

5—Environmental Consequences



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Large wildfires like the King Island fire in 2006 affect air quality, visual resources, soils, and habitat.

This chapter summarizes and compares the potential effects of implementing the four management alternatives described in chapter 3 on the physical and biological environment, management of special area designations, public use opportunities, cultural and paleontological resources, and other social and economic factors. The environment that would be affected by the alternatives proposed by the Service is described in Chapter 4—Affected Environment.

5.1 Analysis Method

Under each topic (resource) the actions or things that could affect that resource are discussed. Usually, these are the actions stemming from the objectives and strategies identified in Chapter 3—Alternatives. Often the effect of an action cuts across several resources. For example the use of motorized equipment or vehicles, prescribed fire, livestock grazing, fencing, and hunting have different consequences that are specific to a resource.

The environmental effects are evaluated at several levels, including whether the effects are negative (or adverse in the case of threatened or endangered species) or beneficial, and whether the effects are direct, indirect, or cumulative with other independent actions. The evaluation of environmental consequences also uses the duration of an effect, whether it is long term or short term.

Direct effects are those where the impact on the resource is immediate and is a direct result of a specific action or activity. Examples of a direct effect might include the effect of ungulate grazing or prescribed fire on vegetation or the effect of hunting on wildlife.

Indirect, or secondary, effects are those that are induced by implementation actions, but occur later in time or farther removed from the place of action through a series of interconnected effects. Examples of indirect effects include the downstream water quality effects from an upstream surface disturbance, or the effect that a use along a road could have on nearby plant communities because of the periodic introduction of invasive plants from outside sources.

A cumulative effect is defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7). Reasonably foreseeable future actions independent of the CCP for the refuge are described in chapter 3.

Effects are often described in terms of their context, intensity, and duration:

- Negligible—The effect would be at the lower levels of detection (less than 5-percent change, compared to existing conditions).
- Minor—The effect would be detectable (a change of 5–24 percent).
- Moderate—The effect would be readily apparent, and it would have the potential to become major (a change of 25–50 percent).
- Major—The effect would be severe, or if beneficial, it would have exceptional beneficial effects (a change of more than 50 percent).

The duration of effects are described as short term or long term. Short-term effects would persist for a period of 1–5 years, and would consist primarily of temporary disturbance due to habitat restoration, prescribed fire, facility construction, and subsequent revegetation efforts. Long-term effects would last more than 5 years after project initiation, and may outlast the 15-year life of the CCP. For example, there could be a long-term benefit to wildlife habitat resulting from a short-term management action.

Organizationally, under each resource the effects that are common to all alternatives are discussed first. This is followed by a discussion of specific sub-topics that are related to the aspect of the environment being affected. If the topic is short, all the alternatives are discussed together, but where there are distinct differences between the alternatives they are broken out by alternative.

In compliance with the provisions of the Improvement Act, the Service has made a thorough assessment of the environmental effects using available science, which is consistent with National Environmental Policy Act and department and bureau policies. Wherever possible, the degree of effect was quantified using known numeric information or modeled estimates, or where extensive monitoring or research provided pertinent numeric information. The Service used GIS data that was provided from a number of sources including other agencies, organizations and researchers to evaluate and make measurements, and those sources are identified. Although GIS is useful tool for evaluating and answering questions, it is not the same as a formal land survey and discrepancies can exist. Where suf-

ficient numeric information was not available, qualitative or relative assessments were made using scientific literature or professional field experience.

The analysis of environmental consequences is documented in the seven major sections of this chapter:

- 5.4 Environmental Consequences for the Physical Environment
- 5.5 Environmental Consequences for Biological Resources
- 5.6 Environmental Consequences for Visitor Services
- 5.7 Environmental Consequences for Special Areas
- 5.8 Environmental Consequences for Cultural and Historical Resources
- 5.9 Environmental Consequences for Paleontological Resources
- 5.10 Environmental Consequences for the Socio-economic Environment

In addition, the Service analyzed the following aspects of implementing the alternatives, as documented in these sections:

- 5.11 Irreversible and Irrecoverable Resource Commitments
- 5.12 Short-term Uses of the Environment and Maintenance of Long-term Productivity
- 5.13 Adherence to Planning Goals
- 5.14 Unavoidable Adverse Effects
- 5.15 Conflicts with Federal, State, Tribal, and Local Agencies

5.2 Assumptions

Assessments were based on a variety of information, including meetings and other communications with natural resource and other professionals, published scientific information, site monitoring, agency reports, and computer modeling, among other sources. The following assumptions have been made in the analysis presented in this chapter:

- Funding and personnel would be sufficient to implement any alternative selected. This does not constitute a commitment for funding, and future budgets could affect implementation.
- Monitoring programs would be implemented and monitoring activities would be conducted a minimum of once every 5 years, and adjustments or revisions would be made to management as indicated by evaluations (but within the scope of the particular alternative).
- Standard operating procedures would be followed.
- The CCP would be reviewed at 15 years.

5.3 Cumulative Impacts

Following the discussion of direct and indirect effects, at the end of each topic (physical environment, biological environment public uses, special areas designations, cultural and paleontological, and social and economic conditions), the anticipated cumulative impacts of each alternative and the reasonably foreseeable actions are disclosed. Reasonably foreseeable actions are described near the end of Chapter 3—Alternatives.

The cumulative effects discussion focuses on four broad categories of reasonably foreseeable actions:

- Federal land management activities
- State wildlife management
- Nongovernmental conservation activities
- Regional demographic and economic changes

5.4 Environmental Consequences for the Physical Environment

The following sections discuss the effects of implementing the alternatives on the physical environment.

EFFECTS on CLIMATE CHANGE

The specific effects of the Service's actions with respect to influencing climate change at a global level are addressed in this section. The likely effects of climate change on the refuge's habitat and wildlife resources are addressed under the biological environment.

All Alternatives

Over 15 years the refuge would implement departmental and bureau policies regarding climate change including biological planning, landscape conservation, monitoring and research, becoming more carbon neutral in day-to-day refuge operations, partnering with others on climate change, and educating the public and others. This would be achieved by adopting specific objectives and strategies for habitat management or public use (refer to the climate change sections in chapters 1 and 3 for a complete discussion). To reduce the effects of climate change stressors, the refuge would protect the heterogeneity of species and structure, protect grassland types across environmental gradients, promote connectivity and corridors to facilitate migration, restore natural fire regimes, and promote sustainable herbivory. In the long-term, habitat management actions would benefit the refuge's vegetation and habitats, which are important for carbon sequestration and reducing the loss of carbon currently stored in the terrestrial biosphere.

Carbon dioxide from motorized vehicles, boats, and equipment from public and activities and refuge operations would continue to contribute directly or indirectly to climate change. It is estimated that about 10,000 vehicles use the auto tour route annually (refer to access in chapter 4) and many visitors stop at the contact stations while traveling through to other places. With an annual visitation of 250,000, the number of motorized vehicles including boats would exceed 100,000 annually (based on 2.5 persons per vehicle). However, when compared to other tourist attractions in western Montana such as Glacier National Park, which receives 2 million visitors annually (National Park Service 2008), the refuge's direct contribution to carbon emissions from refuge operations and refuge visitation would be low. The differences in visitation numbers between the alternatives would be negligible for climate change (see visitation projections under the next section on air quality). Nonetheless, under all alternatives the Service would be committed to driving cleaner vehicles, increasing fuel efficiency or reducing driving. A transportation plan would be developed including identifying options for alternative forms of transportation.

Fire

The Great Plains, including the refuge, evolved with fire on the landscape. Fire, whether a wildfire or prescribed fire, would release carbon dioxide (CO₂) directly into the atmosphere from the biomass consumed during combustion. In the Missouri River Breaks where wildfire is inevitable due to lightning strikes or human causes, modeled wildfire scenarios indicate that landscapes managed by prescribed burning would store more carbon as compared to landscapes where constant fire suppression leads to higher intensity wildfires (Hurteau and North 2009). It is likely that prescribed fire has similar smoke impacts as a wildfire as the above ground grass fuels are all consumed. In other areas where there are more trees, prescribed fire is likely to produce less emissions than a wildfire, particularly ones that consume large stands of trees. Alternative A would provide the least carbon storage for reduction of carbon gases due to constant fire suppression followed by high-intensity fires across a broader area (refer to below sections on air quality and habitat for more information), followed by alternatives B and C. Alternative D would store the greatest amount of carbon over the long term because the wider use of light prescribed fire is expected to lead to fewer and lower intensity wildfires.

Conclusion

Implementation of the CCP under any alternative would negligibly affect global climate change. All alternatives would provide positive benefits for

carbon sequestration due to the large amount of vegetated land the refuge provides. Carbon dioxide emissions from motorized vehicles would occur under all alternatives, although the effects on global climate change (and the differences between the alternatives) would be negligible. Alternative A would provide less benefit for carbon storage due to constant fire suppression and higher intensity fires over the long term, followed by alternatives B and C. Alternative D would store the greatest amount of carbon over the long term. Implementing carbon neutral refuge programs also would be positive steps for reducing the refuge's carbon emissions.

Mitigation

Reducing the carbon footprint of the refuge by driving fuel-efficient vehicles, upgrading offices to make them more energy efficient, conducting more teleconferencing, recycling, and setting an example for the public and partners would all be positive ways to mitigate for the Service's contributions to carbon emissions (refer to air quality below for additional information).

EFFECTS on AIR QUALITY

Impacts to air quality occur from several sources including motorized vehicles, boats, prescribed fire, and wildfires.

All Alternatives

Under all alternatives, the class 1 air shed within UL Bend Wilderness would continue to be protected and monitored. Short-term increases in particulates from a large wildfire would result in direct, negative effects to air quality that could vary from negligible to major depending on the acreage and fire conditions, but overall the long-term effects to the class 1 air shed in UL Bend would be negligible as a result of the implementation of any alternative.

Implementation of all alternatives would result in varying levels of equipment usage. Construction of public use facilities, habitat restoration activities, and on-going refuge management including operating motor vehicles or conducting wildlife surveys would require the use of motorized equipment including the use of aircraft, causing localized increased dust, carbon monoxide and hydrocarbon emissions. Equipment usage by the refuge would have an overall negligible effect on air quality in the region, and any impacts could be mitigated by best management practices (refer to mitigation).

Emissions from Motorized Vehicles or Boats

Some effects are common to all and some are specific to the alternatives.

All Alternatives. Emissions including dust, carbon monoxide, and hydrocarbon from motor vehicles would

occur in varying degrees under all of the alternatives. Road use, especially of dirt, gravel, or other soft-surface roads, generates and disperses dust in levels that vary depending on soil moisture content, particle size, and traffic volume (Havlick 2002). Nearly all of the refuge's roads are dirt, and emissions from dust particulates would be common during dry periods. Emissions from motorboats would be the same regardless of which alternative was selected. The Service would develop a transportation plan under all alternatives that would address parking, congestion, and other issues.

Alternative A. Under alternative A, motor vehicles would continue accessing the 1.1 million-acre refuge on 670 miles of road open to the public. Visitation would remain near current levels of 250,000 (refer to effects on the socioeconomic environment in section 5.10). During the fall months, as many as 175 vehicles have been counted at one time in the elk-viewing area. These localized and concentrated emissions including dust and hydrocarbons would continue to occur during periods of high use, which is typically during the fall hunting season or in the spring when paddlefish fishing is popular.

Alternative B. Five hundred sixty-four miles of road would remain open for motor vehicle access. In some localized areas, there would be fewer particulates (dust) and hydrocarbon emissions from road closures because of a larger footprint where there were no vehicles. There would be a modest increase in visitation (253,000) over the long-term, which would result in negligible to minor increases in emissions (less than 10 percent) from vehicles. Closing 106 miles of road would not reduce the concentrated number of motorized vehicles using popular viewing areas during the fall months or paddlefish fishing in the spring, and short-term increases in emissions during these periods would continue.

Alternative C. Similar to alternative A, motorized vehicles would access the refuge on 670 miles of road, and on some roads, there would be improvements (for example, gravel for all-weather access), which would likely increase the number of vehicles using the refuge. Long term, there would be a moderate increase in the number of visits to the refuge (275,500), which would increase emissions by a minor amount, particularly during high-use seasons.

Alternative D. Under alternative D, there would be a modest number of miles of road closed (23) as compared with alternative A, which is less than 5 percent. But as with alternative B in some localized areas, there could be fewer emissions, especially in areas that are adjacent to wilderness, increasing the overall footprint of an area where motorized vehicles were not used. Long term, there would be modest

additions in visitation to 258,000 visits, which would raise emissions by a minor amount, particularly during high-use seasons.

Fire

Some fire effects are common to all alternatives and some are specific to each alternative.

All Alternatives. Prescribed fire would be used in all alternatives, although the acreage burned annually in alternative A would be minimal. All prescribed fires would be subject to approved fire management plans, and factors such as weather conditions, fuel conditions, adequate firebreaks, and preparedness of fire management and emergency response crews would be assessed before using prescribed fire.

In Montana, the open-burning season is March 1 through October 30. The periodic use of fire could result in short-term, localized increases in particulates and decreased visibility. The refuge would be assessed a fee based on particulate matter produced by prescribed fires (refer to air quality in chapter 4). The amount of smoke and particulates generated by a prescribed fire would depend on variables such as wind, soil and vegetation moisture, and fire intensity. Although the objectives and strategies for prescribed fire vary for alternatives B, C, and D, the differences in increased particulates or decreased visibility would not be significantly different when compared to the entire land base on the refuge. Alternative C would have less prescribed fire than alternatives B and D. Alternative A would have the least amount of short-term increases in particulates stemming from the use of prescribed fire. The use of prescribed fire in any alternative would have negligible long-term effects on air quality.

Wildfires on the refuge are usually concentrated in June, July, and August during the height of tourist season. Depending on the size and intensity, small wildfires would result in minor to moderate short-term increases in particulates and decreased visibility in localized areas. Nevertheless, for a large wildfire, increases in particulates could have major, short-term, negative effects to a larger region (refer to the uplands section under vegetation in chapter 4).

Alternative A. The large wildfires of 2003 and 2006 directly affected the visual and air quality of the refuge's class 1 air shed—UL Bend Wilderness—as well as the downwind communities of Jordan, Fort Peck, and Glasgow. These types of short-duration impacts from wildfire would continue into the near future. Effects would vary from negligible increases in emissions to major, short-term, negative effects.

Alternatives B and D. These alternatives would make greater use of prescribed fire or naturally caused fires to reduce hazard fuel and fuel buildup. In the long-term, this could result in fewer large wildfires

that produce more smoke and particulates. Alternatives B and D would incorporate the most patch burning to reduce fuel buildup, with alternative D having the greatest emphasis. The increased emphasis of pyric herbivory would allow the refuge to spread impacts over an 8-month burning period.

Wildfires would continue to have significant short-term, air quality impacts, but these effects would be lessened as more acreage is treated with prescribed fire.

Alternative C. As compared to alternative A, alternative C would have slightly more prescribed fires. With a greater emphasis on public and economic uses, there would be fewer prescribed fires than under alternatives B and D.

Fine fuel such as grass would decrease, which would initially result in fewer wildfires escaping initial attack efforts and, therefore, having less air quality impact. As grassland encroachment by woody fuel such as trees increased, tree-stand density and biomass volume would increase significantly. Eventually wildfires would consume this fuel and, in the process, release significant amounts of particulate matter with significant, negative effects on air quality and visual resources.

Conclusion

The implementation of any alternative would have negligible long-term effects on the class 1 air shed in UL Bend Wilderness. The use of equipment for habitat restoration or construction of public use facilities would also result in negligible effects to air quality on the refuge. Overall, the emissions from motor vehicles or the use of aircraft by the public or the Service would stay relatively low for much of the year, although short-term concentrations of higher emissions during popular use seasons would continue. As compared to alternative A, road closures under alternatives B and D would increase the areas with no emissions, but those improvements may be offset by increases in visitation of some localized areas where there were no emissions, thus resulting in only minor beneficial effects.

