Elk	
White-tailed deer	*Odocoileus virginianus*
Moose	*Alces alces*
Mule deer	*Odocoileus hemionus*
Elk	*Cervus elaphus*

Class Osteichthyes

Common name	*Scientific name*
Fish	
Largemouth bass†	*Micropterus salmoides*†
Pumpkinseed†	*Lepomis gibbosus*†
Yellow perch†	*Perca flavescens*†
Largescale sucker	*Catostomus macrocheilus*
Longnose sucker	*Catostomus catostomus*
Northern pikeminnow	*Ptychocheilus oregonensis*
Redside shiner	*Richardsonius balteatus*
Mountain whitefish	*Prosopium williamsoni*
Rainbow trout†	*Oncorhynchus mykiss*†
Brown trout†	*Salmo trutta*†
Brook trout†	*Salvelinus fontinalis*†
Bull trout*	*Salvelinus confluentus**

Class Pinopsida

Common name	*Scientific name*
Pinaceae (Pine)	
Rocky Mountain juniper	*Juniperus scopulorum*
Lodgepole pine	*Pinus contorta*
Ponderosa pine	*Pinus ponderosa* v. *ponderosa*
Douglas fir	*Pseudotsuga menziesii* v. *glauca*

Class Magnoliopsida

Common name	*Scientific name*
Aceraceae (Maple)	
Rocky mountain maple	*Acer glabrum*
Amaranthaceae Amaranth (Pigweed)	
Tumbleweed	*Amaranthus albus*
Prostrate pigweed	*Amaranthus graecizans*
Powell's amaranth	*Amaranthus powellii*
Redroot amaranth	*Amaranthus retroflexus*
Asclepiadaceae (Milkweed)	
Showy milkweed	*Asclepias speciosa*
Apocynaceae (Dogbane)	
Spreading dogbane	*Apocynum androsaemifolium*
Clasping leaved dogbane	*Apocynum sibiricum*
Balsaminaceae (Touch-Me-Not)	
Spurless jewelweed	*Impatiens ecalcarata*
Berberidaceae (Barberry)	
Oregon grape	*Berberis repens*
Betulaceae (Birch)	
Thin-leaved alder	*Alnus incana*
River birch	*Betula occidentalis*
Boraginaceae (Borage)	
Slender cryptantha	*Cryptantha affinis*
Houndstongue‡	*Cynoglossum officinale*‡
Blueweed‡	*Echium vulgare*‡
Western stickseed	*Lappula redowskii*
Corn gromwell	*Lithospermum arvense*
Wayside gromwell	*Lithospermum ruderale*
Field forget-me-not	*Myosotis arvensis*
Small flowered forget-me-not	*Myosotis laxa*
Blue forget-me-not	*Myosotis micrantha*
Common forget-me-not	*Myosotis scorpioides*
Early forget-me-not	*Myosotis verna*
Italian bugloss‡	*Anchusa azurea mill*‡
Scouler's popcorn-flower	*Plagiobothrys scouleri*
Cactaceae (Cactus)	
Brittle cholla	*Opuntia fragilis*

Common name	*Scientific name*
Callitriche (Water-Starwort)	
Northern water-starwort	*Callitriche hermaphroditica*
Water-starwort	*Callitriche heterophylla*
Pond water-starwort	*Campanula rotundifolia*
Campanulaceae (Harebell)	
Scotch harebell	*Campanula rotundifolia*
Caprifoliaceae (Honeysuckle)	
Blue elderberry	*Sambucus caerulea*
Common snowberry	*Symphoricarpos albus*
High-bush cranberry	*Viburnum opulus*
Caryophyllaceae (Pink)	
Blunt leaved sandwort	*Arenaria lateriflora*
Thyme-leaved sandwort	*Arenaria serpyllifolia*
Field chickweed	*Cerastium arvense*
Nodding chickweed	*Cerastium nutans*
Jagged chickweed	*Holosteum umbellatum*
White champion	*Lychnis alba*
Menzies' silene	*Silene menziesii*
Red sandspurry	*Spergularia rubra*
Long leaved starwort	*Stellaria longifolia*
Ceratophyllaceae (Hornwort)	
Common hornwort	*Ceratophyllum demersum*
Chenopodiaceae (Goosefoot)	
Fat hen	*Atriplex patula* v. *hastata*
Lambs quarter	*Chenopodium album*
Jerusalem oak	*Chenopodium botrys*
Maple leaved goosefoot	*Chenopodium nybridum*
Kochia/red belvedere‡	*Kochia scoparia*‡
Poverty weed	*Monolepis nuttalliana*
Russian thistle‡	*Salsola kali*‡
Compositae (Asteraceae) (Sunflower)	
Yarrow	*Achillea millefolium*
False dandelion	*Agoseris glauca*
Pearly everlasting	*Anaphalis margaritacea*
Nuttals pussy-toes	*Antennaria parviflora*
Rosy pussy-toes	*Antennaria microphylla*
Umber pussy-toes	*Antennaria umbrinella*
Common burdock‡	*Arctium minus*‡
Meadow arnica	*Arnica chamissonis*
Western absinthium ‡	*Artemisia absinthium*‡
Biennial sagewort	*Artemisia biennis*
Northern sagewort	*Artemisia campestris* v. *scouleriana*
Tarragon	*Artemisia dracunculus*
Fringed sagewort	*Artemisia frigida*
Western mugwort	*Artemisia ludoviciana* v. *latiloba*

Common name	*Scientific name*
Prairie sage	*Artemisia ludoviciana* v. *ludoviciana*
Smooth aster	*Aster laevis*
Few-flowered aster	*Aster modestus*
White prairie aster	*Aster pansus*
Beggar-ticks	*Bidens cernua*
Musk thistle‡	*Carduus nutans*‡
Spotted knapweed‡	*Centaurea maculosa*‡
Oxeye daisy‡	*Chrysanthemum leucanthemum*‡
Hairy golden aster	*Chrysopsis villosa*
Rabbit-brush	*Chrysothamnus nauseosus*
Canada thistle‡	*Cirsium arvense*‡
Wavy leaved thistle	*Cirsium undulatum*
Bull thistle	*Cirsium vulgare*
Horseweed	*Conyza canadensis*
Cutleaf daisy	*Erigeron compositus*
Spreading fleabane	*Erigeron divergens*
Shaggy fleabane	*Erigeron pumilus*
Showy fleabane	*Erigeron speciosis*
Daisy fleabane	*Erigeron strigosus* v. *strigosus*
Field filago	*Filago arvensis*
Blanket flower	*Gaillardia aristata*
Lowland cudweed	*Gnaphalium palustre*
Gumweed	*Grindelia squarrosa*
Sunflower	*Helianthus annuus*
Nuttals sunflower	*Helianthus nuttallii*
Narrow-leaved hawkweed	*Hieracium umbellatum*
Poverty weed	*Iva xanthifolia*
Prickly lettuce	*Lactuca serriola*
Pineapple weed‡	*Matricaria matricarioides*‡
Nodding microseris	*Microseris nutans*
False-agroseris	*Microseris troximoides*
Woolly groundsel	*Senecio canus*
Groundsel	*Senecio indecorus*
Tall butterweed	*Senecio serra*
Canada goldenrod	*Solidago canadensis*
Late goldenrod	*Solidago gigantea*
Missouri goldenrod	*Solidago missouriensis*
Western goldenrod	*Solidago occidentalis*
Common sowthistle	*Sonchus oleraceus*
Marsh sowthistle‡	*Sonchus uliginosus*‡
Common tansy‡	*Tanacetum vulgare*‡
Smooth dandelion‡	*Taraxacum laevigatum*‡
Common dandelion‡	*Taraxacum officinale*‡
Goatsbeard/western salsify‡	*Tragopogon dubius*‡
Cocklebur	*Xanthium strumarium*