The use of prescribed fire—which results in localized, short-term increases of particulates—would be the least under alternative A. However, without prescribed fire to reduce fuel buildup and restore a more natural fire regime, the severity of wildfires would likely be greatest under alternative A. Alternatives B, C, and D would result in more frequent, short-term, negligible effects from prescribed fire and less frequent severe wildfires with short-term moderate to major effects. Overall, the implementation of any alternative would have negligible long-term negative effects on air quality in the area.

Mitigation

The Service could minimize emissions and particulates by following the best management practices

when using motorized equipment or conducting restoration activities; these practices include limiting tilling during windy periods, reducing the footprint of bare soil, and using vehicles that are more fuel-efficient and well maintained. As identified under alternatives B, C, and D, a well-thought-out visitor services plan and transportation plan could identify ways to diversify and spread out visitors more during popular seasons or perhaps offer tours or find other methods of reducing short-term concentrations of higher emissions.

All prescribed fires would be initiated in accordance with an approved fire plan. Impacts of prescribed fire can be mitigated by ignition patterns, for example, only burning when convection is good to excellent so heat and smoke quickly rise or with winds that preclude smoke from critical areas. Using a management response as described in an approved fire management plan would enable the Service to respond quickly to changing conditions, thus reducing some of the risk of severe wildfires developing. Reducing a buildup in fuel and restoring a natural fire regime would also reduce the risk of larger wildfires.

EFFECTS on VISUAL RESOURCES

As discussed in chapter 4, the refuge has outstanding scenic values and special management areas where scenic values are important to preserve. Scenic resources could include a large landscape view of the refuge, wildlife viewing in a natural setting, or close-in views of vegetation, topography, water, and wildlife. Impacts to visual resources are often qualitative in nature depending on the individual, location, and time of year. Effects from facilities and structures, fire, grazing, and other habitat and wildlife management programs were assessed.

Facilities, Structures, and Camping Areas

The Service manages several primitive recreation areas (USACE recreation areas are not evaluated, refer to Chapter 4—Affected Environment). Additionally, a network of roads crisscrosses the refuge. The Service uses fencing and other equipment for managing habitat.

Most of the scenic values of the refuge—including the special management areas identified in chapter 4 (section 4.4), along with wildlife viewing and the rugged and remote vistas—would be largely preserved and maintained, but in localized areas, the scenery could be interrupted or marred by facilities and structures, management activities, or other impacts.

The primitive recreation areas managed by the Service would continue at Slippery Ann, Rock Creek, Turkey Joe, Withrow Bottoms, Jones Island, and Rocky Point, in addition to a few outgranted areas that have no facilities (Bear Creek and Bob Cat) (see figure 15 in chapter 4). Although, tents, camping

gear, and the minor losses of vegetation marking the campsite could be visible in foreground views and in some places from higher vantage points, these are low-key facilities, and any effect would be negligible.

Under all alternatives, the small cluster of buildings located at Sand Creek Field Station, Jordan, UL Bend, and the Fort Peck Interpretive Center would exist with the Interpretive Center at Fort Peck Field Station being the most visible. Under alternatives B, C, and D, a small science or interpretive center would be built at Sand Creek Field Station. There could be some short-term impacts from construction of new facilities or structures such as trails, viewing blinds, kiosks, and parking areas that would cease following construction. The installation of alternative energy structures such as solar panels or a small wind turbine at any of the stations would be negligible.

A three-strand wire fencing scheme would be used across the refuge for a variety of purposes (refer to Chapter 4—Affected Environment). Although there are some differences in how fencing would be used between the alternatives and the amount of fencing, generally the effects on visual resources would be negligible even in foreground views. Currently fencing does not block wildlife viewing in the elk-viewing area where cross fences are used or fences are located away from the road.

Havlick (2002) states that the effects of roads on public lands can be lumped broadly into two categories: use effects and presence effects. Among other impacts such as edge effects, just the presence of a road can have a long-lasting visual impact on the landscape. From differing perspectives, the same road could be either a “boon or bane” (Havlick 2002). On the refuge, roads would likely be visible from higher vantage points or looking down ridgelines and from further away in many areas of the refuge. Areas where severe rutting and braiding occurs particularly during wet seasons would result in localized negative effects. The visibility of roads decreases up to 20 percent in proposed wilderness units as compared to refugewide (see figure 43).

The 670-mile network of roads would continue under both alternatives A and C. Alternative C would have about 16 miles of road improvements such as graveling the roads for better access along Knox Ridge (Route 209 and Route 108). Knox Ridge would also be considered for graveling under alternative D. In a few localized areas, the visibility of roads could increase because of road improvements from more vehicles and dust. Roads under alternatives A and C would have the greatest visibility (see figure 44). As shown in figure 44, percentage wise the differences in visibility between alternatives A and C and B and D are negligible to minor, but in some localized areas, the differences could be more

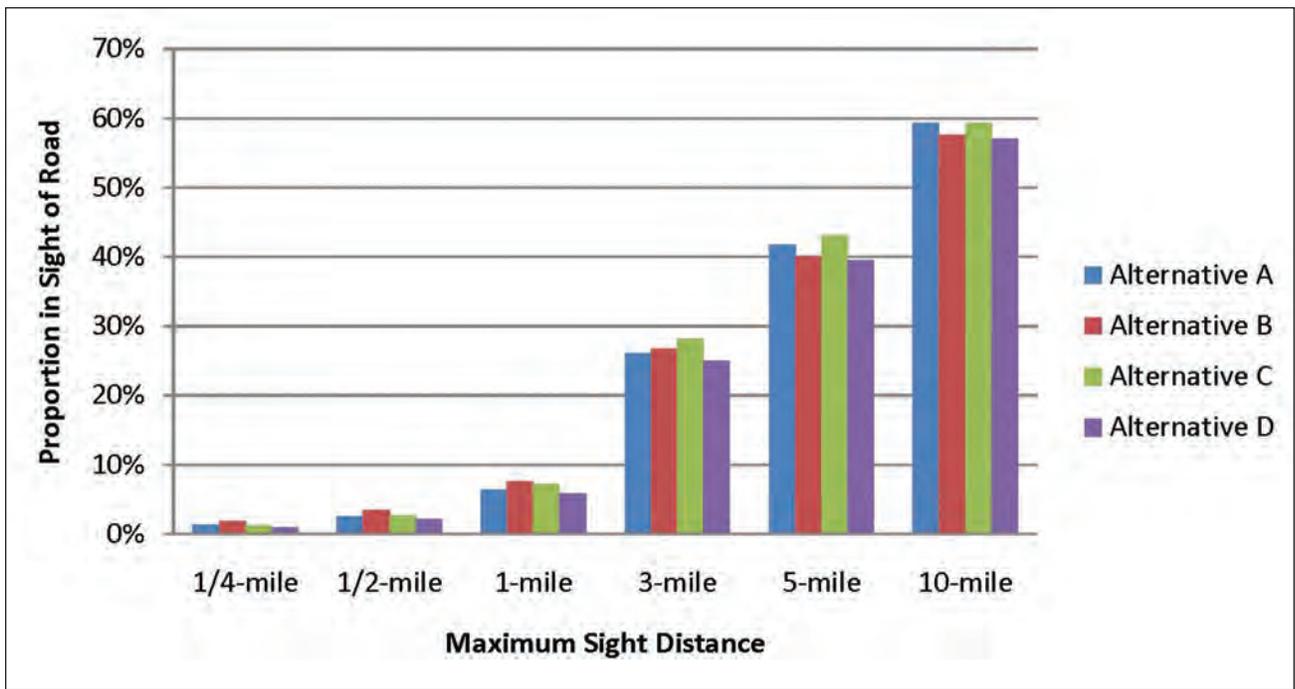


Figure 43. Chart of the visibility of roads from proposed wilderness units in the Charles M. Russell and UL Bend refuges by alternative. Source: The Wilderness Society (2009).

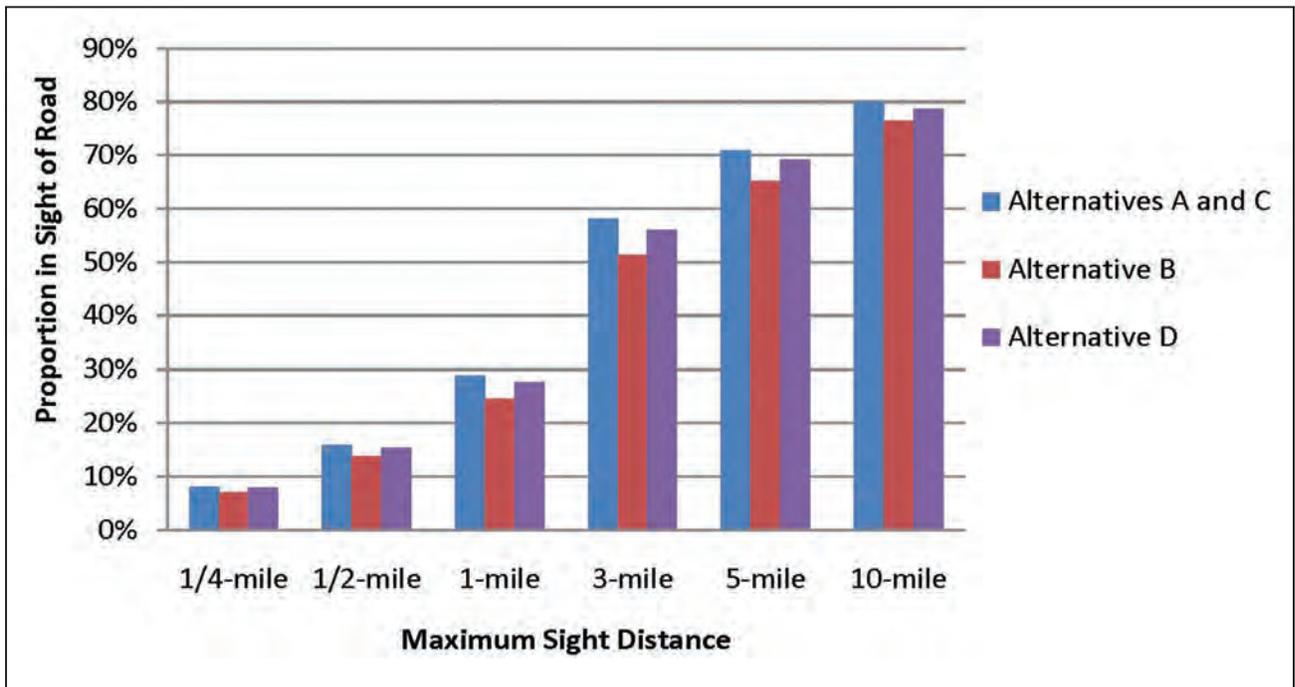


Figure 44. Chart of the visibility of roads refugewide by CCP alternative for the Charles M. Russell and UL Bend refuges. Source: The Wilderness Society (2009).

pronounced particularly from vantage points that were further away.

Closing 106 miles of road in alternative B, would result in about 16-percent fewer roads than under alternatives A and C. Under alternative D, the amount would amount to less than 5-percent fewer roads. However, in several areas, the footprint of areas without roads would increase, which would benefit scenic values by a negligible to minor degree, particularly in the eastern portion of the refuge under alternative B and a lesser extent in alternative D.

Overall, the differences in total road miles and road visibility between the alternatives would be negligible.

Habitat Management

The effects for these activities are broken out below.

Invasive Species. In general, the Service's on-going weed management efforts in all alternatives would benefit scenic values. The proliferation of weeds moving up drainages, or blowing in from other areas or being transported from outside sources would continue regardless of the alternative selected, and controlling invasive species in cooperation with USACE and others would be a priority. Reducing saltcedar infestations would be an ongoing effort by the Service and USACE, but because of the extent of the infestations, it would unlikely yield significant improvements to visual resources in short term.

Restoration of the river bottoms on the western portion of the refuge would decrease weedy species, which would improve the quality and diversity of views in these areas under all alternatives. During the restoration process, there would continue to be bare, patchy, or weedy areas for several years, but in the long term, scenic values would improve. As compared with alternative A, alternative C would have the greatest potential for moderate to major localized benefits, while alternatives B and D could potentially result in moderate long-term benefits.

Prescribed Fire. During a prescribed fire, there would be short-term, localized negative effects to visual resources as a result of smoke (refer to air quality above). Blackened vegetation would be visible in localized areas immediately after a fire. Depending on the time of year and moisture levels, many areas would green up within several weeks, but some trees and shrubs that were affected would take longer to recover. Across the refuge, negative effects would be negligible in the short term from the use of prescribed fire. In the long term, implementing a patch-burning program under alternative B and, to a greater extent, under alternative D would create a greater mosaic effect as compared to alternative A, where little prescribed fire would be used. This

would increase species diversity of both plants and wildlife, resulting in beneficial effects for scenic values and wildlife viewing. Alternative C would not use prescribed fire to this extent.

Wildfire. As with prescribed fire, blackened vegetation would be visible after a wildfire. During and immediately after a fire, there could be moderate to major negative effects on scenic values in localized areas. Generally, grasses and other vegetation quickly green up by the following year, reducing the visual contrast. Furthermore, some areas could have large crown fires that may cause significant visual scarring of the landscape for many years (refer to wildfire suppression under vegetation in section 5.6 below). The visual scarring would decrease in the long term.

Livestock Grazing. The use of grazing as a management tool may result in short-term and long-term impacts to visual or scenic resources in some areas due to manure, trampling, livestock trails, and most significantly, degradation of riparian areas. Livestock grazing would continue under all alternatives, although there would be differences in the timing and application of prescriptive grazing or annual between the alternatives (refer to soil discussion for specific percentages below). Not all areas of the refuge are currently grazed (see figure 16 in chapter 4), and areas that were rested or no livestock grazing occurred, there would be fewer visual impacts as compared to areas that are grazed frequently (refer to the discussion on grazing and monitoring under riparian areas and wetlands in chapter 4). On the refuge, some of the proposed wilderness units are under a prescriptive grazing program, and visual impacts would likely decrease in the long term, benefiting some users. There would still be several proposed wilderness units where annual grazing would be allowed and, in these areas, impacts would continue to be apparent and negatively affect some visitors. In areas where prescriptive grazing has been implemented, or where riparian areas are fenced, signs of visual degradation of the resource would decrease over the long term.

Conclusion

Most of the Service's structures, fencing, and facilities would have negligible effects to visual resources including special management areas. In localized areas, the impacts would be greater. Roads would have the greatest potential to affect visual resources because of number and extensive area they cover (670 miles). Overall, the differences in the total road miles between alternatives would result in negligible to minor differences in visibility (see figures 43 and 44 above).

The use of prescribed fire would result in short-term negative effects to visual resources and long-term benefits due to an increase in species diversity. These impacts and benefits would be greatest under alternatives B and D and to a lesser extent under alternative C. There would be little impact or benefit under alternative A. Wildfire would result in short-term and potentially long-term impacts to visual resources in some areas from loss of vegetation or where severe scarring of the landscape occurred.

The degree to which refuge visitors are negatively affected by the visual effects of livestock grazing varies by type of user and location of use. The greatest potential impact would occur under alternative A and to a lesser degree under alternative C, where there may be minor to moderate impacts to some users. In alternatives B and D, where there would be a greater emphasis in moving toward a prescriptive grazing regime and riparian restoration, there could be moderate benefits to scenic resources in areas that are currently being affected.

Mitigation

Hardening and delineating campsites that are impacted would reduce the spread and overall visibility of the site. Restoring closed roads would benefit views by creating larger patches of undisturbed habitat. Successful revegetation efforts in the river bottoms would reduce visual impacts from invasive species.

EFFECTS on SOUNDSCAPES

Like visual resources, impacts to the natural acoustical environment from external noises are often qualitative in nature. These would result of public use activities and other management activities.

Public Use

Many restrictions would remain in effect, thus minimizing sound impacts. These would include seasonal and day-of-the-week restrictions on motorized boat access along the Upper Missouri Breaks Wild and Scenic River, prohibitions on motorized access in UL Bend Wilderness and the proposed wilderness units, prohibitions on aircraft landing in upland areas, and designated landing zones on Fort Peck Reservoir (refer to soundscapes in chapter 4). Similar to visual resources, effects from various mechanized noises would vary on the user, type of noise, and location. Wilderness users would likely have a greater expectation of solitude and from being away from external noises. A number of roads border these areas, and it could be possible to hear sounds along the edges from motorized equipment or vehicles including four-wheel drive vehicles, ATVs, and quadricycles. These would be short-term impacts that would decrease with distance.

Because alternative C would look to improve road access and maximize public use, in localized areas, noise impacts could increase as compared to alternative A. Under alternative C, there would be about 76 miles of graveled roads, and under alternative D there would be about 65 miles of graveled roads compared to alternative A with 60 miles and those areas would see increased use. Proposed road closures under alternative B and to a lesser extent in alternative D would augment the buffer zone of several proposed wilderness units providing minor benefits for soundscapes.

Construction of viewing facilities, the science and/or interpretive center in alternatives C and D, parking lots, and road maintenance would require the use of heavy equipment for site excavation, grading, and other activities. This equipment would produce higher, short-term noise levels in the immediate vicinity of the construction activities. Noise levels would return to existing levels after construction or maintenance ceases.

Public hunting would continue to be a popular activity under any alternative. Gunshots associated with the sound of a variety of weapons could be audible from on- and off-refuge, depending on hunter location, wind, and topography. Some nonconsumptive users (those who only participate in such activities as wildlife viewing, photography, and interpretation) could be negatively affected by the sounds of gunshots, and nonconsumptive use is generally increasing on the refuge. Presumably, not all hunters fire their weapon during their visit, and given the immense size of the refuge, the overall effect on noise levels and nonconsumptive users would be negligible.

Habitat and Wildlife Management

Restoration activities in all alternatives would require the use of motorized equipment, which would result in short-term minor increases in noise levels in the immediate vicinity of the restoration activities. Noise levels would return to existing levels after the activity ceases. Similarly, the use of aircraft to conduct wildlife counts would also result in distractions and disturbance for and could negatively affect wilderness users. Overall, the Service's use of aircraft for wildlife monitoring or other purposes is low and is not likely to increase to any degree over the long term.

Conclusion

Although there are a number of potential external noises, which could affect visitor experiences, many restrictions and policies in place would limit external noises and these would continue to benefit visitors, wildlife, and the special management areas (refer to section 4.4 in chapter 4). All alternatives would result in negligible to minor effects due to motorized boats, road use, and facility construction. Road closures could reduce the effects in alternatives B and D.

The effect of gunshot noise from hunters would be negligible.

Mitigation

Over the next few years, the Service expects to assess the amount of motorized boat access to upland areas, which would provide baseline information about the extent of this type of use. Refuge staff would develop a transportation plan under all alternatives, and through this planning effort, ways to address potential sound impacts would be addressed.

EFFECTS on SOILS

Habitat management activities and public use activities have a variety of effects on soils.

Restoration Activities in River Bottoms

Restoration generally involves disking and tilling of the soil, planting food crops to remove weeds, applying herbicides, limiting livestock in restoration areas, and burning areas for invasive plant removal. Under all alternatives except B, the Service would actively restore approximately 15 former agricultural fields plus two fields that are currently being restored. The number, timing, and intensity of restoration efforts would vary by alternative. Alternative A would have the least aggressive schedule, and restoration would occur when funding and staff time permitted it. Alternative C would have the most aggressive restoration schedule with 50–60 percent of the restoration completed within 15 years. Under alternative B, the bottomlands would not be restored, but would become permanent food plots. Alternative D would restore 20–30 percent of the fields within 15 years, and native plantings could follow after weeds have been removed.

Restoration activities would result in short-term minor disturbances of soil resources during site preparation and planting. Disking and tilling of soil has the potential to result in localized, short-term erosion, soil loss, and the release of soil particles (dust) into the air. Once restoration activities were complete, soil protection and productivity would be maintained long term.

Prescribed Fire

When used as a habitat restoration tool, prescribed fire would temporarily reduce vegetation in a treatment area. Generally, the use of prescribed fire would stimulate new plant growth and increase the vigor of existing plant communities. However, prescribed fire has the potential to cause short-term, soil erosion and loss resulting from the loss of vegetation. Alternative A would result in negligible soil erosion and loss, because little prescribed would be used, as compared to minor impacts in alternatives B, C, and D.

Wildfire

At a minimum, large wildfires would temporarily reduce vegetation in an area. If severe enough—for example, a large crown fire in overgrown decadent vegetation—a wildfire could result in moderate to major short-term and long-term, severe sterilization of soil, subsequently leading to further loss of vegetation and soil erosion. Alternative A likely would result in the most soil erosion and loss due to continued fire suppression. In alternatives B, D, and to a lesser degree in C, there would be more use of prescribed fire to reduce heavy fuel buildup, as compared to alternative A.

Livestock Grazing

With defined habitat objectives, livestock grazing can stimulate new plant growth and increase the vigor of plant communities. However, livestock tend to use the same trails to access water or graze in riparian areas, which has resulted in localized major, soil compaction, long-term losses of vegetation, soil erosion and sedimentation. These effects are particularly evident in areas with higher stocking rates or where there is also heavy grazing by wild ungulates such as elk (refer to livestock grazing in riparian areas in chapter 4).

Under all alternatives, livestock grazing would continue either prescriptively or through annual grazing. Alternatives A and C would continue the annual grazing regime across half (currently 55 percent) of the refuge with some movement toward prescriptive grazing when possible. Under existing conditions, a number of units are not meeting the objective of 70-percent residual cover (refer to vegetation monitoring in uplands in chapter 4), and the short-term and long-term effects from soil erosion and loss would likely continue compared with lands where prescriptive grazing was used. In some habitat units such as the Big Dry Arm where there is more forage allocated to cattle (refer to vegetation, uplands, and livestock grazing later in this chapter), moderate to major negative effects from soil compaction, erosion and loss of soil would continue. In areas where a prescriptive grazing regime was implemented with defined habitat objectives and a comprehensive monitoring plan, soil compaction, erosion, and loss could be reduced in the long term. Thirty-four percent of the refuge is currently prescriptively grazed. Although alternative B would convert to prescriptive grazing over 50–75 percent of the refuge within 4–7 years, because of the emphasis on maximizing wildlife populations, including large ungulates, it could take longer for vegetation and subsequently soils to recover particularly in areas that continued to be heavily grazed by elk. Alternative D would implement prescriptive grazing over 50–75 percent of the refuge and a comprehen-

sive monitoring program within about 9 years, and in the long term this would benefit soil resources due to greater vegetation cover.

Fishing

Under all alternatives, impacts to soils would continue to occur during the spring paddlefish season when refuge roads and riverbanks are frequently wet and muddy. In localized areas, compacted soils and erosion would be moderate to major.

Roads

In all alternatives, maintenance of nearly 137 miles of road by the refuge and 90 miles by the counties would reduce soil erosion and loss. During wet seasons, unmaintained roads often become rutted and braided resulting in short-term and long-term effects from soil disturbance and erosion. Refuge-wide impacts to soils from roads are minor, but in localized areas, moderate to major impacts from soil erosion would occur. Under alternative C, several roads would be considered for all-weather access (graveled), and one road (Knox Ridge) would be considered under alternative D. Properly maintained, all-weather access roads could reduce rutting and braiding and soil disturbance over the length of the road. Activities related to upgrading a road would likely increase the overall width of the road resulting in direct, short-term impacts to soils.

Camping

Under all alternatives, camping would be allowed along the river, in the primitive campgrounds the Service manages and most areas on the refuge. Motorized vehicles must stay within 100 yards of a road to camp. In a few popular camping sites or areas, there are varying levels of impact from minor vegetation loss to denuded vegetation, soil compaction, and soil erosion and loss.

Public Use Facilities (excluding roads and camping areas)

Currently under alternative A, there are only a handful of facilities such as kiosks, hunting blinds, pullouts, and few new facilities that would be built. Under alternative B, there would be a 5–10 percent increase in new facilities as compared to alternative A. In alternative C, there would be a 5–15 percent increase in new facilities, and under alternative D, a 10 percent increase. In alternatives C and D, a science and/or interpretive center with parking facilities would be built at the Sand Creek Field Station. This would require soil excavation, grading, and other surface disturbances. Temporary increases in soil erosion would occur during construction of new facilities, resulting in direct, short-term impacts to soils. The anticipated footprint of soil disturbance for the science or interpretive center would be about 1–3 acres

within the Sand Creek complex. Long-term losses in soil productivity could occur from construction of visitor-related structure. The effects from these activities on soils would be negligible considering the small area that would be affected compared to the size of the refuge.

Management of Cultural and Paleontological Resources

Effects on soils from excavation of cultural resources during surveys would be temporary and negligible as most areas are already disturbed or eroded. As with public use facilities, under all alternatives, the excavation of paleontological resources (refer to paleontological resources in chapters 3 and 4 and later in this chapter) would result in direct, short-term increases in soil disturbances during any digging of fossils. Large equipment would be used. The footprint of soil disturbance would vary by the size of the dig but would be limited to the area needed for the dig and estimated to be less than a few acres. Effects from these activities on soils would be negligible considering the small area that would be affected. In the foreseeable future, most excavations would occur in central portion of refuge in the Hell Creek formation where fossils are often exposed. In localized areas, there would be temporary increases in soil erosion, but permittees would be required to reclaim areas. As compared with alternative A, under alternative C, an increase in opportunities for research would increase the area of soil disturbance.

Conclusion

In all alternatives, the Service's restoration of 15 former agricultural fields would cause short-term minor disturbances of soil resources, followed by long-term minor benefits. The use of prescribed fire in all alternatives would result in short-term, localized soil erosion and loss due to the temporary loss of vegetation. These short-term effects would be negligible for alternative A, and minor under alternatives B, C, and D. Large wildfires would likely lead to greater soil erosion and loss due to greater fire severity and vegetation loss compared to prescribed fires. The potential for severe major effects would be greatest under alternative A, while alternatives B, C, and D would use prescribed fire more lightly across the landscape to produce a patchwork effect for vegetation.

Impacts from livestock grazing on soils would continue in areas where annual grazing was used, and would be reduced in areas under prescriptive grazing. Alternatives A and C would continue to have moderate to major impacts to soils in some areas, with long-term improvement in areas under prescriptive grazing. Under alternatives B and D, improvements from prescriptive grazing would be greater.

The Service would continue to provide for a number of public use activities including road access, camping, and fishing that would negatively affect soil resources. Under all alternatives, these general refugewide effects would be minor, but in some localized areas, moderate to major negative impacts would continue to occur from roads, camping areas, and heavily used fishing areas. Construction of a science center or interpretive center at Sand Creek Field Station would result in temporary increases in soil erosion during any construction, with negligible long-term effects. Cultural resources and paleontological excavations under all alternatives would result in localized soil disturbances. The overall effects on soils would be negligible.

Mitigation

The Service could minimize losses in vegetation and subsequent soil disturbance and loss by ensuring that the best management practices were followed during construction activities, restoration of the river bottoms, or excavation of paleontological resources. Better definition of popular campsites or fishing areas or hardening sites would limit soil impacts from these public use activities. Planning for these actions should be incorporated into the visitor service's step-down plan and the transportation plan.

Similarly, by managing grazing areas with prescriptive grazing or reducing annual grazing to lighter grazing levels, limiting livestock grazing during the hot season and fencing cattle out of riparian areas, the Service would minimize soil erosion and loss over the long term.

Permittees for paleontological excavations would be required to reclaim areas.

EFFECTS on WATER RESOURCES

Effects on water resources were evaluated based on existing information on the distribution and quality of water at the refuge and potential for refuge activities to impact water resources.

Water Development, Water Rights, and Water Quality

Currently 215 reservoirs designed to store about 705 acre-feet have been developed across the refuge (refer to chapter 4). Under all alternatives, select stock ponds would be maintained and rehabilitated although the number and schedule would vary by alternative. Riparian habitat would be restored where possible and standard watershed management practices would be enforced. Water rights would be adjudicated and defined. Under alternative B, the Service would work to restore water quality for fish and wildlife habitats by addressing soil erosion from livestock and wildlife grazing and public use activities. Under alternative C, future water devel-

opments would be allowed on site-specific basis and consideration of effects. Alternative D would encourage more natural water development within streams such as increased flow, pools, and beaver ponds. The Service would assess the uses and needs of current reservoirs and restore the hydrologic condition of those reservoirs when they were no longer needed for wildlife or livestock. Additionally, the Service would work with others to restore dynamic hydrological processes where possible.

River Bottom Restoration

All alternatives except B would restore the 15–17 river bottoms (former agricultural fields) although the timing would vary. In localized areas during restoration activities, particularly under alternatives B and C, planting crops for reduction of invasive plants could result in short-term, direct negative effects on water quality in the Missouri River particularly if herbicides were applied to large areas. Given that current water quality monitoring indicates few problems (refer to chapter 4), and the Service judiciously applies all herbicides, any negative effects would likely be short term and negligible overall. Using best management practices during restoration activities would limit any potential impacts to water quality.

Riparian Area Restoration

Healthy riparian systems enhance water quality by filtering out organic and chemical pollutants (Ehrhart and Hansen 1997). Water quality is closely related to soil erosion and sedimentation. These can be associated with vegetation cover, concentration of livestock grazing, and geologic erosion. High concentrations of sediment loads, and fecal coliforms can have a major impact on altering an existing stream ecosystem or even creating an entirely new ecosystem (Kauffman and Krueger 1984).

Many streams on the refuge are intermittent, lasting only a short time. Under all alternatives, any restoration activities would be conducted when streams are dry or minimal flow to minimize the direct introduction of sediments. Planned revegetation and stabilization of the stream channels would reduce the potential for stream sedimentation during precipitation events. Additional benefits from improved streamside habitat conditions would include bank stabilization and the retention and removal of sediments and pollutants from the water.

Invasive Species

Herbicides would be used under all alternatives for invasive species management. The Service implements its invasive species program in a variety of habitats including areas where there are water impoundments or riparian areas. Under all alternatives, the invasive species program would be carried out through an approved step-down plan. All person-

nel who use chemicals would be trained in the proper application of where, when, and how to apply them. All chemicals would be required to be safely stored and identified. Under alternatives B, C, and D, the Service would step up efforts to stop encroachment of saltcedar, Russian olive, and other invasive species. Short-term, negligible effects could occur to water quality due to soil erosion or sedimentation, but following required protocols would greatly limit the potential of influencing water quality downstream.

Livestock Grazing

Because this issue is closely connected with riparian health, it is addressed under riparian areas and wetlands in section 5.6 below and is not discussed further here.

Public Use

Construction activities involved in developing facilities, structures, parking areas, viewing blinds, or other facilities, in addition to existing public use activities could result in indirect, short-term effects to water resources due to erosion, sedimentation, and contamination. The extent of facility development and corresponding effects would vary among the alternatives with alternative A having the least potential for impacts with few if any new facilities built or developed. Alternative B would have a few new facilities (5 percent greater than alternative A), alternative C would have about 15 percent more, and alternative D would have about 10 percent more. Considering the relatively small amount of facility development and likely distance from water, the any subsequent effects would be negligible.

Conclusion

Activities related to river bottom restoration, riparian restoration, public use activities, and invasive species could result in negligible short-term effects on water quality.

Mitigation

By limiting the amount of bare soil, using soil erosion barriers, limiting the use of herbicides, hardening popular public use areas, and following other best management practices, the Service would reduce potential impacts on water quality as a result of areas any of its activities related to restoration, invasive species management or public uses.

CUMULATIVE IMPACTS on the PHYSICAL ENVIRONMENT

None of the proposed alternatives would result in cumulative effects on climate change, air quality, visual resources, soils, soundscapes, or water resources.

The long-term benefits of various management actions on global climate change may result in cumulative benefits when combined with current and

future programs and initiatives, such as the Department of Interior Climate Change Initiative, to reduce carbon emissions and mitigate the effects of climate change on refuges. The overall cumulative benefit, however, would be negligible.

5.5 Environmental Consequences for Biological Resources

This section analyzes the effects of the actions on vegetation communities or habitats and the wildlife resources of the refuge. In general, it follows the organization of Chapter 4—Affected Environment.

EFFECTS on UPLANDS

Implementation of varying approaches to upland habitat management under the alternatives would result in a range of effects on the condition, structure, and function of upland vegetation.