Common name	*Scientific name*
Convolvulaceae (Morning-Glory)	
Field bindweed‡	*Convolvulus arvensis*
Cornaceae (Dogwood)	
Red-osier dogwood	*Cornus stolonifera*
Crassulaceae (Stonecrop)	
Lanceleaf stonecrop	*Sedum lanceolatum*
Cruciferae (Mustard)	
Pale alyssum	*Alyssum alyssoides*
Desert alyssum	*Alyssum desertorum*
Holboell's rockcress	*Arabis holboellii*
Nuttall's rockcress	*Arabis nuttallii*
Wintercress	*Barbarea orthoceras*
Hoary alyssum‡	*Berteroa incana*‡
Field mustard	*Brassica campestris*
Black mustard	*Brassica nigra*
Hairy false flax	*Camelina microcarpa*
Shepherd's purse	*Capsella bursa-pastoris*
Little western bittercress	*Cardamine oligosperma*
Pennsylvania bittercress	*Cardamine pensylvanica*
Tansy mustard	*Descurainia sophia*
Woods draba	*Draba nemorosa*
Whitlow-grass	*Draba verna*
Wormseed mustard	*Erysimum cheiranthoides*
Dame's rocket	*Hesperis matronalis*
Field pepper grass	*Lepidium campestre*
Common pepper grass	*Lepidium densiflorum*
Clasping pepper grass	*Lepidium perfoliatum*
Western yellowcress	*Rorippa curvisiliqua*
Marsh yellowcress	*Rorippa islandica*
Watercress	*Rorippa nasturtiumaquaticum* v. *glabrata*
Jim hill mustard	*Sisymbrium altissimum*
Tumble mustard	*Sisymbrium loeselii*
Fanweed	*Thlaspi arvense*
Dipsacaceae (Teasel)	
Teasel‡	*Dipsacus sylvestris*‡
Euphorbiaceae (Spurge)	
Leafy spurge‡	*Euphorbia esula*‡
Corrugate-seeded spurge	*Euphorbia glyptosperma*
Thyme-leaf spurge	*Euphorbia serpyllifolia*
Ericaceae (Heath)	
White pyrola	*Pyrola elliptica*
Pinedrops	*Pterospora andromeda*
Geraniaceae (Geranium)	
Cranes bill	*Erodium cicutarium*
Bicknell's geranium	*Geranium bicknelli*

Common name	*Scientific name*
Small field geranium	*Geranium pusillum*
Sticky geranium	*Geranium viscosissimum*
Grossulariacea (Gooseberry)	
Common current	*Ribes sativum*
Missouri gooseberry	*Ribes setosum*
Haloragaceae (Water-Milfoil)	
Northern water milfoil	*Myriophyllum sibricum*
Hippuridaceae (Mares-Tail)	
Mares-tail	*Hippuris vulgaris*
Hydrophyllaceae (Waterleaf)	
Sand phacelia	*Phacelia linearis*
Hypericaceae (St. Johnswort)	
Western St. Johnswort	*Hypericum formosum* v. *scouleri*
Canada St. Johnswort	*Hypericum majus*
Goatweed/St. Johnswort‡	*Hypericum perforatum*‡
Labiatae (Mint)	
Hemp nettle	*Galeopsis tetrahit*
Water horehound	*Lycopus americanus*
Rough bugleweed	*Lycopus asper*
Northern bugleweed	*Lycopus uniflorus*
Field mint	*Mentha arvensis*
Wild bergamot	*Monarda fistulosa*
Catnip	*Nepeta cataria*
Purple dragonhead	*Physostegia parviflora*
Self-heal	*Prunella vulgaris*
Marsh skullcap	*Scutellaria galericulata*
Hedge nettle	*Stachys palustris* v. *pilosa*
Leguminosae (Pea)	
Canada milkvetch	*Astragalus canadensis* v. *mortonii*
Weedy milkvetch	*Astragalus miser*
Wild licorice	*Glycyrrhiza lepidota*
Velvet lupine	*Lupinus leucophyllus*
Washington lupine	*Lupinus polyphyllus*
Blue-bonnet	*Lupinus sericeus*
Black medic	*Medicago lupulina*
Alfalfa	*Medicago sativa*
White sweet-clover	*Melilotus alba*
Yellow sweet-clover	*Melilotus officinalis*
Alsike clover	*Trifolium hybridum*
Wooly clover	*Trifolium microcephalum*
Red clover	*Trifolium pratense*
White clover	*Trifolium repens*
White-tip clover	*Trifolium variegatum*
American vetch	*Vicia americana*
Common vetch	*Vicia sativa*
Slender vetch	*Vicia tetrasperma*

Common name	*Scientific name*
Hairy vetch	*Vicia villosa*
Lentibulariaceae (Bladderwort)	
Little bladderwort	*Utricularia minor*
Common bladderwort	*Utricularia vulgaris*
Loranthaceae (Mistletoe)	
Dwarf mistletoe	*Arceuthobium* sp.
Malvaceae (Mallow)	
Common mallow	*Malva neglecta*
Cheese weed	*Malva parviflora*
Moraceae (Mulberry)	
Hops	*Humulus lupulus*
Nymphaeaceae (Water Lily)	
Indian pond lily	*Nuphar polysepalum*
Onagraceae (Evening Primrose)	
Enchanter's nightshade	*Circaea alpina*
Fireweed	*Epilobium angustifolium*
Swamp willow-herb	*Epilobium palustre*
Annual willow-herb	*Epilobium paniculatum*
Shrubby willow-herb	*Epilobium suffruticosum*
Watson's willow-herb	*Epilobium watsonii*
Yellow evening primrose	*Oenothera strigosa*
Oxalidaceae (Wood-Sorrel)	
Yellow wood-sorrel	*Oxalis corniculata*
Plantaginaceae (Plantain)	
Ribgrass	*Plantago lanceolata*
Common plantain	*Plantago major* v. *major*
Indian wheat	*Plantago patagonica*
Polemoniaceae (Phlox)	
Narrow-leaved collomia	*Collomia linearis*
Scarlet gillia	*Gilia aggregata*
Pink microsteris	*Microsteris gracilis*
Annual polemonium	*Polemonium micranthum*
Jacob's ladder	*Polemonium pulcherrimum* v. *calycinum*
Polygonaceae (Buckwheat)	
Umbrella plant	*Erigonum umbellatum* v. *subalpinum*
Knotweed	*Polygonum achoreum*
Water smartweed	*Polygonum amphibium*
Dooryard knotweed	*Polygonum aviculare*
Water smartweed	*Polygonum coccineum*
Ivy bindweed	*Polygonum convolvulus*
Douglas' knotweed	*Polygonum douglasii* v. *douglasii*
Marshpepper	*Polygonum hydropiper*
Smartweed	*Polygonum hydropiperoides*
Willow weed	*Polygonum lapathifolium*
Spotted ladysthumb	*Polygonum persicaria*
Dotted smartweed	*Polygonum punctatum*

Common name	*Scientific name*
Red sorrel	*Rumex acetosella*
Curly dock	*Rumex crispus*
Seaside dock	*Rumex maritimus*
Western dock	*Rumex occidentalis*
Willow dock	*Rumex salicifolius*
Portulacaceae (Purslane)	
Narrow-leaved miners lettuce	*Montia linearis*
Miner's lettuce	*Montia perfoliata*
Purslane	*Portulaca oleracea*
Bitterroot	*Lewisia rediviva*
Primulaceae (Primrose)	
Fairy candelabra	*Androsace occidentalis*
Woodland shooting star	*Dodecatheon pulchellum*
Fringed loosestrife	*Lysimachia ciliata*
Tufted loosestrife	*Lysimachia thrysiflora*
Ranunculaceae (Buttercup)	
Western clematis	*Clematis ligusticifolia*
Sedge mousetail	*Myosurus aristatus*
Kidney-leaved buttercup	*Ranunculus abortivus*
Tall buttercup‡	*Ranunculus acris*‡
Water buttercup	*Ranunculus aquatilis* v. *capillaceus*
Shore buttercup	*Ranunculus cymbalaria*
Yellow water buttercup	*Ranunculus flabellaris*
Creeping buttercup	*Ranunculus flammula*
Sagebrush buttercup	*Ranunculus glaberrimus* v. *glaberrimus*
Gmelins buttercup	*Ranunculus gmelinii* v. *limosus*
Long-beaked water-buttercup	*Ranunculus longirostris*
Macouns buttercup	*Ranunculus macounii*
Bristly buttercup	*Ranunculus pensylvanicus*
Creeping buttercup	*Ranunculus repens*
Celery-leaved buttercup	*Ranunculus sceleratus*
Stiff-leaf water buttercup	*Ranunculus subriqidus*
Little buttercup	*Ranunculus uncinatus* v. *uncinatus*
Tall meadowrue	*Thalictrum dasycarpum*
Western meadowrue	*Thalictrum occidentale*
Few-flowered meadowrue	*Thalictrum sparsiflorum*
Rosaceae (Rose)	
Serviceberry	*Amelanchier alnifolia*
River hawthorn	*Crataegus douglasii*
Woods strawberry	*Fragaria vesca*
Blueleaf strawberry	*Fragaria virginiana*
Large-leaved avens	*Geum macrophyllum*
Water avens	*Geum rivale*
Prairie smoke	*Geum triflorum*
Silverweed	*Potentilla anserina*