All Alternatives

Both prescribed fire and wildfire have positive and negative effects, because different species of plants and wildlife respond differently to the effects of fire. The short-term negative effects of fire on a specific species are usually compensated by the long-term benefits to the overall plant and wildlife community.

Prescribed fires can be very labor intensive. Implementation of the alternatives would result in varying levels of equipment use and associated impacts. Prescribed burning in wilderness or proposed wilderness units would require using the minimum tool necessary to accomplish management objectives, per Federal wilderness policy. Impacts from prescribed fire would vary by project and by location, but would generally result in short-term, localized effects that would be offset by long-term benefits.

Wildfire is a natural occurrence that will continue to significantly alter the landscape of the refuge. Not all wildfire is unwanted or destructive. Naturally occurring wildfires would be managed for multiple objectives, and human-caused wildfires would be suppressed using tactics and strategies that result in the least damage to values at risk and costs while providing for firefighter and public safety. Fewer opportunities would be available in alternatives A and C, because most wildfires result in short-term negative economic effects to livestock grazing interests. All suppression efforts would be evaluated to ensure the least human impact on the natural resource as possible, while allowing for the timely control of the incident.

Management Approaches

The general effects of the management approach for uplands under each alternative are evaluated.

Alternative A. This alternative would maintain the current management emphasis of fire suppression, annual livestock grazing, invasive species control, and water development. The Great Plains evolved through a complex interaction of fire and grazing (refer to uplands in chapter 4), and the continued emphasis on constant grazing and fire suppression across the uplands would greatly limit the composition, structure, and functioning of vegetation, resulting in continued loss of plant diversity and habitat function (FWS 2001).

The past and present effects of current management are represented by existing conditions and are described in chapter 4. For example, fire-intolerant species such as big sagebrush and junipers have benefited at the expense of sentinel plants such as chokecherry, green ash, and golden currant. Likewise, grazing and fire suppression have reduced or locally eliminated palatable forbs. Upland habitats would be increasingly vulnerable to continued loss of palatable plant species, loss of ancient trees due to fuel buildup when fires occur, and increased insect and invasive plant infestations. These conditions are the result of more than 120 years of fire suppression and livestock grazing. While the management approach under alternative A would continue these conditions and their impacts over the long-term, the incremental effect of alternative A would be minor.

Alternative B. The Service would actively manage and manipulate wildlife habitat using both natural ecological processes and active management practices to promote target wildlife species. The target species would be primarily animals that are important game species such as elk, mule deer, bighorn sheep, pronghorn, sharp-tailed grouse, and sage-grouse. Different parts of the refuge would be managed for different species. This approach would improve the overall composition, structure, and functioning of habitat refuge-wide. However, the emphasis on managing for individual species may not result in improvements in biological integrity within individual habitat units and could be harmful to the habitat in some areas if overbrowsing continued.

The overall effects on habitat quality, integrity, and resilience would vary geographically based on the target species that are chosen and the management tools that are used. For example, using sporadic fire and grazing to manage habitat for sharp-tailed grouse, which use a broad range of habitat gradients, would likely result in more diverse and resilient areas that would provide for a wider range of other species. Areas managed for sage-grouse habitat, which is tied to a narrow range of habitat gradi-

ents, would become less resilient and would benefit few other species.

Some areas would require management practices that favor vegetative diversity, ecological processes, and sentinel species and would result in localized benefits. Other areas would continue management practices that emphasize grazing, fire suppression, and uniform grass production and would result in localized impacts and overbrowsing. Overall, this management approach would improve habitat conditions and habitat function and diversity, resulting in moderate long-term benefits to upland vegetation.

Alternative C. Under alternative C, the Service would manage uplands to emphasize wildlife-dependent recreation (primarily hunting opportunities or wildlife viewing) and livestock forage needs. The Service would implement a prescriptive grazing and pyric herbivory program on appropriate habitat units. In most areas, the current management conditions and disturbance cycles (constant grazing and limited fire) would prevail.

This management approach would be similar to existing conditions, with additional emphasis on improving the uplands for wildlife and livestock grazing and balancing use by wild and domestic ungulates. This approach would more closely follow NRCS guidelines for improving grass cover and vigor, which promotes tall, productive grasses and provides the most forage for ungulates. The additional use of prescribed grazing, fire, and range condition monitoring would provide additional tools to reach desired rangeland conditions. These changes in rangeland conditions, however, would not necessarily translate to improvement in overall habitat resilience and diversity. Early successional species, including sentinel forbs and shrubs, would not be a management priority. Implementation of alternative C would result in minor long-term benefits for upland vegetation.

Alternative D. Under alternative D, the Service would mimic and restore natural processes on the refuge, managing for a diversity of upland plant species. This approach would restore the historical disturbance cycles of sporadic fire and grazing (pyric herbivory) and re-create the habitat conditions in which native species of plants and wildlife evolved and are most adapted.

Alternative D would incorporate a broad range of disturbance factors on the landscape, facilitating the development of a diverse and changing mosaic of habitat conditions with high heterogeneity. This approach is based on the resiliency concept, which is described in Chapter 3—Alternatives. For example, the combination of prescribed fire, prescribed grazing, and other active management techniques would likely result in an improvement in highly palatable shrubs (such as saltbush, winterfat, silver

sagebrush, and chokecherry) and forbs (such as purple prairieclover, dotted gayfeather, and Maximilian sunflower), as well as vigorous and diverse grasses. Specific management would be based on sentinel species monitoring.

This approach would not optimize vegetation conditions for livestock or any single wildlife species and would result in less area focused on uniform grass production. Instead, it would promote a dynamic and shifting mosaic of vegetation that provides a variety of vegetation at different successional stages, which ultimately supports habitat for a variety of wildlife species. Implementation of this approach would result in major long-term benefits for upland vegetation.

Livestock Grazing, Prescribed Fire, and Other Practices

The effects of achieving each alternative's objectives for grazing, prescribed fire, and other practices are evaluated below.

Alternative A. Some of the vegetation management objectives outlined in alternative A would benefit habitat conditions. Successful implementation of efforts to increase deciduous shrub quality and quantity through prescribed fire and plantings would provide minor, localized benefits. However, successful reestablishment of shrubs would be difficult due to grazing by ungulates (both wild and domestic), and the overall acreage goals are relatively small. The benefits on vegetation and habitat conditions would be negligible.

The gradual transition to prescriptive grazing under alternative A would result in long-term, minor benefits. While recent reductions in grazing numbers (AUMs) have already benefited vegetation in some locations, these benefits have not resulted in a recovery of sentinel plants and may be offset by increases in native ungulates. Additional fencing of one habitat unit and portions of the refuge boundary may result in minor to moderate benefits to vegetation in localized areas, but the overall effect on the refuge would be negligible.

The refuge would continue to burn about 525 acres of upland habitat per year. There would be short-term benefits to deciduous shrub quality and quantity, because fire initiates new, succulent growth, but overall benefits to habitat would be negligible due to the small acreage being treated. Livestock grazing would be restricted on prescribed burn units, but impacts from native ungulates on these isolated, small, patches would intensify as ungulates are attracted to new growth from burn areas. Prescribed burns would include areas of isolated and dense stands of ponderosa pine and Douglas-fir. Small portions of these areas would also be hand thinned. Benefits to forested areas would continue to be minimal as the acreages treated would be relatively small.

Alternative B. The implementation of a prescriptive grazing plan under alternative B for over half of the refuge lands would generally benefit vegetation conditions and the viability of sentinel species. This would be complemented by the removal of 25–50 percent of the interior fences, which would allow wild and domestic ungulates to access burned areas. This would benefit the burned area as well as the unburned areas that are allowed to rest. However, management of some localized areas may result in negligible to minor effects if the targeted wildlife species favors a single plant species or specific vegetative condition. For example, Baird's sparrow prefers tall vegetation, whereas mountain plover prefers short prairie grasses (refer to birds in chapter 4).

Once the patch-burning program was fully implemented, about 2,500 acres of upland habitat would be treated each year with prescribed fire. These burned patches would be purposefully located across the entire refuge and would have a significant positive effect on fire-adapted plants, fire-dependent plants, and highly palatable plant species. Formerly diverse upland communities would respond with an increased abundance of fire-adapted shrub species such as saltbush, winterfat, silver sagebrush, and gray rubber rabbitbrush. The current monoculture of relatively unpalatable and fire-intolerant big sagebrush would gradually diversify into a natural mosaic of heterogeneous plant communities, resulting in moderate, long-term benefits.

There are numerous old-growth stands of forest on the refuge. When feasible, the Service would thin the forest's volatile, fire-prone understory with mechanical treatment or prescribed fire, or both. Once treated, these stands would be less prone to be consumed by wildfire, which would preserve old-growth trees that in some instances exceed 750 years of age.

Douglas-fir and ponderosa pine have gradually encroached into what was formerly treeless needlegrass-wheatgrass prairie. Prescribed fire is the most cost-effective tool to set back this encroachment.



Eastern Kingbird

Sites with the greatest encroachment would be targeted for prescribed fire and lower priority units would be treated by wildfire managed for multiple objectives. The use of prescribed fire would result in long-term benefits: supporting efforts to reestablish natural prairie; reducing highly volatile hazard fuel; revitalizing decadent, fire-dependent vegetation; and restoring the natural ecological process.

Alternative C. The prescriptive grazing program under alternative C, while less aggressive than alternatives B and D, would generally result in minor to moderate benefits to vegetation conditions, although the scale of the benefits would be more limited than the other action alternatives. Prescribed fire on habitat units with prescriptive grazing, as well as on those identified to have fair to poor range condition, would benefit the range conditions and some sentinel plants. This would be complemented by the removal of interior fences in areas where prescriptive grazing is applied. The combination of these factors would better establish ecological gradients and heterogeneity between the habitat units, benefiting the overall conditions and improving forage for both wild and domestic ungulates.

Habitat units with excessive fuel loading of grass, shrub, or forest would be evaluated for wildfire risk and, if compatible with management objectives, increased use by grazing ungulates would be allowed to reduce the fire danger. There may be some areas, such as heavily forested slopes, where prescribed fire or mechanical treatment may be the only option to reduce the risk. It would be important to strike a balance between the needs of wildlife and improved forage for livestock and lower fire danger. Effects would be positive for reducing fire danger and economic benefits to the permittee. There may be decreased plant vigor due to increased use but, under a prescriptive grazing program, this could be minimized.

Prescriptively grazed habitat units that are in fair to poor range condition would be rested to allow the vegetation to recover to the point that the units could be treated with prescribed fire. Once treated, grazing may be allowed but at a level that would promote species diversity and increased plant palatability, vigor, and heterogeneity. Because a permittee could be required to use other grazing units until rested units recover, this may have an initial negative effect on the permittee. However, the increased biomass production resulting from prescribed fire could be better used by grazing ungulates and should ultimately be a positive effect. Effects on native vegetation would be positive.

Alternative D. The effects of vegetation management objectives under alternative D would be similar to alternatives B and C, but would more aggressively promote biological diversity. The extent of prescriptive grazing (50–75 percent of the refuge) would be the

same as alternative B and more than alternative C. However, a pyric-herbivory dynamic would be applied to the entire area where prescriptive grazing is used. The construction of boundary fencing and removal of interior fencing on 10–25 percent of the refuge would improve wild and domestic ungulate access to burned areas. If successfully implemented, the combination of these and other management approaches are anticipated to benefit upland vegetation over the long term.

Wildfire

As the northern Great Plains climate continues to change, it is expected wildfire frequency and intensity will increase. The past decade has produced the most intense and largest wildfires the area has seen since establishment of the refuge. Even though the northern Great Plains is an ecosystem that evolved with fire, historically, fires did not burn with near the intensity. This is mostly due to past grazing practices that reduced fine fuel (grass) and fire suppression, which resulted in a massive buildup of woody fuel from Douglas-fir and ponderosa pine.

The effects of achieving each alternative's objectives for wildfire are evaluated below.

Alternative A. Under alternative A, wildfires would increase in size and intensity as the natural fire regime continues to be altered. Large blocks of forest would most likely be eliminated. These conditions could result in moderate to major detrimental effects on vegetation.

Alternatives B and D. Wildfires would continue to increase in intensity and severity until the Service established a semi-natural burn mosaic across most of the landscape, which may not occur during the life of this CCP. Eventually, a seminatural fire-return interval would be established across the landscape, which would have a positive effect on fire intensity and severity. Wildfires would continue to occur, but with the gradual reduction of hazard fuel using prescribed fire and mechanical treatments, a natural mosaic of burned and unburned fuel would begin to appear across the landscape. This mosaic would limit the potential of wildfires to consume vast portions of the refuge during any one event. The refuge would use wildfire to benefit natural resources and to reestablish natural fire regimes. The short-term negative effects of wildfire would gradually change into a positive effect on species diversity, plant palatability, plant vigor, and heterogeneity.

Alternative C. With an increased emphasis on economic uses in alternative C, much of the forested habitat would see greater use by grazing ungulates. This would reduce the fine fuel that carries a fire but would also continue to alter the natural fire regime. Wildfire size and intensity should decrease as the fine fuel that carries a fire was significantly reduced

by grazing. However, this would also continue to dramatically alter the natural fire regime of the area and result in significant buildup of woody fuel. In the short term, the number of fires would decrease in intensity and severity. Eventually a wildfire would burn through these areas with considerably greater intensity than is normal, inflicting far more damage to the habitat. This was experienced on the refuge in 2003 and 2006 when more than 100,000 acres of refuge habitat (mostly dense stands of trees) were consumed by fire. These type of fires usually engulf entire landscapes and leave very little unburned mosaic; in addition, these fires consume practically all but the most isolated pockets of old-growth forest.

Water Impoundments

Artificial water impoundments—stock ponds and reservoirs—contribute to the degradation of nearby vegetation by facilitating the congregation of large animals and the development of radiating stock trails to and from these water sources. Alternative A would not change management of water impoundments, resulting in minor long-term impacts by allowing the current conditions to persist. The aggressive removal of almost all water impoundments under alternatives B and D would result in major localized benefits to vegetation near the impoundments. Under alternative C, long-term efforts to evaluate water impoundments for rehabilitation, removal, or new pond development would have a negligible to minor benefit on nearby upland vegetation.

Wildlife Management

The effects of achieving each alternative's objectives for wildlife management are evaluated below.

Alternative A. Continued management of big game populations under alternative A to achieve target levels outlined in the 1986 EIS record of decision could contribute to long-term impacts to some sentinel forbs and shrubs. Monitoring at some sites has indicated that wild ungulate populations have exacerbated the effects of livestock grazing on highly palatable forbs and shrubs or have offset the gains made by reduced livestock numbers. If ungulate population targets are based on habitat condition (such as the "good to excellent condition" expressed in the objective) these effects could be reduced. Overall, continued big game management under alternative A would result in minor, incremental impacts to upland vegetation.

Alternative B. Under alternative B, the effects of wildlife management objectives on vegetation would vary based on the habitat and needs of target species. Wild ungulate objectives could result in minor benefits to habitat conditions if they were successfully implemented in concert with prescriptive graz-

ing plans and meeting habitat needs of target species. Unsuccessful implementation of those objectives could result in minor to moderate negative effects to vegetation in localized areas due to overgrazing by all ungulates. The elimination of predator control in alternative B potentially could benefit vegetation if the uncontrolled predators reduced ungulate numbers, thereby reducing wild and domestic grazing pressure.

Alternative C. The wildlife management objectives in alternative C, which seek to maintain a balance between big game and livestock numbers, would result in minor benefits to upland vegetation conditions if they were successful. However, it would be difficult to achieve this balance because of the competing and additive demands of wild and domestic ungulates for the same forage, and the differences in scale at which MFWP's big game objectives and the refuge's grazing targets are set. Therefore, the implementation of wildlife management objectives would likely result in upland vegetation conditions that are similar to existing conditions (negligible long-term effects).

Alternative D. Wildlife management in alternative D would complement the vegetation management approach. Big game population targets would be managed to promote ecological resilience while minimizing impacts on sentinel plants. This would provide a comprehensive approach to total ungulate (wild and domestic) use. This management approach to wild ungulates would contribute to the overall benefits to upland vegetation. However, it could be difficult to effectively limit big game populations through hunting if major reductions were necessary. The elimination of predator control would help limit big game populations.