Common name	*Scientific name*
Silvery cinquefoil	*Potentilla argentia*
Biennial cinquefoil	*Potentilla biennis*
Sticky cinquefoil	*Potentilla glandulosa*
Elmer's cinquefoil	*Potentilla gracilis* v. *elmeri*
Marsh cinquefoil	*Potentilla palustris*
Sulfur cinquefoil‡	*Potentilla recta*‡
Bitter cherry	*Prunus emarginata*
Chokecherry	*Prunus virginiana* v. *melanocarpa*
Woods rose	*Rosa woodsii*
Red raspberry	*Rubus idaeus*
Rubiaceae (Madder)	
Cleavers	*Galium aparine*
Thinleaf bedstraw	*Galium bifolium*
Northern bedstraw	*Galium boreale*
Small cleavers	*Galium trifidum*
Salicaceae (Wwillow)	
Lombardy poplar	*Populus nigra* v. *italica*
Quaking aspen	*Populus tremuloides*
Black cottonwood	*Populus trichocarpa*
Peach-leaf willow	*Salix amygdaloides*
Bebb willow	*Salix bebbiana*
Sandbar willow	*Salix exigua*
Geyer willow	*Salix geyeriana*
Whiplash willow	*Salix lasiandra*
Mackenzie willow	*Salix rigida*
Saxifragaceae (Saxifrage)	
Smooth fringecup	*Lithophragma glabra*
Small-flowered fringecup	*Lithophragma parviflora*
Scrophulariaceae (Figwort)	
Blue-eyed mary	*Collinsia parviflora*
Common hedge-hyssop	*Gratiola neglacta*
Dalmation toadflax‡	*Linaria dalmatica*‡
Yellow toadflax‡	*Linaria vulgaris*‡
Monkey flower	*Mimulus guttatus* v. *guttas*
Musk plant	*Mimulus moschatus*
Little penstemon	*Penstemon procerus*
Common mullein	*Verbascum thapsus*
American speedwell	*Veronica americana*
Water speedwell	*Veronica anagallis-aquatica*
Chain speedwell	*Veronica catenata*
Purslane speedwell	*Veronica peregrina*
Thyme-leaved speedwell	*Veronica serpyllifolia* v. *serpyllifolia*
Vernal speedwell	*Veronica verna*
Solanaceae (Nightshade)	
Henbane	*Hyoscyamus niger*

Common name	*Scientific name*
Bittersweet nightshade	*Solanum dulcamara*
Cut-leaved nightshade	*Solanum triflorum*
Umbelliferae (Parsley)	
Water hemlock	*Cicuta douglasii*
Cow-parsnip	*Heracleum lanatum*
Mountain sweet-cicely	*Osmorhiza chilensis*
Wild parsnip	*Pastinaca sativa*
Black snakeroot	*Sanicula marilandica*
Water parsnip	*Sium suave*
Urticaceae (Nettle)	
Stinging nettle	*Urtica dioica* spp. *Gracilis*
Verbenaceae (Vervain)	
Blue vervain	*Verbena hastata*
Violaceae (Violet)	
Early blue violet	*Viola adunca* v. *bellidifolia*
Marsh violet	*Viola palustris*
Bog violet	*Viola nephrophylla*

Class Liliopsida

Common name	*Scientific name*
Alismataceae (Water-Plantain)	
America water-plantain	*Alisma plantago-aquatica* v. *americanum*
Narrowleaf water-plantain	*Alisma gramineum* v. *angustissimum*
Arumleaf arrowhead	*Sagittaria cuneata*
Cyperaceae (Sedge)	
Awned sedge	*Carex atherodes*
Water sedge	*Carex aquatilis*
Clustered sedge	*Carex arcta*
Slenderbeaked sedge	*Carex anthrostachya*
Golden sedge	*Carex aurea*
Bebb's sedge	*Carex bebii*
Lesser panicled sedge	*Carex diandra*
Douglas' sedge	*Carex douglassii*
Wooly sedge	*Carex languinosa*
Slender sedge	*Carex lasiocarpa*
Kellog's sedge	*Carex lenticularis*
Nebraska sedge	*Carex nebrascensis*
Retrose sedge	*Carex retrosa*
Sawbeaked sedge	*Carex stipata*
Beaked sedge	*Carex utriculata* (c. *Rostrata)*
Inflated sedge	*Carex vesicaria*
Fox sedge	*Carex vulpinoidea*
Awned flatsedge	*Cyperus aristatus*
Shining flatsedge*	*Cyperus rivularis**
Needle spike-rush	*Eleocharis acicularis*

Common name	*Scientific name*
Delicate spike-rush	*Eleocharis bella*
Common spike-rush	*Eleocharis palustris*
Hardstem bulrush	*Scirpus acutus*
Small-fruited bulrush	*Scirpus microcarpus*
Softstem bulrush	*Scirpus validus*
Poaceae (Gramineae) (Grass)	
Goat grass	*Aegilops cylindrica*
Bearded wheatgrass	*Agropyron canium* v. *andinum*
Crested wheatgrass	*Agropyron cristatum*
Thin spiked wheatgrass	*Agropyron dasystachyum*
Intermediate wheatgrass	*Agropyron intermedium*
Quack grass	*Agropyron repens*
Western wheatgrass	*Agropyron smithii*
Bluebunch wheatgrass	*Agropyron spicatum*
Redtop	*Agropyron alba* v. *alba*
Tickle-grass	*Agropyron scabra*
Shortawn foxtail	*Alopecurus aequalis*
Meadow foxtail	*Alopecurus partensis*
Common oats	*Avena sativa*
Slough grass	*Beckmania syzigachne*
Smooth brome-grass	*Bromus inermis* spp. *inermus*
Soft brome-grass	*Bromus mossi*
Cheatgrass‡	*Bromus tectorum*‡
Bluejoint reedgrass	*Calamagrostis canadensis* v. *canadensis*
Slim reedgrass	*Calamagrostis neglecta*
Brook grass	*Catabrosa aquatica*
Woodreed	*Cina latifolia*
Orchard grass	*Dactylis glomerata*
Canada wildrye	*Elymus canadensis*
Great basin wildrye	*Elymus cinereus*
Stinkgrass	*Eragrostis cilienensis*
Tall fescue	*Festuca arundinacea*
Six weeks fescue	*Festuca octoflora*
Northern mannagrass	*Glyceria borealis*
Tall mannagrass	*Glyceria elata*
American mannagrass	*Glyceria grandis*
Fowl mannagrass	*Glyceria striata*
Foxtail barley	*Hordeum jubatum*
Junegrass	*Koeleria cristata*
Perennial ryegrass	*Lolium perenne*
Indian ricegrass	*Oryzopsis hymenoides*
Common witchgrass	*Panicum capillare*
Reed canarygrass	*Phalaris arundinacea*
Common timothy	*Phleum pratense*
Annual bluegrass	*Poa annua*