Expansion of prairie dog populations would improve the overall diversity of upland habitats and would provide another disturbance factor that would increase diversity and heterogeneity. Under alternative A, prairie dog populations would be able to expand up to 10,000 acres, resulting in minor benefits. Under alternatives B, C, and D, the Service would more actively seek to expand prairie dog colonies to at least 10,000 acres, resulting in moderate benefits to upland vegetation diversity.

Invasive Species

Much of the upland areas have not been mapped for invasive species as much of the treatment efforts have been focused along the river corridor. The Service would continue mapping for invasive species along roads, running the weed wash station in the fall, and requiring horse users to use weed-seed-free hay. Many of these existing preventive actions would continue to benefit upland areas by prevent-

ing and detecting large infestations from occurring. Under alternatives B, C, and D, the Service would increase its detection and treatment efforts of invasive species in the upland areas.

Roads and Access

While the existing 670 miles of road are important for administrative, recreational, and emergency access, excessive roads can fragment vegetation and provide conduits for invasive plants. The effects of fragmentation are more important for wildlife, but should nonetheless be considered for vegetation. The effects of achieving each alternative's objectives for access are evaluated below.

Alternative A. Alternative A would maintain the current number of roads, resulting in negligible effects over the long term.

Alternative B. The closure of about 106 miles of road under alternative B would result in moderate benefits to vegetation in areas adjacent to the closures. Once closed, most roads recover without restoration. While the actual proportion of total roads to be closed would remain small, the selected closures would restore large blocks of unfragmented vegetation and habitat. Closing roads could have impacts in localized areas from overbrowsing if harvest objectives are not met. Working with MFWP before implementation of road closures or allowing for game retrieval could limit those impacts.

Alternative C. Efforts to expand recreational access and upgrade roads and facilities would result in localized impacts to vegetation next to the improvements. The overall effects on upland vegetation, however, would be negligible.

Alternative D. The beneficial effects of 23 miles of road closures would be similar to alternative B, but less extensive. Benefits from road closures could be slightly diminished by invasive plant infestations if roads were unsuccessfully restored. As with alternative C, improving the Knox Ridge Road would result in some localized impacts to vegetation, but overall the impact to the area would be negligible. Allowing access on closed roads outside of proposed wilderness areas for game retrieval would allow for harvest objectives to be met, benefitting upland habitats.

Conclusion

Implementation of alternative A would continue the current management approach and vegetation conditions, resulting in minor, short-term, incremental impacts. However, the long-term implications would be moderate to major impacts on upland habitat composition, structure, and function.

Alternative B effects would vary depending on the target species that are chosen for each habitat

unit. Some areas would have moderate to major benefits, while benefits to other areas would be negligible. Overall, the implementation of alternative B would result in long-term moderate benefits to upland habitat composition, structure, and function.

Alternative C would result in minor benefits to upland habitat composition, structure, and function over the long-term.

Alternative D would benefit habitat conditions and the viability of sentinel species and promote biological diversity and integrity. Implementation of alternative D is anticipated to result in long-term, major benefits to the composition, structure, diversity, and function of upland habitats.

Mitigation

Several measures have been built into the alternatives to mitigate for impacts to upland areas from excessive livestock or wild ungulate grazing. The Service would implement a more comprehensive monitoring program in order to fully assess impacts on plants by all ungulates. Moving toward a greater reliance on prescriptive grazing, particularly in alternatives B and D, and to a lesser extent in alternative C would help to limit impacts. Controlling the numbers of ungulates (domestic and wild), using fire to move ungulates to other areas, reductions in livestock grazing, expanding boundary fencing, removing fencing, and management of water structures are all examples of measures that would be incorporated into the plan.

EFFECTS on RIVER BOTTOMS

Figure 20 in chapter 4 identifies the river bottoms that would be restored.

All Alternatives

The establishment of healthy, native plant communities is the best long-term defense against invasive weeds (Riley and Wilkinson 2007). While it is nearly impossible to eliminate all invasive plants, the planting of native forbs, shrubs, and grasses combined with ongoing monitoring and spot treatments would eliminate many of the large monotypic weed patches that currently exist in many river bottom areas. By planting and cultivating native plants, additional seed sources will also be available for the spreading of seeds to other locations. reestablishment of healthy native plant communities would benefit the ecosystem and a suite of native bird and wildlife species.

River bottoms tend to be fire-exclusive environments by their very nature. Subsurface moisture allows for greener, lush vegetation, which restricts fire development and growth. Great Plains cottonwoods are easily killed by low intensity fire and these areas would not be targeted for prescribed burning and would not be negatively affected. The river bottoms that were farmed in the past are now infested

with invasive plants. Prescribed fire would be used in these units to prepare the seedbed for planting of native vegetation.

Alternative A

The initiation of five to seven restoration efforts in the river bottom would benefit these habitat areas by improving native species composition, habitat resiliency, and the historical character of these plant communities. However, these benefits would be limited to the areas that are successfully restored. The minimal commitment of resources and personnel to river bottom restoration in alternative A could lengthen the timeframe and ultimately reduce the success of restoration efforts. Untreated areas would likely continue to be overtaken by expanding invasive weed patches, which would ultimately increase the rate of spread and the cost of restoration. Overall, alternative A would result in minor to moderate benefits to river bottom habitats.

Alternative B

Seed removal and planting of wildlife food crops or agricultural crops such as alfalfa would benefit affected areas by reducing or removing weeds by competing with weeds for resources and space. These plantings would also provide wildlife value, particularly for large ungulates.

The planting of nonnative monoculture crops could reduce the plant diversity in some areas, reducing available habitat for some bird and wildlife species. The attraction of wild ungulates to these areas could also exacerbate impacts to nearby riparian areas. The reapplication of herbicide, and the need to replant cover crops over time could provide opportunities for invasive plants to reinvade the bottomlands over time, reducing the long-term effectiveness of these efforts.



USFWS

White-tailed Deer

Overall, weed reduction efforts outlined in alternative B would result in minor to moderate benefits to river bottom habitats.

Alternative C

The effects and benefit of river bottom restoration through partnerships with cooperative farmers in alternative C would be similar to alternative B, with some exceptions. Cooperators would plant river bottoms to nonnative crops for multiple years to make it profitable (and to reduce or eliminate invasive plants), and would then plant to native forbs and grasses. One of the main benefits of this approach is that the first step of the process (planting economic/cover crops) would occur more quickly since the cooperators would do most of the on-site work using their own equipment. It is not clear how long it would take to successfully implement the second step of the process (planting native forbs and grasses).

In addition to the negative effects described under alternative B, the restoration approach proposed under alternative C would result in the need to apply herbicide over the entire area at least twice—once to remove invasive plants before planting crops, and again to remove the crops before planting native seeds. Another drawback would be the increased number of wild ungulates that would be conditioned to frequent planted areas. Besides the subsequent impacts on nearby riparian areas, the continued browsing and grazing of wild ungulates could also decrease the chances of survival of newly emerging native plants.

Overall, the alternative restoration approach outlined in alternative C would result in minor to moderate benefits to river bottom habitats over the long term.

Alternative D

The bottomland restoration efforts in alternative D would be similar to alternative C, but with a less aggressive approach. These efforts would result in minor benefits to river bottom habitats over the long term.

Conclusion

Each of the alternatives would use a different approach to treating river bottoms, and all would result in minor to moderate benefits to river bottom habitats over the long term. The minimal commitment in alternative A would lengthen the timeframe for restoration. Alternative B would have a more comprehensive and aggressive approach, although the application of herbicides and the planting of cover crops could provide opportunities for invasive plants to reinvade the bottom lands, reducing long-term effectiveness. The effects of implementing alternative C would result in the need to apply herbicides several times. Alternative D would be similar to C but would involve a less aggressive approach. While each alternative differs in its approach to restoration, all alternatives would result in minor to moderate long-term benefits to river bottom habitat.

Mitigation

Mitigation measures are primarily discussed under soils. Adhering to best management practices in disking, tilling, and applying herbicides would limit impacts from restoration of river bottoms.

EFFECTS on RIPARIAN AREAS and WETLANDS

The effects on riparian areas were assessed as part of the Service's work with the Riparian and Wetland Research Program.

Method Used to Analyze Effects

Sources of information used to assess the level of impact on riparian areas included (1) scientific literature on the effects of management activities of riparian areas, (2) site-specific assessment of the refuge's riparian areas, and (3) professional judgment of refuge biologists and other professional biologists and ecologists familiar with the refuge's riparian areas. The Service also consulted with members of the National Riparian Service Team, an interagency effort to accelerate riparian restoration primarily in the Western United States. Ultimately, the Service contracted with Paul Hansen, a riparian ecologist who worked with the National Riparian Service Team in developing a functional stream analysis, to conduct a follow-up riparian assessment. Hansen had previously evaluated riparian communities on the refuge in the mid-1990s. Information from Hansen's assessment in 2009, in addition his work in the mid-1990s was used in the effects analysis. Past and current riparian assessment and monitoring efforts are described in chapter 4.

Invasive Species

The localized short-term effect of invasive plant management may be a moderate negative trend in riparian health with the initial removal of "cover" to trap sediment. If restoration occurs, the long-term effect with restoration may be a minor to moderate positive effect on riparian health. Much of the gain in health rating on riparian areas refugewide due to increased vegetation cover is offset by the further invasion of invasive plants (Ecological Solutions Group 2009).

Water Impoundments

Artificial water impoundments (stock ponds and reservoirs) provide for alternative watering sites away from riparian areas releasing these areas from impacts of large animals. However, impoundments also contribute to the degradation of riparian health downstream by preventing and reducing the flow regime. Precipitation and runoff levels would determine the amount of sedimentation deposition below the impoundment, building a floodplain on which riparian vegetation may establish and capture more

sediment. Improvements to the water impoundment, including additional woody species along a portion of the edge, could have a moderate positive effect on riparian wildlife species that use lentic wetlands (Pilliod and Wind 2008, Taylor and Tuttle 2007).

Alternative A. Alternative A would not change management of water impoundments, resulting in minor long-term effects by allowing the current conditions to persist.

Alternatives B and D. The aggressive removal of almost all water impoundments on the refuge in alternatives B and D would result in major to moderate localized benefits for riparian habitat surrounding the existing impoundments. Immediate effects include increased in-stream water flow, sedimentation, and floodplain building. Restoring hydrologic function of streams and drainages would have a moderate to major benefit for riparian areas that are affected by altered hydrology. These benefits would also result in moderate positive benefits on riparian wildlife species that use lotic wetlands such as beaver.

Alternative C. Under alternative C, long-term efforts to evaluate existing water impoundments for rehabilitation, removal, or new pond development would have a negligible to minor benefit on riparian health, compared to existing conditions.

Livestock Grazing

Alternatives A, B, C, and D all include livestock grazing at varying levels. Livestock grazing in riparian areas affects water quality, stream morphology, hydrology, soils, streambank vegetation, and aquatic and riparian wildlife (Belsky et al. 1999, Hansen 1992, Kaufman and Krueger 1984). A livestock grazing management strategy designed for an area should be tailored to the conditions, problems, site potential, objectives, and livestock management consideration on a site-specific basis that will best meet the resource needs. Hansen (1992), Meehan and Platts (1978), and Platts and Wagstaff (1984) found no grazing system that was compatible with healthy aquatic ecosystems.

Riparian health assessment surveys in 1995 and 1997 indicated the riparian areas across the refuge on average were not functioning (Cook et al. 1996, Parker and Hansen 1996, Thompson and Hansen 1999). Hansen (1992) stated that livestock grazing is a compatible use in riparian-wetland areas only when the functions of the riparian system guide the development of the grazing strategy. This includes sediment filtering, bank building, water storage, aquifer recharge, energy dissipation, potential of the site, and the needs of the riparian vegetation. Riparian areas grazed without above considerations have a major negative effect (Belsky et al. 1999, Kaufman and Krueger 1984, Hansen 1992). Management changes since the 1985 EIS include a significant reduction

in AUMs refugewide and the construction of fences along the Missouri River and other streams across the refuge. Excluding livestock from riparian areas using fencing has allowed riparian areas to improve, thereby increasing riparian function (Ames 1977, Duff 1983, Hollow et al. 2001). However, if cattle were not excluded from other riparian areas, then any benefits of the enclosures to riparian areas would be negligible due to increased use by native ungulates (Miles 2006).

Alternative A. Alternative A would maintain the current management approach of annual livestock grazing and water development. The past and present effects of the current management regime are represented by existing conditions and are described in chapter 4.

Based on 2009 surveys completed on most of the same locations as in 1995–7, riparian health on the refuge has improved over the past 14 years with most of the improvement seen in the soil and hydrology. Implementation of alternative A would improve riparian habitat in general, but localized sites could continue to experience a negative trend. The 2009 survey shows the current trends to be improving in some areas with no livestock. An example of this is in the UL Bend refuge where 100 percent of the area was rested and the riparian health assessment increased 58 percent from nonfunctional to healthy (Ecological Solutions Group 2009). However, if AUMs are reduced but cattle are not fenced out of riparian areas then no change in riparian health would be expected and a negative trend would occur. This is evident in the area between Rock Creek (east) to Fort Peck Dam where total AUMs in the habitat units decreased slightly but the riparian health assessment decreased 24 percent from healthy to functioning at risk.

Overall, the continuation of current grazing management practices under alternative A would result in negligible to minor incremental benefits to riparian habitat areas over the long term. However, some localized areas would continue to decline, resulting in moderate long-term impacts to some riparian areas.

Alternative B. Under alternative B, the Service would actively manage and manipulate wildlife habitat using both natural ecological processes and active management practices to promote specific target wildlife species.

The potential benefits of implementing prescriptive grazing across 50–75 percent of the refuge and fencing riparian areas are moderate refugewide, but potentially could vary from major to negligible benefits at local sites. Fencing cattle away from the river and shorelines would have a moderate to major benefit on riparian habitat. The woody draws from Rock Creek (east) to Fort Peck would experience

major long-term benefits due to fencing along riparian areas. However, excluding livestock from riparian areas could potentially have a long-term impact on upland sites as wild and native ungulates are displaced (refer to uplands above).

Elk are an example of the target wildlife species under alternative B. The Service would actively manage and manipulate elk populations at the highest levels possible. These potential increases in elk populations could offset the benefits of livestock management on riparian habitat due to increased elk browsing. An example of this is the Slippery Ann Elk Viewing Area, where, during the fall, hundreds of elk gather for a few months. The short-term impact is moderate and may be major over the long-term.

The effects from aggressive restoration along 50 percent of streams would depend on precipitation, site potential, fencing, and prescriptive grazing (Ecological Solutions Group 2009). The short-term benefits to the refuge as a whole would be moderate with possible long-term benefits being major for previously degraded, currently nonfunctioning areas. However, the benefits for an area that was functioning at risk could be minor or negligible. The long-term benefits could be major with an increase in vegetation capturing sediment for floodplain building.

The benefits of increased monitoring would be major if prescriptive grazing occurs in the monitored area. If negative effects are found, rapid adaptive management can occur, lessening the impact. A few weeks of unauthorized use or overgrazing could set back years of progress in improvements of riparian-wetland systems (Duff 1983). A few head of unauthorized livestock throughout most of the hot season would negate any positive riparian-wetland habitat response (Myers 1981).

Overall, the implementation of livestock grazing management objectives in alternative B would result in moderate, long-term benefits to riparian habitats refugewide. However, some localized areas could continue to be degraded and increased browsing by wild ungulates could offset some of the benefits.

Alternative C. Under alternative C, the Service would manage riparian habitats to emphasize wildlife-dependent recreation (primarily hunting and fishing opportunities) and livestock forage needs. Prescriptive grazing would be gradually implemented on up to 50 percent of the refuge. The overall management approach for alternative C would be similar to existing conditions (alternative A) in areas with annual grazing and similar to alternative B where prescriptive grazing is implemented. The effects of these approaches on riparian habitat would be similar to alternatives A and B, depending on where prescriptive or annual grazing approaches are used.

Alternative D. Under alternative D, the Service would mimic and restore natural processes on the refuge, managing for a healthy riparian area. Prescriptive grazing would be implemented on 50–75 percent of the refuge. Actions are the same as alternative B only the magnitude of the effects may be different. Overall, alternative D includes a more aggressive approach to riparian habitat protection and management, and therefore the long-term benefits would be greater, ranging between moderate to major.