Common name	*Scientific name*
Viviparous bluegrass	*Poa bulbosa*
Canada bluegrass	*Poa compressa*
Fowl bluegrass	*Poa palustris*
Kentucky bluegrass	*Poa pratensis*
Sandbergs bluegrass	*Poa sandbergii*
Green bristlegrass	*Setaria viridis*
Sand dropseed	*Sporobolis cryptandrus*
Squirreltail	*Sitanion hystrix*
Needle and thread	*Stipa comata*
Green needlegrass	*Stipa viridula*
Hydrocharitaceae (Frog's Bit)	
Canada waterweed	*Elodea canadensis*
Nuttalls waterweed	*Elodea nuttallii*
Iridaceae (Iris)	
Yellow flag iris‡	*Iris pseudacorus*‡
Blue-eyed grass	*Sisyrinchium angustifolium*
Juncaceae (Rush)	
Wire grass	*Juncus balticus*
Toad rush	*Juncus bufonius*
Soft rush	*Juncus effusus*
Dagger-leaf rush	*Juncus ensifolius*
Tuberous rush	*Juncus nodosus*
Slender rush	*Juncus tenuis* v. *tenuis*
Torrey's rush	*Juncus torrei*
Smooth rush	*Luzula hitchcockii*
Lemnaceae (Duckweed)	
Water lentil	*Lemna minor*
Star duckweed	*Lemna trisulca*
Great duckweed	*Spirodela polyrhiza*
Watermeal	*Wolffia punctata*
Lilaceae (Lily)	
Nodding onion	*Allium cernuum*
Asparagus	*Asparagus officinalis*
Wild hyacinth	*Brodiaea douglasii*
Starry false solomon's seal	*Smilacina stellata*
Common death camas	*Zigadenus venenosus*
Najadaceae (Water-Nymph)	
Guadalupe water-nymph*	*Najas guadalupensis**
Potamogetonaceae (Pondweed)	
Reddish pondweed	*Potamogeton alpinus*
Large-leaved pondweed	*Potamogeton amplifolius*
Berchtold's pondweed	*Potamogeton berchtoldii*
Ribbon-leaved pondweed	*Potamogeton epihydrus*
Slender-leaved pondweed	*Potamogeton filiformis*
Illinois pondweed	*Potamogeton illinoensis*

Common name	*Scientific name*
Floating-leaved pondweed	*Potamogeton natans*
Fennel-leaved pondweed	*Potamogeton pectinatus*
Small pondweed	*Potamogeton pusillus*
Richardsons pondweed	*Potamogeton richardsonii*
Eel-grass pondweed	*Potamogeton zosteriformis*
Sparganiaceae (Bur-Reed)	
Narrow-leaved bur-reed	*Sparganium angustifolium*
Simple stem bur-reed	*Sparganium emersum* v. *multipedunculatum*
Typhaceae (Cat-Tail)	
Common cattail	*Typha latifolia*
Zannichelliaceae (Horned Pondweed)	
Horned pondweed	*Zannichellia palustris*

Class Filicopsida

Common name	*Scientific name*
Polypodiaceae (Common Fern)	
Brittle bladder-fern	*Cystopteris fragilis*
Marsileaceae (Pepperwort)	
Pepperwort	*Marsilea vestita*

Class Equisetopsida

Common name	*Scientific name*
Equisetaceae (Horsetail)	
Common horsetail	*Equisetum arvense*
Water horsetail	*Equisetum fluviatile*
Scouring rush	*Equisetum hyemale*
Smooth scouring rush	*Equisetum laevigatum*
Marsh horsetail	*Equisetum palustre*
Shady horsetail	*Equisetum pratense*

Class Lycopodiopsida

Common name	*Scientific name*
Selaginellaceae (Clubmoss)	
Compact clubmoss	*Selaginella densa* v. *densa*

Class Marchantiospida

Common name	*Scientific name*
Marchantiaceae	
—	*Marcantia polymorphia*
Ricciaceae	
—	*Riccio carpus natans*

Class chlorophyceae

Common name	*Scientific name*
Characeae (Green Algae)	
—	*Nostoc* ssp.
—	*Hydrodictnon reticulatum*
—	*Riccia fluitins*
—	*Nitella* spp.
—	*Chara* spp.
—	*Tolypella* spp.

Class insecta

Common name	*Scientific name*
Butterflies	
Two-tailed swallowtail	*Papilio multicaudata*
Western tiger swallowtail	*Papilio rutulus*
Pale swallowtail	*Papilio eurymedon*
Western white	*Pontia occidentalis*
Cabbage white†	*Pieris rapae*†
Beckers white	*Pontia beckerii*
Checkered white	*Pontia protodice*
Clouded sulphur	*Colias philodice*
Sara orangetip	*Anthocharis sara*
Orange sulfur	*Colias eurytheme*
Ediths copper	*Lycaena editha*
Purplish copper	*Lycaena helloides*
Bronze copper	*Lycaena hyllus*
Western pine elfin	*Callophrys eryphon*
Gray hairstreak	*Strymon melinus*
Melissa blue	*Lycaeides melissa*
Spring azure	*Celastrina ladon*
Arrowhead blue	*Glaucopsyche piasus*
Great spangled fritillary	*Speyeria cybele*
Silver-bordered fritillary	*Boloria selene*
Mormon fritillary	*Spreyeria mormonia*
Mylitta crescent	*Phyciodes mylitta*
Northern crescent	*Phyciodes cocyta*
Field crescent	*Phyciodes pratensis*
Ediths checkerspot	*Euphydryas editha*
Satyr anglewing	*Polygonia satyrus*
Oreas anglewing	*Polyfonia oreas*
Zephyr anglewing	*Polyfonia zephyrus*
Mourning cloak	*Nymphalis antiopa*
Milbert's tortoiseshell	*Nymphalis milberti*
California tortoiseshell	*Nymphalis californica*
Red admiral	*Vanessa atalanta*
West coast lady	*Vanessa annabella*

Common name	*Scientific name*
Painted lady	*Vanessa cardui*
Lorquins admiral	*Limenitis lorquini*
Viceroy	*Limenitis archippus*
Common wood nymph	*Cercyonis pegala*
Small wood nymph	*Cercyonis oetus*
Common alpine	*Eregia eipsoodea*
Common ringlet	*Coenonympha ampelos*
Pecks skipper	*Polites peckius*
Sandhill skipper	*Polites sabuleti*
Long dash	*Polites mystic*
Common branded skipper	*Hesperua comma*
Woodland skipper	*Ochlodes sylvanoides*
Arctic skipper	*Carterocephalus palaemon*
Garita skipperling	*Oarisma garita*
Roadside skipper	*Amblyscirtes vialis*
Common sootywing	*Pholisora catullus*
Common checkered skipper	*Pyrgus communis*
Dragonflies and Damselflies	
Spotted spreadwing	*Lestes congener*
Emerald spreadwing	*Lestes dryas*
Lyre-tipped spreadwing	*Lestes unguiculatus*
Northern spreadwing	*Lestes disjunctus*
Northern bluet	*Enallagma annexum*
Boreal bluet*	*Enallagma boreale**
Marsh bluet	*Enallagma ebrium*
Pacific forktail	*Ischnura cervula*
Western forktail	*Ischnura perparva*
Western red damsel	*Amphiagrion abbreviatum*
Canada darner	*Aeshna canadensis*
Lance-tipped darner	*Aeshna constricta*
Paddle-tailed darner	*Aeshna palmata*
Shadow darner	*Aeshna umbrosa*
Common green darner	*Anax junius*
Variable darner	*Aeschna interrupta*
California darner	*Rhionaeschna californica*
Pale snaketail	*Ophiogomphus severus*
Sinuous snaketail	*Ophiogomphus occidentis*
Common whitetail	*Plathemis lydia*
Four-spotted skimmer	*Libellula quadrimaculata*
Eight-spotted skimmer	*Libellula forensis*
Twelve-spotted skimmer	*Libellula pulchella*
Dot-tailed whiteface	*Leucorrhinia intacta*
Hudsonian whiteface	*Leucorrhinia hudsonica*
Variegated meadowhawk	*Sympetrum corruptum*
White-faced meadowhawk	*Sympetrum obtrusum*
Cherry-faced meadowhawk	*Sympetrum internum*