Wildlife Management

Under all alternatives, continued management of furbearer, threatened and endangered species, fish, reptiles, amphibians, small mammals, and most birds would have no effect on riparian areas.

Alternative A. Continued management of big game populations under alternative A to achieve target levels outlined in the 1986 EIS record of decision may result in minor, incremental impacts to riparian health, due to increased grazing and browsing pressure on riparian habitat areas.

Continued management for bald eagle migration habitat and to improve or maintain riparian habitat are moderate refugewide, but potentially could have varied benefits to local sites depending on site potential, restoration techniques, and precipitation.

Alternative B. Under alternative B, the effects of big game management objectives on riparian health would vary depending livestock management and spatial interactions between wild and domestic ungulates and riparian habitat. This could result in minor benefits to riparian habitat conditions refugewide with varied localized effects. If wolves were to naturally recolonize the refuge, the presence and management of wolves on the refuge would provide predation pressure on wild ungulates, which would benefit riparian health by potentially reducing wild ungulate grazing pressure in some areas. If bison were reintroduced to the refuge, their presence as another large ungulate could result in negligible to minor effects on riparian health. Restoring riparian habitat in the tributaries in an effort to promote furbearers could result in moderate to major benefits to riparian health.

The effects of fish management objectives would be the same as those described above under water impoundments—short-term impacts followed by long-term benefits. Removal of fish passage impediments could result in minor to major benefits to habitat conditions.

Alternative C. The overall big game management objectives in alternative C would depend on livestock management and may result in minor, incremental impacts to riparian health refugewide with varied localized effects. The effects of bison or wolf man-

agement, should they occur on the refuge, would be negligible. The effects of fish management would be the same as those described above under Water Impoundments—negligible to minor benefits.

Alternative D. Big game objectives in alternative D would result in an incremental positive trend, with minor to moderate benefits to riparian health. The elimination of active predator removal and incorporation of wolf management objectives on the refuge would provide predation pressure on wild ungulates, which would benefit riparian health by potentially reducing wild ungulate grazing pressure in some areas.

The effects of management objectives for bison, furbearers, and fish would be the same as described under alternative B.

Roads and Access

While roads are important for administrative, recreational, and emergency access, excessive roads can disrupt natural drainage patterns when water is diverted and prevented from infiltrating into soils. Soil compaction increases runoff, soil displacement, and funneling of water leading to increased erosion. Impacts from roads result in introduced sediment into streams, snowmelt redirection and concentration, and surface flow production. Roads can affect both the volume of water available as surface runoff and the efficiency by which water flows through a watershed. More water and sediment in channels alter their physical structure, usually with negative effects on aquatic habitat. When culverts fail, large amounts of sediment can be delivered directly to the channel and from there down into lower streams potentially affecting sensitive fish habitat (Douglass et al. 1999). Indirect effects from roads on riparian areas include impacts to wildlife that use riparian areas, particularly reptiles, amphibians, small mammals and birds (refer to wildlife sections below).

Alternative A. Alternative A would maintain the current number of roads, resulting in negligible effects over the long term.

Alternatives B and D. The closure of about 106 miles of road on the refuge in alternative B could result in moderate refugewide benefits, though the effects to local sites would vary. Benefits from road closures could be slightly diminished by invasive plant infestations if roads are unsuccessfully restored. In alternative D, the beneficial effects of road closures (23 miles) would be similar to alternative B, but less extensive (minor benefit). Graveling Knox Ridge road in alternative D would have minimal impacts on riparian areas.

Alternative C. Under alternative C, efforts to expand recreational access and upgrade roads and facili-

ties on the refuge could result in localized impacts to riparian health in the immediate vicinity of the improvements. The overall effect on riparian health, however, would be negligible.

Conclusion

Under alternative A, the continuation of current grazing management practices would result in minor to moderate incremental benefits in some riparian areas over the long term. However, some localized areas would continue to decline, resulting moderate long-term impacts. The implementation of livestock grazing management objectives in alternative B would result in moderate, long-term benefits to riparian habitats refugewide. Some localized areas could continue to be degraded, and increased browsing by wild ungulates could offset some benefits. Alternative C would be similar to alternative A, but where prescriptive grazing occurred, long-term benefits would be similar to alternative B. Under alternative D, the actions would be similar to alternative B, but the magnitude of effects would be different. Alternative D would include an aggressive approach to riparian habitat protection and management, and the long-term benefits would be greater, ranging between moderate to major.

The continued use of water impoundments under existing conditions would result in minor long-term impacts to riparian areas under alternative A. Alternatives B and D, which would remove nearly all water impoundments would result in moderate to major localized benefits for areas surrounding the impoundments. Some rehabilitation of water impoundments would occur in alternative C having a negligible to minor benefit.

The continued management of big game populations in alternative A could result in minor, incremental impacts on riparian health due to increased grazing and browsing. The effects under alternative B would vary depending on spatial interactions between wild and domestic ungulates and riparian habitat. Under alternative C, impacts would be similar to alternative A and would depend on livestock management. Big game objectives in alternative D would result in an incremental positive trend in riparian health. Reducing active predator removal would provide predation pressure on wild ungulates, potentially reducing grazing pressure in some areas.

Alternative A would maintain the current road configuration resulting in negligible effects to riparian health. The closure of roads in alternatives B and D would have varied (minor to moderate) benefits to riparian areas. Alternative C would have negligible effects.

Overall, the long-term benefits to riparian habitat would be minor under alternative A, moderate under alternative B, minor to moderate under alternative C, and moderate to major under alternative D. In all

alternatives, localized moderate impacts would still occur from grazing.

Mitigation

In addition to the mitigation measures discussed under soils, the alternatives incorporate several measures for mitigating negative impacts on riparian areas and wetlands from excessive grazing by livestock or wild ungulates. These include utilizing prescriptive grazing and fire for improved ungulate management, using exclosures to fence off riparian areas, rehabilitating stock reservoirs that are no longer needed, planting riparian species, strategic placement of salt or mineral blocks, establishing or improving off-stream watering sites, installing stable access points to limit streambank trampling, requiring permittees to keep livestock out of riparian areas, restoring beaver colonization, and monitoring impacts.

EFFECTS on SHORELINE

The USACE controls reservoir levels and has primary jurisdiction for management of the lakeshore areas. Most of the issues related to any action the Service would take that would impact shoreline areas are addressed under threatened and endangered species, invasive species management, uplands, river bottoms, and riparian and wetland areas. There would be some delineation of routes down to the river for public access when water levels were low (refer to fishing objectives, rationale, and strategies) but the effect on shoreline vegetation would be negligible.

Mitigation

No mitigation would be required.

EFFECTS on BIG GAME

Pronghorn, mule deer, white-tailed deer, Rocky Mountain elk, Rocky Mountain bighorn sheep, and mountain lion are addressed.

All Alternatives

The effects of management objectives for furbearers, threatened and endangered species, species of concern, birds or other wildlife would have minimal, if any, effects on big game populations under any of the alternatives.

The effects the alternatives would have on hunting opportunities and experience do not directly affect big game populations and are addressed under public use. However, under all of the alternatives, hunting and harvest levels would be a major factor affecting big game populations. Harvest levels can be adjusted more easily than weather or other factors that would also influence population levels. The aim would be to adjust harvest to achieve specified objectives under each of the alternatives.

Invasive Species. Management objectives for shorelines and working with the USACE to address habitat needs for threatened and endangered species and management actions to reduce invasive species will have negligible effects on big game populations. Overall, efforts to reduce invasive species and maintain/restore native plant communities will benefit big game species and other wildlife.

Fire. Overall, wildfire and prescribed fire would have negligible effects on big game animals. Animals do not flee wildfire as is commonly believed. When mortality of large animals does occur, it is usually from smoke inhalation in very large, very fast-moving fires. The refuge has experienced some fast-moving wildfires in the past, which have likely resulted in some animal mortality. However, documentation of mortality is very rare, indicating minimal overall effects.

The biggest effect fire has on wildlife is the change in their habitats. Wildlife habitats, like forests, are not static; they adapt and respond to disturbances as do other natural systems. Fire changes the proportion, arrangement, and characteristic of habitats across the landscape. Immediately after a fire, there can be temporary loss of food and shelter; animal populations may shift from species that prefer cool, moist conditions to ones that prefer warm, dry conditions. Unburned areas and adjacent burned areas result in a mosaic of habitats with a range of vegetative conditions in which wildlife can find food and cover (Forest Encyclopedia Network 2009).

Roads and Access. Existing road access would remain under alternative A and would result in few new effects on big game populations. However, if more hunters continue to access the refuge from the river, which has been a trend in recent years, there could be additional wildlife disturbance affecting use and movements by elk in some local areas. It is also well documented that roads and traffic during the hunting season affect big game movements and distribution (especially for elk) with animals avoiding roads. Less easily accessed areas may provide a degree of refugia for big game from hunters and allow more animals, especially males, to survive the hunting season. In addition, decreased road access almost certainly reduces poaching.

Road access objectives in alternatives B, C, and D intend to reduce or improve road access to some degree. Effects on big game would be expected to be commensurate with the degree of road access change. The amount of open roads under all of the alternatives provides sufficient vehicular access to the hunting public and essentially the entire refuge is open to hunting. Hunting season structure and length, combined with permit levels for some species, will have the dominant effect on big game populations regardless of road management changes that may occur under each of the alternatives.

Wilderness. Since the biggest difference in proposed wilderness units on the refuge and other areas is roads, any effects the adjustments to proposed wilderness units suggested in each alternative might have on big game populations would parallel effects outlined above for vehicle access via roads.

Grizzly Bear Management. Similar to wolves, in itself, the drafting of a grizzly bear management plan would have no effect on big game populations, but implementation of management strategies developed in the plan could have major effects on big game populations should grizzly bears colonize the refuge. Grizzly bears would likely replace a portion of big game mortality now attributed to hunter harvest, but the degree to which this would occur is unknown and speculative.

Alternative A

There would be no changes from current objectives and management practices for big game under this no action alternative. The big game density objectives that were established for native ungulates are thought to be well within habitat capacities for long-term population viability and allow for maintenance of or improvement in habitat quality. Continued management for habitat conditions and diversity that support healthy big game populations would also result in habitat conditions favorable for a wide range of other wildlife, especially migratory birds, many Special Status Species, and sharp-tailed grouse. Opportunities remain for expanding bighorn sheep populations into previously occupied habitat. Such expansion would restore a missing wildlife component to those areas and could provide additional recreational opportunities. Overall, wildlife management objectives under alternative A would result in minor benefits to big game populations.

Mountain lion presence or management was not considered in the 1986 EIS. With no changes proposed for management under alternative A, there would be negligible effects on mountain lion populations. Their abundance, distribution, population composition, and trends would remain unknown.



A mountain lion on the refuge.

Habitat Management. The objectives for uplands, river bottoms, riparian areas and wetlands, shorelines and invasive species under alternative A would result in negligible effects compared to status or trends in big game populations that have always been variable and dependent on local conditions and management circumstances. Although a positive approach, the proposed objectives to increase the quantity and quality of shrubs on about 1 percent of the refuge over 15 years would have negligible effects on wildlife populations. The speed at which transition to prescriptive grazing progressed would determine its utility to achieve specified wildlife and habitat objectives.

Fire. Both prescribed and wildfire objectives under alternative A would continue current management strategies and resource protection policies. It is difficult to predict the effect fire alone may have on big game populations without specifics. The effects could be positive or negative depending on the situation, species, locale, previous management, disturbances, or other factors. Fire in some pine–juniper areas could dramatically reduce thermal cover that is essential to mule deer survival during severe winter weather. However, reduction of conifer cover in other areas may improve habitat suitability for bighorn sheep. There would certainly be immediate short-term effects depending on fire intensity and spatial extent in addition to intermediate and more long-term effects that would be complex and variable across the refuge. These same short- to long-term effects would apply to all alternatives.

Alternative B

With this alternative emphasizing big game abundance, management actions would strive to increase big game populations and distribution wherever possible within habitat limits. Such increases would necessitate reductions in livestock grazing to reduce competition and to provide adequate forage and space for native ungulates without adversely affecting habitat quality and conditions for other wildlife species.

Habitat objectives and monitoring on the refuge would be the primary guide for determining allowable big game population levels. As one tool to increase and sustain big game populations at higher levels, harvest rates would be reduced from current levels for some species. To achieve population composition ratios similar to a lightly hunted population, harvest intensity of males would be reduced from current levels, affording the opportunity for ecological processes to occur in a more natural fashion compared to the current heavy emphasis on harvest of the largest antlered males, especially for mule deer and elk. As indicated by habitat monitoring, population levels would be largely controlled through harvest of antlerless animals.

Alternative B objectives for bighorn sheep are consistent with current management. Ram harvest is comparatively conservative and ewe harvest or removal has been limited, as there remains suitable but unoccupied habitat where populations may expand. All elk hunting is currently by permit only and compared to bighorn sheep, harvest intensity is greater for elk. Comparatively, big game harvest pressure is greatest on mule deer as there are no limits on how many people can hunt in all but one small hunting district in McCone County. Portions of the refuge have a shortened season compared to adjacent lands, but there are no limits on mule deer harvest like there is with permits for elk, pronghorn, and bighorn sheep hunting.

Compared to current conditions, the consequences of adjusting harvest rates under this alternative would be minor for bighorn sheep, moderate for elk, and major for mule deer. These changes would generally result in populations and ecosystem processes more closely approximating naturally functioning systems as the current intense pressures to harvest the largest antlered males would be reduced. Although harvest opportunities for male elk and mule deer would be reduced from current levels, many would welcome such management for quality public land hunting. However, some members of the public and MFWP would find such a management approach unacceptable and would consider the limitations an unnecessary restriction on hunting opportunity.

When big game populations are managed for higher densities and near the carrying capacities of habitats, disease risks generally increase. Although chronic wasting disease has not yet been detected in wild cervids in Montana, the potential exists. Should chronic wasting disease present, high cervid populations would likely increase risk, incidence, prevalence and spread of the disease. Continued efforts to monitor for chronic wasting disease would benefit cervids by providing an opportunity for early detection and necessary mitigation (specified in the refuge's chronic wasting disease management plan), should it occur.

Other diseases such as bovine brucellosis, bovine tuberculosis, and paratuberculosis are not currently known to be present, but should they become an issue, management for high native ungulate densities would be counter to management needs to minimize such diseases. Because of the susceptibility of bighorn sheep to nearly complete die-offs from pneumonia and other diseases, there would be little change from current management practices that aim to keep sheep populations below carrying capacity in an effort to reduce risks to disease and maintain stable populations over the long term.

Success in coordinating big game surveys and research projects with MFWP would result in a better understanding of big game population dynamics, effects of harvest and native ungulate ecology in relation to other biotic and abiotic factors at a scale larger than the refuge. An improved understanding of natural ecological processes involving big game at a landscape scale would provide a better basis for management decisions and adaptive adjustments, and would result in major long-term benefits to big game.

There are no changes proposed for mountain lion management under alternative B, but there could be effects on mountain lion populations resulting from how native ungulates are managed. Management for abundant native ungulate populations would likely result in greater mountain lion abundance with more abundant prey compared to management under the other alternatives. In contrast, if the stated objectives for sentinel plants are not met, native ungulate populations may be reduced to low levels for a long time resulting in corresponding effects on mountain lion populations with limited prey availability. A consequence could be increased lion depredation.

In contrast to alternative A, there would be efforts to document mountain lion abundance, distribution, population composition and trends in an attempt to better understand their ecology and function in a larger landscape.

Overall, successful implementation of wildlife management objectives in alternative B would result in moderate benefits to big game species.

Habitat Management. The objectives for uplands listed under alternative B call for writing plans and developing monitoring approaches and would have no immediate effects on big game. Success in fencing boundaries and reducing “common” pastures would facilitate management actions that could promote habitat quality in support of big game populations. Compared to the other alternatives, the objectives for uplands under alternative B move most quickly to prescriptive grazing and that should reduce conflicts between livestock and native ungulates and be a benefit to big game. However, if the stated objectives for sentinel plants are not met, big game populations may be reduced to low levels for a long time resulting in moderate short-term effects on big game. Monitoring results would provide a feedback loop for evaluation of management actions and adopting adaptive management changes for the next iteration of attempts to improve habitat conditions and maintain abundant big game populations.

The objectives for planting food plots attractive to big game in previously cultivated river bottoms would likely benefit big game populations and could reduce conflicts with adjacent landowners by luring animals away from private land. With reduced land-

owner conflict, managing for greater big game populations levels may be possible.

Efforts to improve the health and function of riparian and wetland areas would benefit big game populations by providing additional high quality habitat, forage and flowing streams. Removal of reservoirs and restoration of natural hydrological systems would likely have multiple and complex effects on big game and would be variable, depending on the proportion of a watershed involved. Big game species did not evolve with the numerous constructed impoundments present today and their removal would move systems toward more naturally functioning processes. Both native ungulate and livestock distribution and use patterns would change with reservoir removal and it would take time for riparian systems to respond to changes in water flow patterns. With changes in ungulate foraging patterns over time (for example, more intensive grazing near remaining water sources and reduced grazing where reservoirs had been removed), vegetative communities would shift over time. In the long term, the result would probably be favorable for big game populations, but the extent and magnitude are hard to predict.

Overall, habitat management objectives in alternative B would result in minor to moderate benefits to big game.

Fire. Several objectives for prescribed fire in alternative B set priorities for areas to burn, areas not to burn, and development of plans. Until such plans are implemented, the effects of fire on big game populations would be the continued selection of resources and use of habitat by animals in response to ongoing vegetation succession. Those selection patterns would be the result and expression of a multitude of complex and changing influences that include human disturbance, previous fires, and livestock management practices on and adjacent to the refuge.

Alternative B includes an objective to develop a patch-burning system to treat at least 2,500 acres annually, which would be up to 40,000 acres over 15 years. It would be difficult to demonstrate the effects of such a system on big game populations, because there are numerous other variables involved. Several burns that were spatially distributed annually would be relatively insignificant, given the movements and home range sizes of most big game species. There could be some local effects—positive, neutral, or negative—on individuals, depending on the location and local situation. Considering that the density of mule deer on the refuge averaged about 6 per square mile from 2000–5, if the refuge reached the stated burn targets each year, annually those fires would affect at most 8 square miles on the refuge, and overall the effect on the refuge’s mule deer population would be negligible.

Given the different life histories and ecology of the various big game species, burning would have both positive and negative effects depending on the species involved and specifics of the situation, locale, and site history. For example, applying prescribed fire to sagebrush and juniper could reduce habitat quality for wintering pronghorn and mule deer but could increase forage production for elk and bighorn sheep, depending on local conditions and surrounding land use and management practices. The fire objectives for hazard fuel reduction would have no effect on big game populations; the areas targeted for treatment are small and have an insignificant influence on big game populations compared to factors such as weather, harvest intensity, and tolerance for depredation of crops or grasslands on neighboring ranchlands.



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Pronghorn

Wolf and Bison Management. Under alternative B, wolf colonization would represent a step forward in ecosystem restoration and stewardship (Licht et al. 2010). Among the alternatives, wolves would likely have the most effect on big game, especially elk, mule deer and white-tailed deer under alternative B. Depending on established population level objectives, wolf predation would likely replace a portion of big game mortality now attributed to hunter harvest.

Should efforts to reintroduce bison materialize, adjustments in management and population objectives for other big game species may, or may not, be necessary. A detailed evaluation of how bison restoration may affect other resources is beyond the scope of this planning effort, but would be completed during a MFWP planning effort and framework development for the refuge.

Alternative C

In contrast to alternative B, management of big game populations would be geared toward maximizing sustainable harvest levels. As a result, populations would have younger age structures and sex ratios skewed toward females compared to management under alternatives B or D. A high priority would be given to adjacent landowner concerns about big game abundance, game damage outside the refuge and would likely result in management for big game densities below ecological carrying capacity. Adjustments of livestock grazing may be considered if the result could be greater opportunity for increasing the number of big game animals that could be harvested annually. As with all the alternatives, habitat monitoring would help guide appropriate population target levels. Wildlife management objectives under alternative C would result in moderate to major impacts to big game species and natural ecological processes as management would intentionally skew populations toward younger and female dominated populations to maximize harvests.

The effects of management under alternative C on mountain lion populations would likely be minimal as prey base management would not be much different from management under alternative A. Evaluation of establishing a hunting season for mountain lions is called for under this alternative. A prerequisite for creating a new hunting season would be collection of sufficient data to understand mountain lion abundance, distribution, population composition and trends that also provided a basis for responsible harvest management that assured the long-term sustainability of mountain lion populations. That monitoring data would provide a better understanding of mountain lion ecology than with no monitoring under alternative A. Should a mountain lion season become established, mountain lions would likely be managed for lower population levels than under any of the other alternatives in an attempt to minimize any livestock depredation issues.

Habitat Management. Similar to alternative B, the upland and river bottom objectives of writing plans and developing monitoring strategies would have no immediate effects on big game. The speed at which boundary fence is constructed to facilitate management treatments and transitioning to prescriptive grazing is slowest under alternative C, hence any positive results for big game populations would also be expected to be delayed. It is doubtful any meaningful relationships could be established between big game population responses to achievement of the specified upland forb and shrub objectives. Restoration of native vegetation to river bottoms would be beneficial to big game.

Riparian area and wetland management objectives under alternative C, which generally seek to restore degraded riparian areas and systems, would be generally favorable to big game populations. However, with the emphasis of managing riparian resources toward maximizing livestock grazing and meeting NRCS range conditions, more uniform distribution of grazing would be expected. With changes in water distribution and availability, livestock and big game distribution and foraging patterns would also be expected to interact and to change. With such changes (for example, more uniform forage utilization), vegetative communities would likely shift, but the extent and magnitude are hard to predict without specifics.

Development of additional water impoundments would hinder restoration of riparian areas and expand the distribution of livestock, resulting in negative effects on big game populations, depending on livestock stocking rates. The maintenance or creation of new reservoirs by itself would likely result in a negligible effect on big game populations in the absence of livestock grazing.

Habitat management objectives in alternative C would have negligible overall effects on big game populations.

Fire. With the prescribed fire objectives in alternative C being much less aggressive and taking place over a longer timeframe than fire objectives in alternative B, there would be minimal effects on big game populations for the same reasons discussed under alternative B above.

Wolf and Bison Management. The effects of wolf colonization and management under MFWP's wolf management plan on big game populations would be similar under alternative C. Wolves would be managed to minimize conflicts with livestock and for recreational viewing.

The concept of bison restoration in Montana is in its infancy, and MFWP has only recently begun preliminary scoping discussions and has not initiated a planning process. For these reasons, it is difficult to predict how bison restoration, if pursued, would affect big game populations on the refuge under a MFWP management plan as called for under alternative C.

Alternative D

Many of the environmental consequences of big game management under alternative D would be similar to those described under alternative C, but to a lesser degree. It would seek a more balanced approach that still achieves natural ecological function, natural density, and sex/age composition makeup of big game populations. This approach provides for reasonable recreation and harvest opportunities and fulfills the quality wildlife-dependent recreational use emphasis directives of the Improvement Act.

The main big game objective under alternative D calls for cooperatively developing population and habitat monitoring strategies with MFWP and establishing desired population and abundance levels. Successful accomplishment of the big game objectives under alternative D could result in big game populations meeting the Service's goal of increasing biological diversity and integrity, but numbers of ungulates would likely need to be reduced in some areas. Ideally, distribution and density targets would be tailored to ecological units and their ability to support native ungulates.

Additionally, alternative D would provide quality wildlife-dependent public uses and experiences. Management under alternative D would provide more recreational opportunity than under alternatives A and B, but less than alternative C.

The effects of limited mountain lion hunting would be similar to alternative C. If wildlife and sentinel plant monitoring indicates stable and robust populations, a limited mountain lion hunt would have negligible effects on the population.

Habitat Management. The upland, river bottom, and riparian area and wetland objectives for alternative D would strive to manage toward functional vegetative communities with the full compliment of native plant species and processes. Once achieved, such habitat conditions could be expected to support abundant big game populations, perhaps not unlike those described by early explorers, and a complex system of co-evolved flora and fauna. Such habitat conditions would result in moderate to major long-term benefits for big game populations, but could result in moderate short-term impacts for several years with reduced livestock and big game populations to reduce total ungulate herbivory until stated objectives for sentinel plants are achieved.

Fire. Although Frost (2008) used fire scar chronologies, vegetation, soil, and topography among other methods to reconstruct the approximate fire frequency on the refuge, the response of plants and ungulates in the diverse habitat types of the refuge is not fully understood; furthermore, there are multiple and competing perspectives on what the historical fire regimes were. Only well-executed monitoring of plant and animal responses to fires would lead to an assessment and better understanding of the effects of management actions such as patch burns and restoration of pyric-herbivory systems, which could alter forage selectivity and abandonment by animals or change the ecological resilience. The effects of fire management objectives on big game and other wildlife would vary by location, timing, fire behavior, and other factors and result in a negligible, short-term impact in some areas and potential minor to moderate long-term benefits.

The objectives for prescribed fire and wildfire in alternative D are similar to alternative B, although there would be a greater emphasis on patch burning in alternative D. As discussed under alternative B above, there would be few if any effects on big game populations directly attributable to fire.

Wolf and Bison Management. The objectives for wolf management and bison restoration potential under alternative D is the same as alternative B (develop a plan), hence the effects on big game populations would be the same as described under alternative B.

Conclusion

Under all alternatives, hunting and harvest levels would be the greatest factor affecting big game populations. Alternative A would continue current management with minor benefits. Alternative B would result in populations and ecosystem processes more closely approximating natural functioning systems, with moderate overall benefits for big game. Alternative C would result in moderate to major impacts to big game populations as natural ecological processes are intentionally skewed to maximize harvests. Alternative D would result in moderate to major benefits to big game, using a balanced approach to management.

With few changes in habitat management under alternative A, there would be negligible effects on existing big game populations that have always been variable and dependent on local conditions. Over the long term, habitat management objectives would result in minor to moderate benefits to big game under alternative B because of reducing livestock conflicts. Alternative C would have negligible effects. Similar to alternative B, alternative D would result in minor to moderate benefits to big game populations with a greater emphasis on prescriptive grazing. However, alternatives B and D could also result in moderate impacts if big game populations are reduced to achieve sentinel plant objectives.

Drafting of a wolf management plan or evaluating the potential would have negligible effects on big game populations. Should wolves colonize the refuge or bison be reintroduced, in the long term, there could be impacts on big game, and adjustment in management and populations could be necessary. Effects on mountain lion populations would vary by alternative, depending on big game and prey population levels and hunting opportunities—the overall effects would be negligible.

Overall in the long-term, alternative A would have minor benefits on big game populations, while alternative B would have minor to moderate benefits, and alternative D would have moderate benefits (health), although numbers could be reduced to improve diversity across the refuge. Alternative C would result in moderate impacts to big game populations.

Mitigation

Generally, mitigation would not be required under this alternative. However, under alternative B, because big game populations would be managed for higher densities, the potential for diseases being introduced into the herds increase. If this occurred, depending on the disease and its prevalence, mitigation measures could be necessary.

EFFECTS on FURBEARERS and SMALL PREDATORS

Furbearers include swift fox (discussed under species of concern), coyotes, beaver, muskrat river otter and mink, raccoons, badgers, and other small mammals.

Alternative A

There would be no changes from the current status or management practices for furbearer species under this alternative. Effects would be negligible. All furbearing species, excluding coyote, would remain protected from hunting or trapping. Protection from harvest should result in maximum abundance, if not already obtained.

Overall, current management practices would continue to benefit furbearing species by maintaining current upland habitat levels, restoring riparian habitat, continuing an active fire management program, and moving towards a prescriptive livestock-grazing program on some portions of the refuge. Riparian area restoration and protection would result in moderate to major benefits for all furbearer species; especially the beaver and muskrat (refer to riparian habitat above). Additional benefits would be expected for furbearer species that are currently below acceptable population levels (for example, river otter, beaver, and swift fox) by continuing to protect from harvest and by promoting range expansion. However, furbearer species currently at viable, self-sustaining levels (for example, badger and coyote) may remain relatively unaffected under this alternative.

It is unknown how predatory furbearer species would be affected by changes in grazing or changes in prescribed fire frequency. Certain prey species may benefit from these management objectives, but how they affect the predators is unknown.

Alternative B

In addition to alternative A, additional benefits would result from active reintroduction of species not currently found on the refuge or are considered rare (for example, swift fox and river otter). These benefits would be major and long-term for the affected species.

Alternative C

This alternative could promote sustainable harvest of furbearing species, which have been identified as

self-sustaining, through hunting or trapping for the sole purpose of maximizing public use opportunities. Harvesting of furbearer species currently protected would vary between minor and major, negative effects on the furbearer populations. Current regulations do not allow any take of furbearer species, except coyote, and thus are currently below or at maximum abundance. Any allowable harvest would lower current abundance and maintain the populations at minimum, self-sustaining numbers. A comprehensive monitoring program would be in affect to detect moderate impacts to any furbearing species to maintain a minimum, self-sustaining population.

It is unknown how predatory furbearer species would be affected by changes in grazing or changes in prescribed fire frequency. Certain prey species could be affected from these management objectives, but how they affect the predators is unknown.

Alternative D

Under this alternative, harvesting of furbearing species would be possible if populations were considered above acceptable levels (based on native habitat and food resources) or able to maintain a self-sustaining population with regulated harvest. This should result in a negligible effect on the selected furbearing species. A comprehensive monitoring program would be in affect to detect minor impacts to any furbearing species to maintain maximum abundance. Current management practices on the refuge allow only the coyote to be harvested and the other species remain protected.

Conclusion

Under alternative A, few changes would occur in the management of furbearers, and effects would be negligible. Additional benefits for furbearers would occur with the implementation of alternatives B and D, such as the active reintroduction of species not currently found on the refuge or are considered rare (for example, swift fox and river otter). These benefits would be major and long-term for the affected species. Alternative C could promote sustainable harvest of furbearing species that are currently protected, resulting in minor to major, negative effects to the furbearer populations. Harvest of furbearing species under alternative D would be based on acceptable population levels, resulting in negligible effects.

Mitigation

No mitigation would be necessary.

EFFECTS on BISON RESTORATION

Any proposal to move forward with a bison restoration endeavor would be conducted through another public process led by MFWP in which all of the associated issues regarding such a proposal will be

thoroughly vetted. Hence, it is beyond the scope of analysis here to exhaustively address or evaluate all of the issues associated with a bison restoration proposal. The important aspect for the purposes of this CCP is to evaluate the environmental consequences pertinent to the refuge, realizing any restoration effort would be part of a separate and larger planning effort involving multiple partners.

Alternative A

Bison restoration was not addressed in the 1986 EIS. Given there are no objectives or strategies for bison restoration and management under this alternative, it is difficult to anticipate what environmental consequences may ensue. Should bison remain absent, progress in restoring ecological processes would remain incomplete. Should bison restoration materialize, ecological systems would move closer to full restoration and their presence would likely result in a host of subsequent effects that are difficult to predict. The range of environmental consequences with, and without bison presence, is more fully explored in the action alternatives.

Alternatives B and D

By itself, development of a collaborative bison restoration and management plan would not have any environmental consequences, but the contents and direction of that management plan would set the stage for subsequent environmental and social effects should a restoration effort be launched that involved the refuge.

Alternatives B emphasize the abundance of targeted species while alternative D emphasizes the diversity of all wildlife species. Bison restoration would bring back what was once a dominant herbivore and keystone species in the refuge landscape. Such a project would be consistent with the wildlife population emphasis of this alternative, a positive move toward restoration of natural ecological processes and would present the opportunity for enhanced wildlife-dependent public uses.

It is anticipated there would be changes in bovid herbivory patterns, and subsequent changes in plant and community responses, with bison allowed to range over relatively large areas compared to current domestic cattle management practices. It is hard to predict what those changes would be as they would be influenced by many as of yet undetermined factors (for example, bison population targets, size and location of areas managed for bison, fire frequency and distribution, topography, and previous land use and management practices). Even if those effects are currently unpredictable, it is reasonable to assume the interaction of bison with the other biotic and abiotic factors that affect natural ecological processes would be improved by the presence of

the dominant herbivore with which these systems evolved.