Common name	*Scientific name*
Saffron-winged meadowhawk	*Sympetrum costiferum*
Band-winged meadowhawk	*Sympetrum semicinctum*
Striped meadowhawk	*Sympetrum pallipes*
Black meadowhawk	*Sympetrum vicinum*
Moths	
Isabella tiger moth	*Pyrrharctia isabella*
Carpenterworm moth	*Cossoidea* spp.
Big poplar sphinx	*Pachysphinx occidentalis*
Large yellow underwing	*Noctua pronuba*
One-eyed sphinx	*Smerinthus cerisyi*
Polyphemus moth	*Antheraea polyphemus*
Catocaline moth	*Catocala* spp.
Beetles	
Blister beetle	*Epicauta* spp.
Tiger beetle	*Cincidela oregona*
Leaf beetle	*Chrysomelidae latreille*
Rifle beetle	*Optioservus quadrimaculatus*
Beetle	*Troposternus latoralis*
Tumbling flower beetle	*Mordellidae latreille*
Carrion beetle	*Silphidae latreille*
Ground beetle	*Pterostichus* spp.
Leaf beetle	*Systena* spp.
Predaceous diving beetle	*Platambus* spp.
Weevil	*Larinus* spp.
Weevil	*Rhinocyllus conicus*
Flies	
Caddisfly	*Parapsyche almota*
Caddisfly	*Limnephelus* spp.
Caddisfly	*Hydropsyche californica*
Mayfly	*Baetis tricaudatus*
Mayfly	*Drunella coloradensis*
Mayfly	*Ephemerella excrucians*
Mayfly	*Siphlonurus occidentalis*
Mayfly	*Callibaetis pictus*
Mayfly	*Rhitrhogena robusta*
Mayfly	*Ameletus similior*
Mayfly	*Sweltsa* spp.
Mayfly	*Serratella tibialis*
Mayfly	*Drunella doddsi*
Stonefly	*Claassenia sabulosa*
Stonefly	*Hesperoperla pacifica*
Stonefly	*Kogotus modestus*
Stonefly	*Isoperla* spp.
Stonefly	*Pteronarcella*
Deerfly	*Chrysops* spp.

Class gastropoda

Common name	*Scientific name*
Snails and Slugs	
Forest disc	*Discus whitneyi*
Marsh pondsnail	*Stagnicola elodes*
Mountain marshsnail	*Stagnicola montanensis*
Coeur d'Alene Oregonian	*Cryptomastix mullani*
Brown hive	*Euconolus fulvus*
Garlic glass snail†	*Oxychilus alliarus*†
Two-ridge rams-horn snail	*Helisoma anceps*
Big-eared radix†	*Radix auricularia*†
Mimic lymnaea snail	*Pseudosuccinea columella*
Glossy pillar	*Cochilicopa lubrica*
Grey fieldslug†	*Derocerus reticulatum*†
Idaho forestsnail	*Allogona ptychophora*
Lovely vallonia	*Vallonia pulchella*
Meadow slug†	*Derocerus laeve*†
Quick gloss	*Zonitoides arboreus*
Dusky arion†	*Arion subfuscus*†

Class arachnida

Common name	*Scientific name*
Spiders	
Western black widow	Latrodectus hesperus

Class malacostraca

Common name	*Scientific name*
Scuds	
Scud†	Hyalella azteca†

* Species of concern
† Nonnative animal species
‡ Invasive plant species

Appendix F

Fire Management Program

The U.S. Fish and Wildlife Service (Service) has administrative responsibility for fire management at the Lee Metcalf National Wildlife Refuge, which covers 2,800 acres. This appendix describes the fire management plan that will be implemented on the refuge.

F.1 The Role of Fire

Vegetation in the Rocky Mountains evolved under periodic disturbance and defoliation from fire, drought, floods, large herbivores, insect outbreaks, and disease. These periodic disturbances kept the ecosystem diverse and healthy and maintained significant biodiversity for thousands of years.

Historically, wildland fire played an important role in many ecosystems by stimulating regeneration, cycling nutrients, providing a diversity of habitats for plants and wildlife, and decreasing the impacts of insects and diseases. When fire or grazing is excluded from a landscape, fuel loading occurs due to the buildup of thatch and dead or downed trees. Increased fuel loading intensifies a fire's resistance to control, increases the potential for large-scale severe wildfires, and threatens firefighter and public safety as well as Federal and private facilities. The return of fire in most ecosystems is essential for healthy vegetation for wildlife habitats in grasslands, wetlands, and forests.

When used properly, fire can accomplish the following:

- Reduce hazardous fuel buildup in both wildland–urban interface areas and non-wildland–urban interface areas.
- Improve wildlife habitats by reducing the density of vegetation, changing the plant species composition, or both.
- Sustain or increase biological diversity.
- Improve woodland and shrubland by reducing plant density.
- Reduce susceptibility of plants to insect and disease outbreaks.
- Increase the quantity of water available for municipalities and activities that depend on wildland water supplies.

F.2 Wildland Fire Management Policy and Guidance

Based on Federal interagency policy (Fire Executive Council 2009), wildland fire is defined as any non-structure fire that occurs in the wildland including wildfire and prescribed fire. Response to wildland fire 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 important resources or adjacent lands are likely threatened.

The 1995 Federal Wildland Fire Management Policy was updated in 2001. This revised policy directs Federal agencies to achieve a balance between suppressing fires to protect life, property, and resources and prescribing fires to regulate fuels and maintain healthy ecosystems. The following are the foundational principles for Federal Wildland Fire Management Policy and have been excerpted from "Review and Update of the 1995 Federal Wildland Fire Management Policy" (National Wildfire Coordinating Group 2001):

1. Firefighter and public safety is the first priority in every fire management activity.
2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process. Federal agency land and resource management plans set the objectives for the use and desired future condition of the various public lands.
3. Fire Management Plans (FMP), programs, and activities support land and resource management plans and their implementation.
4. Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities must be understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity. Net gains to the public benefit will be an important component of decisions.
5. Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives. Federal agency administrators are adjusting

and reorganizing programs to reduce costs and increase efficiencies. As part of this process, investments in fire management activities must be evaluated against other agency programs in order to effectively accomplish the overall mission, set short- and long-term priorities, and clarify management accountability.

6. Fire Management Plans and activities are based upon the best available science. Knowledge and experience are developed among all federal wildland fire management agencies. An active fire research program combined with interagency collaboration provides the means to make these tools available to all fire managers.
7. Fire Management Plans and activities incorporate public health and environmental quality considerations.
8. Federal, State, tribal, local, interagency, and international coordination and cooperation are essential. Increasing costs and smaller work forces require that public agencies pool their human resources to successfully deal with the ever-increasing and more complex fire management tasks. Full collaboration among federal wildland fire management agencies and between the federal wildland fire management agencies and international, State, tribal, and local governments and private entities result in a mobile fire management work force available for the full range of public needs.
9. Standardization of policies and procedures among federal wildland fire management agencies is an ongoing objective. Consistency of plans and operations provides the fundamental platform upon which federal wildland fire management agencies can cooperate, integrate fire activities across agency boundaries, and provide leadership for cooperation with State, tribal, and local fire management organizations.

The standardization of policies and procedures among Federal agencies is an ongoing objective. The fire management considerations, guidance, and direction should be addressed in the land use resource plans (for example, the comprehensive conservation plan [CCP]). Fire management plans are stepdown processes from the land use plans and habitat plans; they detail fire suppression, fire use, and fire management activities.

F.3 Management Direction

Lee Metcalf National Wildlife Refuge will suppress human-caused fires and wildfires that threaten life and property. Appropriate suppression actions—whether aggressive, high intensity, or low intensity—will be based on preplanned analysis, executed to minimize costs and resource losses, and consistent with land management objectives.

Prescribed fire, as well as manual and mechanical fuel treatments, would be used in an ecosystem context to protect both Federal and private property and for habitat management purposes. Fuel reduction activities would be applied in collaboration with Federal, State, private, and nongovernmental partners. For wildland–urban interface treatments, focal areas would be those with community wildfire protection plans and designated communities at risk. The only community at risk near the refuge, as identified in the Federal Register, is the community of Stevensville, Montana. The State of Montana has developed a community wildfire protection plan for all communities in Ravalli County.

All aspects of the fire management program will be conducted in a manner consistent with applicable laws, Department of Interior and Service policies, and guidance established at national, regional, and local levels. Lee Metcalf National Wildlife Refuge will maintain a fire management plan to accomplish the fire management goals described below. Wildland fire, prescribed fire, and manual and mechanical fuel treatments will be applied under selected weather and environmental conditions, monitored using scientific techniques, and refined using adaptive management.

FIRE MANAGEMENT GOALS

Fire management goals are set at national, regional, and local levels.

National Fire Management Goals

The goals and strategies of the U.S. Fish and Wildlife Service National Wildlife Refuge System Wildland Fire Management Program Strategic Plan are consistent with the following guidance:

- policies of the Department of the Interior and the Service
- direction from the National Fire Plan
- the President's Healthy Forest Initiative
- 10-Year Comprehensive Strategy and Implementation Plan
- guidelines of the National Wildfire Coordinating Group
- initiatives of the Wildland Fire Leadership Council
- "Interagency Standards for Fire and Aviation Operations"

Regional Fire Management Goals

Priorities stated in "The Region 6 Refuges Regional Priorities FY07–11" are consistent with the vision statement for Region 6: "to maintain and improve the biological integrity of the region, ensure the ecological condition of the region's public and private lands are better understood, and endorse sustainable use

of habitats that support native wildlife and people's livelihoods."

Refuge Fire Management Goals and Objectives

Fire management goals and objectives are used in the planning process to help management determine which responses and activities are necessary to achieve National Fire Plan and land management goals and objectives.

The fire management goals and objectives for Lee Metcalf National Wildlife Refuge are as follows:

1. Provide for firefighter and public safety.
2. Suppress human-caused fires and wildfires that threaten life and property.
3. Reduce wildland fire risk to the community of Stevensville and other public structures and private lands through hazardous fuels reduction treatments.
4. Use wildland fire, manual treatment methods, and mechanical treatment methods to achieve habitat goals and objectives identified in this CCP using scientific techniques and adaptive resource management to monitor results.
5. Protect important migratory bird habitats and natural resource values.
6. All wildfires will receive a management response based on firefighter and public safety considerations, resource and cultural values at risk, and circumstances unique to the incident while providing for cost-effective management.
7. Prevent human-caused wildfires through public contact and education, monitoring, and hazard fuels mitigation.
8. Safely suppress all wildfires occurring within the refuge. Maintain an initial attack success rate of 95 percent or higher on wildfires occurring on Service lands.
9. Utilize Burned Area Emergency Response (BAER) or Burned Area Rehabilitation (BAR) funding as needed following wildfires.
10. Implement and monitor a rotational prescribed burn program over the life of the plan that supports the fire dependent communities within the refuge.

The refuge staff recognizes that fire can play an important role in habitat management. With an approved Fire Management Plan, the refuge staff may use wildland fire or prescribed fire in accordance with Federal, State, and local ordinances and laws to achieve hazardous fuels reduction and resource management objectives. Strategies and tactics that consider public and firefighter safety, as well as resource values at risk, will be used. Wildfire suppression, prescribed fire methods, manual and mechanical means, timing, and monitoring will be described in detail within the stepdown fire management plans for the refuge.

On approval of this CCP, the 2010 Fire Management Plan will be reviewed and updated as needed to meet the goals and objectives set forth by the CCP.

F.4 Fire Management Organization, Contacts, and Cooperation

Region 6 of the Service would establish a fire management organization to provide qualified technical oversight of fire management for the refuge. Fire management staffing levels would be determined by established modeling systems and based on the fire management workload of a group of refuges and possibly that of interagency partners. Workload is based on historical wildfire suppression activities as well as historical and planned fuel treatments. Fire management activities would be conducted in a coordinated and collaborative manner through the "Montana State Annual Operating Plan" and other agreements with Federal and non-Federal partners.

Bibliography

Alt, D.B. 2001. Glacial Lake Missoula and its humongous floods. Missoula, Montana: Mountain Press Publishing Company, 208 p.

Arno, S. 1980. Forest fire history in the northern Rockies. Journal of Forestry, 78(8): 460–465.

Bedunah, D.J. 1992. The complex ecology of weeds, grazing, and wildlife. Western Wildlands 18:6–11.

Brandt, T.M. 2000. Fish diversity, behavior, and microhabitat use in secondary channels of the Bitterroot River, Montana [master's thesis]. Missoula, MT: University of Montana.

Briar, D.W.; Dutton, D.M. 2000. Hydrogeology and aquifer sensitivity of the Bitterroot Valley, Ravalli County, Montana. Helena, MT: U.S. Geological Survey Water Resources. Investigations Report 99-4219. 114 p.

Bull, Evelyn L.; Collins, Charles T. 2007. Vaux's swift (*Chaetura vauxi*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. [Internet]. <http://bna.birds.cornell.edu/bna/species/077doi:10.2173/bna.077> accessed January 3, 2011.

Burkhardt, J.W. 1996. Herbivory in the Intermountain West: an overview of evolutionary history, historic cultural impacts and lessons from the past. Idaho Forest, Wildlife and Range Agricultural Experiment Station, Bulletin 58. University of Idaho, College of Natural Resources, Boise, ID.

Cappious, S.L. 1939. A history of the Bitter Root Valley to 1914 [master's thesis]. Seattle, WA: University of Washington. [Pages unknown].

Cartier, K.D.W. 1984. Sediment channel morphology, and streamflow characteristics of the Bitterroot River drainage basin, southwestern Montana. M.S. Thesis, University of Montana, Missoula. [Pages unknown].

Carver, Erin; Caudill, James. 2007. Banking on nature 2006: the economic benefits to local communities of national wildlife refuge visitation. Washington, DC: Division of Economics, U.S. Fish and Wildlife Service. 371 p.

Casey, Daniel. 2000. Partners in Flight draft bird conservation plan: Montana. Version 1.0 Kalispell, Montana: Montana Partners in Flight. 288 p.

Caudill, James; Henderson, E. 2006. Banking on nature 2006: the economic benefits to local communities of national wildlife refuge visitation. Washington, DC: U.S. Fish and Wildlife Service. 373 p.

Clary, J.; Hastings, P.B.; O'Neill, J.; Winthrop, R. 2005. First roots: the story of Stevensville, Montana's oldest community. Stevensville, MT: Stoneydale Press Publishing Company. 251 p.

Cooper, D.J.; Merritt, D.M.; Andersen, D.C.; Chimner, R.A. 1999. Factors controlling the establishment of Fremont cottonwood seedlings on the Upper Green River. Regulated Rivers: Research and Management 15:419–440.

Dai, X.; Boutton, T.W.; Hailemichael, M. [et al.]. 2006. Soil carbon and nitrogen storage in response to fire in a temperate mixed-grass savanna. Journal of Environmental Quality 35:1620–8.

Dechant, J.A.; Sondreal, M.L.; Johnson, D.H.; Igl, L.D.; Goldade, C.M.; Zimmerman, A.L.; Euliss, B.R. 2002a. Effects of management practices on grassland birds: western meadowlark. Jamestown, ND: Northern Prairie Wildlife Research Center. 33 p.

Dechant, J.A., Sondreal M.L.; Johnson, D.H.; Igl, L.D.; Goldade, C.M.; Nenneman, M.P.; and Euliss, B.R. 2002b. Effects of management practices on grassland birds: grasshopper sparrow. Jamestown, ND: Northern Prairie Wildlife Research Center. 28 p.

Dobb. E. 1998. Reality check: the debate behind the lens. Audubon: January–February. [Pages unknown].

Eckmann, E.C.; Harrington, G.L. 1917. Soil survey of the Bitterroot River Valley area, Montana. Washington, DC: U.S. Department of Agriculture, Bureau of Soils. 72 p.

Fire Executive Council. 2009. Guidance for implementation of federal wildland fire management policy. Washington, DC: U.S. Department of Agriculture and U.S. Department of the Interior. 20 p. <http://www.nifc.gov/policies/policies_documents/guidance/GIFWFMP.pdf> accessed January 2011.

Fischer, W.C.; Bradley, A.F. 1987. Fire ecology of western Montana forest habitat types. Ogden, UT: U.S. Forest Service Intermountain Research Station. U.S. Department of Agriculture Forest Service General Technical Report INT-223. 95 p.

Gaeuman, D. 1997. Historical channel changes and processes of the central Bitterroot River, Ravalli County, Montana [master's thesis]. Missoula, MT: University of Montana.

Geist, V.; Mahoney, S.P.; Organ, J.F. 2001. Why hunting has defined the North American model of wildlife conservation. In: Transactions of the North American Wildlife and Natural Resources Conference;

March 20, 2001; Washington, DC. Washington, DC: Wildlife Management Institute. 66:175–85.

Geist V.; Organ, J.F. 2004. The public trust foundation of the North American model of wildlife conservation. Northeast Wildlife 58:49–56.

Graham, Todd. 2009 Assessment of upland units. Bozeman, MT: Aeroscene Land Logic. 9–12.

Gratto-Trevor, Cheri L. 2000. Marbled godwit (*Limosa fedoa*). The Birds of North America Online (A. Poole, editor). Ithaca: Cornell Lab of Ornithology. [Internet]. <http://bna.birds.cornell.edu/bna/species/492doi:10.2173/bna.492> accessed January 3, 2011.

Hauer, F.R.; Spencer, C.N. 1998. Phosphorous and nitrogen dynamics in streams associated with wildfire—a study of immediate and long-term effects. International Journal of Wildland Fire 8:183–98.

Heitmeyer, M.E.; Artmann, M.J.; Fredrickson, L.H. 2010. An evaluation of ecosystem restoration and management options for Lee Metcalf National Wildlife Refuge. Prepared for U.S. Fish and Wildlife Service, Region 6, Denver, CO. Greenbrier Wetland Services Report 10-02. Bloomfield, MO: Blue Heron Conservation Design and Printing LLC.

Hejl, S.J.; Newlon, K.R.; Mcfadzen, M.E.; Yound, J.S.; Ghalambor, C.K. 2002. Brown creeper (*Certhia Americana*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/669doi:10.2173/bna.669> accessed January 3, 2011.

Hepp, Gary R.; Bellrose, Frank C. 1995. Wood duck (*Aix sponsa*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/169doi:10.2173/bna.1169> accessed January 3, 2011.

Hodges, K.V.; Applegate, J.D. 1993. Age of Tertiary extension in the Bitterroot metamorphic core complex, Montana and Idaho. Geology 21:161–164.

Hutchinson, M. 1992. Vegetation management guideline—Canada thistle (*Cirsium arvense* [L.] Scop.) Natural Areas Journal 12:160–1.

Hyndman, D.W.; Talbot, J.L.; Chase, R.B. 1975. Boulder batholiths—a result of emplacement of a block detached from the Idaho batholiths infrastructure. Geology 3:401–404.

[IWJV] Intermountain West Joint Venture. 2005a. Coordinated implementation plan for bird conservation in western Montana. [Place of publication unknown]: Montana Steering Committee Intermountain West Joint Venture. 58 p.

———. 2005b. Intermountain West Joint Venture coordinated bird conservation plan. [Place of publication unknown]: Intermountain West Joint Venture. 94 p.

Kendall, W.L. 2001. Using models to facilitate complex decisions. In: Shenk, T.M.; Franklin, A.B., editors. Modeling in natural resource management—development, interpretation, and application. Washington, DC: Island Press. 223 p.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. Wildlife Society Bulletin 21:31–39.

Kudray, G.M.; Schemm, T. 2008. Wetlands of the Bitterroot Valley; change and ecological functions. Prepared for the Montana Department of Environmental Quality, Agreement #DEQ 206028. Helena, MT: Montana Natural Heritage Program.

Kushlan, James A.; Steinkamp, Melanie J.; Parsons, Katharine C.; [et al.]. 2002. Waterbird conservation for the Americas—the North American waterbird conservation plan, version 1. Washington, DC: Waterbird Conservation for the Americas. 78 p.

Lancia, R.A.; Braun, C.E.; Collopy, M.W. [et al.]. 1996. ARM! for the future—adaptive resource management in the wildlife profession. Wildlife Society Bulletin 24:436–42.

Langner, H.W.; Greene, E.; Domenech, R.; Staats, M.F. 2011. Mercury and other mining-related contaminants in ospreys along the Upper Clark Fork River, Montana, USA. University of Montana, Missoula, MT. Environmental Contamination and Toxicology, November 25, 2011. <http://www.springerlink.com/content/m081860p378q2453/fulltext.html> accessed January 3, 2011.

Langton, C.M. 1935. Geology of the northeastern part of the Idaho batholiths and adjacent region in Montana. Journal of Geology 43: 27–60.

Lankston, R.W. 1975. A geophysical investigation in the Bitterroot Valley, western Montana [Ph.D. dissertation]. University of Montana, Missoula. [Pages unknown].

Lonn, J.D.; Sears, J.W. 2001. Geologic map of the Bitterroot Valley, Montana. Butte, MT: Montana Bureau of Mines and Geology Open File Report 362..

Lowther, Peter; Poole, Alan F.; Gibbs, J.P.; Melvin, S.; Reid, F.A. 2009. American bittern (*Botaurus lentiginosus*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/018doi:10.2173/bna.018> accessed January 3, 2011.

Malouf, Carling I. 1952. Economy and land use by the Indians of western Montana, U.S.A. [Unpublished]. Missoula, MT: University of Montana. 63 p.

———. 1956. The cultural connections between the prehistoric inhabitants of the upper Missouri and Columbia River systems [Ph.D. dissertation]. New York, NY: Columbia University. [Pages unknown].

Martin, Stephen G.; Gavin, Thomas A. 1995, Bobolink (*Dolichonyx oryzivorus*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.

edu/bna/species/176doi:10.2173/bna.176> accessed January 3, 2011.

Maxwell, Bryce A.; Nelson, K.J.; Browder, S. 2002. Record clutch size and observance on breeding and development of the western toad (*Bufo boreas*) in Montana. Northwestern Naturalist 83:27–30.

McDowell, Will; Rokosch, Jim. 2005. Ambrose-Threemile watershed project: watershed assessment and recommendations for stream improvements. Sandpoint, ID: Tri-State Water Quality Council. 161p. <http://www.tristatecouncil.org/documents/05ambrose_asses.pdf> accessed November 15, 2011.

McEachern P.; Prepas, E.E.; Gibson J.J.; Dinsmore, P. 2000.The forest fire induced impacts on phosphorus, nitrogen and chlorophyll a concentrations in boreal sub-arctic lakes of northern Alberta Can. Journal of Fisheries and Aquatic Sciences 57 (Suppl. 2):73–81.

McMurtrey, R.G.; Konizeski, R.L.; Johnson, M.V.; Bartells, J.H. 1972. Geology and water resources of the Bitterroot Valley, southwestern Montana, with a section on chemical quality of water, by H.A. Swenson. U.S. Geological Survey Water Supply Paper 1889. 80 p.

Montana Bird Distribution Committee. 1996. P.D. Skaar's Montana bird distribution, fifth edition. Special Publication No. 3. Helena, MT: Montana Natural Heritage Program. 130 p.

Montana Department of Agriculture. 2010. Montana noxious weed list: effective September 2010. <http://agr.mt.gov/weedpest/pdf/weedlist2010.pdf> accessed March 23, 2011.

[MFWP] Montana Fish, Wildlife & Parks. 2005. The Montana Comprehensive Fish and Wildlife Conservation Strategy. Helena, MT: Montana Fish, Wildlife & Parks. 43–44, 78,158–159.

Montana Natural Heritage Program. 2009. [Species of concern]. <http://mtnhp.org/SpeciesOfConcern> accessed May 12, 2009.

Morton, J.M. 1995. Management of human disturbance and its effects on waterfowl. In: Whitman, W.R.; Strange, T.; Widjeskog, L.; Whittemore, R.; Kehoe, P.; Roberts, L.; editors. Waterfowl habitat restoration, enhancement and management in the Atlantic flyway. 3rd edition. Dover, DE: Environmental Management Committee, Atlantic Flyway Council Technical Section; Delaware, Division of Fish and Wildlife. F59–F86.

Mowbray, Thomas. 1999. American wigeon (*Anas americana*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/401doi:10.2173/bna.401> accessed January 3, 2011.

National Association for Interpretation. 2011. [Mission, vision, and core values.] <http://www.interpnet.com/about_nai/mission.shtml> accessed March 9, 2011.

National Climatic Data Center. 2011. Precipitation and temperature graphs, 1900–2010. <http://www.ncdc.noaa.gov/temp-and-precip/time-series> accessed February 8, 2011.

National Wildfire Coordinating Group. 2001. [Review and update of the 1995 Federal Wildland Fire Management Policy]. http://www.nwcg.gov/branches/ppm/fpc/archives/fire_policy/history/index.htm accessed January 13, 2012.

Oring, Lewis W.; Neel, Larry; Oring, Kay E. 2010. U.S. Shorebird Conservation Plan. Version 1.0. Intermountain West Regional Shorebird Plan.

Pardee, J.T. 1950. Late Cenozoic black faulting in western Montana. Geological Society of America Bulletin 61:359–406.

Popham, C. 1998. Early days in sagebrush country. Missoula, MT: Pictoral Histories Publishing Company. 130 p.

Reiss. S.A. 1995. Sport in industrial America, 1850–1920. The American History Series. Wheeling, IL: Harlan Davidson, Inc. 178 p.

Rich, T.D.; Beardmore, C.J.; Berlanga, H.; Blancher, P.J.; Bradstreet, M.S.W.; Butcher, G.S.; Demarest, D.W.; Dunn, E.H.; Hunter, W.C.; Inigo-Elias, E.E.; Kennedy, J.A.; Martell, A.M.; Panjabi, A.O.; Pashley, D.N.; Rosenberg, K.V.; Rustay, C.M.; Wendt, J.S.; Will, T.C. 2004. Partners in Flight North American landbird conservation plan. Ithaca, NY: Cornell Laboratory of Ornithology. Revised March 2005. 85 p.

Richey. E.D. 1998. Subdividing Eden: land use and change in the Bitterroot Valley, 1930–1998. Missoula, MT: University of Montana. 290 p.

Running, Steven W. 2010. Impacts of climate change on forests of the northern Rocky Mountains. University of Montana, College of Forestry and Conservation, Montana Climate Office. <https://www.cfc.umt.edu> accessed February 8, 2011.

Ryan, Michael Jerome. 1977. An archaeological survey of the middle Clark Fork River valley: Missoula to Superior, Montana [master's thesis]. Missoula, MT: University of Montana. [Pages unknown].

Sedgwick, James A. 2000. Willow flycatcher (*Empidonax trailii*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/533doi:10.2173/bna.533> accessed January 3, 2011.

State of Montana. 2011. [Montana field guides: American bullfrog—*Rana catesbeiana*]. <http://fieldguide.mt.gov/detail_AAABH01070.aspx> accessed March 11, 2011.

Stevensville Historical Society. 1971. Montana genesis. Missoula, MT: Mountain Press Publishing Company. 289 p.

Stringer, A. 2009. Effect of constructed wetlands on water temperature in Lower Burnt Fork Creek:

implications for native trout populations and possible stream restoration. Unpublished report to Sentinel High School. Missoula, MT. [Pages unknown].

Takekawa, John Y.; Warnock, Nils. 2000. Long-billed dowitcher (*Limnodromus scolopaceus*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/493doi:10.2173/bna.493> accessed January 3, 2011.

Texas State Parks and Wildlife. 2011. [Hoary bat (*Lasiurus cinereus*)]. <http://www.tpwd.state.tx.us/huntwild/wild/species/hoarybat> accessed February 14, 2011.

Tobalske, Bret W. 1997. Lewis's woodpecker (*Melanerpes lewis*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/284doi:10.2173/bna.284>. Accessed January 3, 2011.

United Nations Educational, Scientific and Cultural Organization. 1978. Needs and priorities in Environmental Education: an International Survey. Paris, France. [Pages unknown].

U.S. Bureau of Reclamation. 1939. Bitter Root Irrigation District. U.S. Department of the Interior, Bureau of Reclamation, Hamilton, MT.

———. 1982. Bitter Root Project, Montana, Ravalli County. U.S. Department of the Interior, Pacific Northwest Region, Bureau of Reclamation.

U.S. Census Bureau. 2010. Census Bureau: state and county quickfacts for Montana. Data derived from 2010 population estimates. <http://www.census.gov> accessed April 4, 2011.

U.S. Department of Agriculture. 2010. [Montana State-listed noxious weeds.] <http://plants.usda.gov/java/noxious?rptType=State&statefips=30> accessed February 10, 2011.

U.S. Department of Energy. 1999. Carbon sequestration research and development. Springfield, VA: National Technical Information Service, Office of Fossil Energy and the Office of Science. <http://www.fossil.energy.gov/programs/sequestration/publications/1999_rdreport/> accessed December 18, 2010.

[USGS] U.S. Geological Survey. 2006. Strategic habitat conservation: final report of the National Ecological Assessment Team. [Place of publication unknown]: U.S. Department of the Interior, U.S. Geological Survey. 45 p.

[USGS] U.S. Geological Survey, National Wildlife Health Center. 2007. [Chronic wasting disease fact sheet.] <http://www.nwhc.usgs.gov/disease_information/chronic_wasting_disease/> accessed February 10, 2011.

[USFWS] U.S. Fish and Wildlife Service. 1966. Wildlife inventory plan. Stevensville, MT: U.S. Fish and Wildlife Service. 22 p.

———. 1974. Flood Report, Ravalli National Wildlife Refuge, Stevensville, MT. [Pages unknown].

———. 1988–1993. Lee Metcalf National Wildlife Refuge annual narratives. Stevensville, MT: Lee Metcalf National Wildlife Refuge. [On file at Lee Metcalf National Wildlife Refuge, Stevensville, MT].

———. 1991. Waterfowl management handbook—section 13.4.6, strategies for water manipulation in moist-soil systems. Washington, DC: U.S. Fish and Wildlife Service. 8 p. [On file at Lee Metcalf National Wildlife Refuge, Stevensville, MT].

———. 1999. Fulfilling the promise. Arlington, VA: U.S. Department of the Interior, Fish and Wildlife Service. 94 p.

———. 2008. Birds of conservation concern 2008. Arlington, VA: United States Department of Interior, U.S. Fish and Wildlife Service, Division of Migratory Bird Management. 85 p. <http://www.fws.gov/migratorybirds/> accessed November 10, 2010.

———. 2010. Rising to the challenge—strategic plan for responding to accelerating climate change. Unpublished report on file at Washington, DC. 28 p. <www.fws.gov/home/climatechange/pdf/CCDraftStratPlan92209.pdf> accessed July 27, 2010.

[USFWS] U.S. Fish and Wildlife Service, Montana Invasive Species Strike Team. 2009. 2009 Lee Metcalf NWR report. Great Falls, MT: U.S. Fish and Wildlife Service, Montana Invasive Species Strike Team. 76 p.

[USFWS] U.S. Fish and Wildlife Service, Region 6 Water Resources Division. 2011. Unpublished data. [On file at the water resources division office in Lakewood, CO]

[USFWS] U.S. Fish and Wildlife Service; Canadian Wildlife Service. 1986. North American waterfowl management plan-a strategy for cooperation. Washington, DC: U.S. Department of the Interior. Gatineau, Quebec: Environment, Canada. 26 p.

Walker, B. 2004. Effects of management practices on grassland birds: Brewer's sparrow. Jamestown, ND: Northern Prairie Wildlife Research Center. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/brsp.brsp.htm> accessed December 22, 2010.

Walters, C.J.; Holling, C.S. 1990. Large-scale management experiments and learning by doing. Ecology 71:2060–8.

Ward, Linda. 1973. Prehistory of the Bitterroot Valley [master's thesis]. Missoula, MT: University of Montana. [Pages unknown].

Weber, W.M. 1972. Correlation of Pleistocene glaciations in the Bitterroot Range, Montana, with fluctuations of glacial Lake Missoula. Montana Bureau of Mines and Geology Memoir 42 pp.

Werner, Kirwin J.; Maxwell, Bryce A.; Hendricks, Paul; Flath, Dennis L. 2004. Amphibians and reptiles of Montana. Missoula, MT: Montana Press Publishing Company. 73–4, 93–4, 100–102.

Woodin, Marc C; Michot, Thomas C. 2002. Redhead (*Aythya americana*). The Birds of North America Online (A. Poole, editor). Ithaca, NY: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/695doi:10.2173/bna.695> accessed January 3, 2011.

Woodside, Gail J. 2008. Comparing native oral history and scientific research to produce historical evidence of native occupation during and after the Missoula floods [senior thesis]. Corvallis, OR: Oregon State University. <http://hdl.handle.net/1957/8746> accessed September 27, 2010.