Alternative C

The environmental consequences on the refuge from a MFWP bison restoration effort would be determined by MFWP management guidelines. As there is currently no proposal being advanced, and those management guidelines have not been drafted, it is difficult to anticipate what the environmental consequences may be, as they would depend on many factors yet to be determined.

Given the public and economic use emphasis of this alternative, there would be an emphasis on promoting compatible public uses of bison (such as viewing and hunting) and minimizing influences of bison on other economic uses of the refuge (such as livestock grazing).

Although the presence of bison would move management toward more naturally functioning ecological processes compared to the absence of bison, such influences would be minimal and management efforts would focus on promoting public and economic uses with less emphasis on promoting restoration of natural ecological processes.

Conclusion

It would be unlikely that bison would be restored under alternative A. Under alternatives B, C, and D, the development of a collaborative bison restoration and management plan would not have any environmental consequences, but the contents and direction of that management plan would set the stage for subsequent environmental and social effects should a restoration effort be launched. Bison restoration would bring back what was once a dominant herbivore and keystone species in the refuge landscape. Such a project would be consistent with the wildlife population emphasis of alternative B and a positive move toward restoration of natural ecological processes under alternative D. It would present the opportunity for enhanced wildlife-dependent public uses.

Mitigation

Mitigation would not be necessary.

EFFECTS on BIRDS

This section addresses the effects on grassland birds, waterfowl, colonial-nesting birds, shorebirds, raptors, owls, and Neotropical migrants stemming from the actions in the CCP and EIS. This includes a discussion of riparian areas, invasive species, fire, grazing, public use and access, special management areas, and monitoring. Sharp-tailed grouse and sage-grouse are also addressed under wildlife resources and threatened and endangered species and species of concern.



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The long-billed curlew nests in wet and dry uplands.

Riparian Areas

Riparian areas are extremely important for birds because they not only provide cover and food but also serve as a seasonal water source particularly during migration and the brood-rearing stages. High plant species diversity, insect abundance and berries make both riparian and hardwood draw areas extremely attractive to grassland and migratory Neotropical birds. Grazing by domestic livestock or heavy browsing by elk directly impacts birds using riparian and hardwood draw areas by (1) reduction and elimination of vegetation layers (2) reduction and elimination of new replacement shrubs and trees in riparian and hardwood draw areas; and (3) reduction and elimination of seed and fruit production as well as the insects that depend on the green parts of highly palatable plants.

Although the refuge has fenced livestock out of many riparian areas, it has not been possible to fence livestock out of all areas, and in localized areas under all alternatives, there would be a continued loss of shrub layers and overstory recruitment, which is important for birds. The specific effects of the alternatives would correspond with the effects of grazing on riparian habitat: minor to moderate incremental benefits for alternative A, moderate long-term benefits for alternative B, variable for alternative C, and moderate to major long-term benefits for alternative D. In all alternatives, riparian habitats in some localized areas would continue to degrade due to grazing impacts.

Invasive Species

Birds require habitat containing a variety of plant species, variation in horizontal canopy cover, and

complexity in vertical structure. In contrast, invasive exotic infestations are often comprised of one species, mostly uniform in height and structure, and form a canopy coverage that is too dense (American Bird Conservancy 2009). As compared to alternative A, alternatives, B, C, and D would result in minor benefits due to increased efforts and partnerships to control invasive species and benefit bird habitat. The use of herbicides and pesticides to control invasive species could have some negative effects on bird populations, but judicious application would limit those effects (Partners in Flight 2000).

Fire

As with grazing, historically wildfire played a significant role in shaping the grassland ecosystem. Suppression of wildfires along with the changes in native ungulate and prairie dog grazing has changed this delicate balance to the detriment of most birds of the Great Plains (Vickery 2008). As described under uplands in chapter 4, constant fire suppression would likely result in negative long-term effects for many grassland birds that use the refuge.

Under alternatives B and D, the use of a patch-burn and prescriptive grazing scheme would benefit the greatest number of grassland birds by providing a mosaic of diverse habitats. The result would be an increase in diversity in both food and structure (Fuhlen-dorf et al. 2006) as compared to alternative A, which would benefit fewer species than alternatives B and D due to constant fire suppression. Managing for different levels of fire severity would also influence bird abundance and species. There would be fewer benefits for birds under alternative C, because there would be an emphasis on fire suppression to limit economic losses and would be a slower transition to prescriptive grazing.



USFWS

A sharp-tailed grouse presents his courtship display.

The season of burn is often an important variable for bird mortality during prescribed fires. Burns during nesting season appears to be most detrimental to birds and other small mammals, but this depends

on the uniformity and severity of a burn. In forested areas, fire effects depend largely on fire severity (Lyon et al. 2000). Mortality of adult songbirds is usually considered a minor effect, but mortality of nestlings and fledglings does occur. Nest destruction and mortality of young have been reported for several ground-nesting species including sharp-tailed grouse, but long-term effects depend partly on their tendency to re-nest. In using prescribed fire on the refuge, careful consideration in the timing of fires and the type of habitat would minimize negative effects to bird species.

Grazing

Annual and prescriptive grazing by domestic livestock would occur under all alternatives and could result in short-term and long-term effects for grassland and other Great Plains birds, depending on timing and location (refer to chapter 3, Upland Objectives). Although understanding these effects is extremely complex, there are a number of direct and indirect negative effects associated with grazing (Bock 1993, Shackford 1996). Livestock grazing can result in the trampling of ground nesting bird nests, the removal of necessary cover for birds that require dense mid- to tall grass heights for nesting and winter habitat, and it contributes to a uniform landscape that supports fewer species of birds. Grazing can impact seed and fruit production as well as insect production which are important food sources for migratory and resident prairie birds. Interior fencing used in conjunction with livestock grazing contributes to edge effects, negatively affecting some birds. Annual grazing often exacerbates impacts on birds by eliminating much of the nesting cover available in an area in one grazing season.

The use of prescriptive grazing could benefit grassland birds over the long term provided it be done in concert with an objective of improving habitat for grassland birds. Domestic livestock can be used to mimic native grazers (ungulates and prairie dogs) to provide the variety of habitats and foods needed for all native grassland bird species. A primary advantage of prescriptive grazing is that when combined with fire, a mosaic of habitats would be created (different heights of grasses and more shrubs and forbs) benefitting more bird species.

Areas that remain under an annual grazing regime would likely negatively affect some bird species to a greater degree in the long term. There would continue to be more uniformity of the grasslands and less diversity in structure and plants. Prescriptive grazing targets in alternatives B and D would achieve the desired mosaic effects quicker than under alternative A, benefitting a diversity of bird species. Heavy grazing by elk in some areas could offset positive benefits for birds under alter-

native B. Prescriptive grazing targets in alternative C would result in minor benefits to grassland birds.

Public Use and Access

Individual bird species react differently to the presence of people. Recreational activities such as hunting, fishing, boating, hiking, bird watching, photography, and the use of and creation of roads and camping sites could directly and indirectly impact birds. Some bird species such as the nonnative house sparrow or the native brown-headed cowbird have increased in numbers due to human influences, whereas others such as the piping plover have drastically declined due to their specific needs for undisturbed shoreline habitat. Reactions vary according to breeding status, species size, group size, location within a habitat or current activity (foraging for food, roosting, and nesting) (Hamann et al. 1999).

Under all alternatives, the Service would continue to provide for a variety of wildlife-dependent recreation opportunities. Much of the refuge's visitation occurs in the fall during hunting season, which is past the breeding season for birds. The refuge is open for hunting of upland birds, waterfowl and migratory game birds, and subsequently, some individuals would be negatively affected, but monitoring has shown sage-grouse and sharp-tailed populations to be stable. There would likely be some modest increases in upland birds hunters under alternatives B, C, and D, but overall any incremental impacts on these species would be negligible over the long term.

The Service would improve visitor programs and facilities in alternatives B, C, and D largely through the development of more opportunities for wildlife viewing and other nonconsumptive uses. Although more facilities and programs could lead to increased disturbances for birds, facilities such as viewing blinds can direct and concentrate visitor use and lessen impacts and serve management goals. With careful planning and placement, a blind can prevent birdwatchers from wandering into sensitive habitats while at the same time providing an opportunity to experience birds in an ideal setting (Colorado Division of Wildlife 2007). Refugewide, the minor to moderate increases in visitors and facilities (refer to section 5.6, effects on visitor services) would have negligible effects on birds. There would be additional temporary disturbances such as increased noise, dust, and activity during the construction of new trails, viewing blinds, or the science and or interpretive center at Sand Creek Field Station. Scheduling construction activities to occur outside of the breeding seasons or migrations would minimize negative effects.

Studies have shown that recreational roads and trails interrupt the continuity of grasslands and forests, often creating an edge effect, which influences breeding communities. Not only can trails affect the

abundance and distribution of bird species, nest predation is often greater near them (Miller et al. 1998). Graveling an additional 16 miles of road under alternative C (Routes 209 and 838) and 5 miles under alternative D (Route 209) would likely increase traffic along those roads resulting in localized incremental disturbances to birds along those corridors. Closing 106 miles of road in alternative B and 23 miles in alternative D would create larger blocks of relatively undisturbed land, which would benefit birds.

Very little information is known about numbers of boaters on Fort Peck or the Missouri River and or the effect they have on waterfowl or other birds on the refuge. Under any of the alternatives, there would be only incremental increases in boating over 15 years. Similarly, significant numbers of anglers line the shores of Missouri River often during the spring breeding season. Much of this occurs during the paddlefish season in select areas from Rock Creek Boat Ramp west to the Fred Robinson Bridge, attracting large crowds and campers when fish numbers and weather conditions are favorable. In recent years, MFWP has limited the number of paddlefish fishing permits. Although fishing would not change substantially under alternatives B, C, and D, birds would continue to be negatively affected to some degree from these disturbances during the spring (refer to chapter 4 and to fishing in section 5.7 below).

Special Management Areas

Protected areas on the refuge such as the research natural areas and wilderness generally benefit birds by allowing more natural processes to take place with fewer disturbances and edge effects. Alternative B would result in the greatest benefits from wilderness protections, followed by alternatives A, D, and C in descending order. The loss of wilderness protection in alternatives C and D would increase disturbance in those areas as there would likely be fewer restrictions on livestock permittees in managing livestock (refer to wilderness in section 5.8 below and to appendix E).

Monitoring

Although more than 250 species of birds have been documented on the refuge, there is little data available on most of the species recorded. Under all alternatives, short-term surveys and long-term monitoring of all grassland birds would indirectly benefit birds as establishing the taxonomy is the foundational first step in species conservation. Bird monitoring, if done correctly, can quantify the status of bird populations, measure trends or changes in status, reveal effects of natural or human-induced changes, and aid in the development and evaluation of management decisions. The monitoring program for bird populations would vary by alternative and would be tied to the habitat objectives described in chapter 3.

Survey and monitoring efforts would be limited under alternative A largely because of the lack of staff and resources and other management priorities. It would continue to limit the ability of the Service to understand trends in bird numbers or species while factors such as climate change are changing bird population dynamics. Without this information, the Service could negatively affect birds inadvertently over the long term through its management actions. Under alternatives B, C, and D, a baseline inventory would be completed within about 6 years, and a comprehensive monitoring program would be established as part of the overall habitat management program. Alternative D would have the most aggressive schedule for implementing a monitoring program to tie bird monitoring into the objectives for sentinel plant monitoring. Alternative C would have a less aggressive schedule and B would be the intermediate alternative.

Conclusion

The Service would increase its monitoring efforts under alternatives B, C, and D, which would be tied to habitat objectives, benefiting birds over the long term. Annual and prescriptive grazing by domestic livestock would be used in all alternatives and could result in short-term and long-term negative effects. Alternative A would result in minor to moderate long-term impacts, while alternatives B and D would result in minor to moderate long-term benefits from prescriptive grazing, and alternative C would have minor benefits. Effects on riparian habitat would be minor to moderate incremental benefits for alternative A, moderate long-term benefits for alternative B, variable for alternative C, and moderate to major long-term benefits for alternative D. Areas with annual grazing (under any alternative) would likely continue to negatively affect birds in localized areas, resulting in moderate to major impacts in localized areas.

Under alternative A, constant fire suppression would have negative long-term effects for many grassland birds largely due to the lack of diversity in species. Alternatives B and D would implement a patch-burning and prescriptive grazing regime that would benefit the greatest number of birds, although the timing of fires in conjunction with breeding seasons would need to be considered. Alternative C would be similar to alternative A. Birds would also benefit from increased invasive species management under alternatives B, C, and D. The loss of wilderness protection in alternatives C and D would increase disturbance in those areas, as there would likely be fewer restrictions on livestock permittees in managing livestock.

Wildlife-dependent recreation activities could negatively affect birds in localized areas under all alternatives, but overall incremental impacts would be minimal with careful planning.

Overall, alternative A would result in negligible effects (as habitat impacts would offset benefits), while alternatives B and D would have moderate to major long-term benefits. Alternative C would have minor long-term benefits. In all alternatives, areas with annual grazing would continue to have moderate to major localized impacts.

Mitigation

The application and timing of prescribed fire would need to be considered in reducing mortality particularly during breeding seasons.

Careful planning in locating and building visitor facilities would minimize disturbances particularly during critical breeding periods. In addition, undertaking a study to fully assess the effects of boating and fishing along the Missouri River would enable the Service to identify ways to work with partners and reduce disturbances to birds.

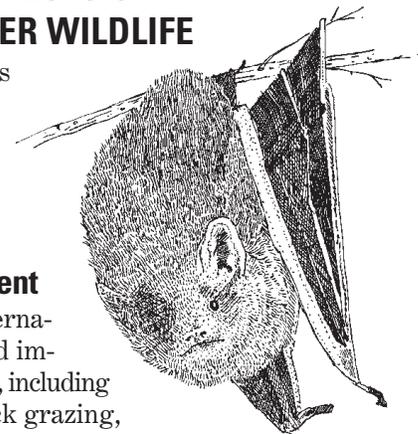
EFFECTS ON OTHER WILDLIFE

Other wildlife includes amphibians, reptiles, fish, and small mammals such as bats and other small rodents.

Habitat Management

Efforts under all alternatives to maintain and improve upland habitats, including prescriptive livestock grazing, prescribed fire, and invasive species management will generally benefit species that depend on those habitats for portions of their life cycle. While prescribed fire, prescriptive livestock grazing, or other management techniques may result in short-term impacts to individual animals or localized areas (due to trampling or the elimination of vegetative cover), the long-term benefits of these measures to amphibian and reptile populations would outweigh the impacts. Overall, these benefits would be moderate to major under alternative D, followed by alternatives B (moderate) and C (minor). Alternative A would result in minor incremental impacts to upland habitats and their value for amphibians and reptiles.

In a similar fashion, efforts to protect and restore riparian habitat areas (including enclosure fence construction and other livestock management efforts) would greatly benefit amphibian, reptile, and fish species, most of which depend on riparian habitats for survival (Pilliod and Wind 2008). Under alternative A, these benefits would be minor though some localized areas would continue to decline, resulting in



Red Bat
© Cindie Brunner

moderate long-term impacts to riparian-dependent species. Benefits to these species and their habitat would be moderate under alternatives B and D, and would vary under alternative C depending on the management emphasis in certain locations.

Invasive Species

Pesticides used to control invasive plants cause negative effects to amphibians and reptiles (Maxell and Hokit 1999). Under all alternatives, the invasive species program would be carried out through an approved step-down plan. All personnel who use chemicals would be trained in the proper application of where, when, and how to apply them which would minimize negative effects to amphibians and reptiles.

Water Impoundments

While water impoundments have contributed to the degradation of native riparian habitats, existing impoundments provide open water habitat for many reptiles and amphibians and some fish species that is otherwise scarce on the refuge. Indirect effects of new development of water impoundments may result in the creation or loss of key breeding, foraging and overwintering habitats for amphibians and reptiles (Maxell and Hokit 1999) and fish. Recreational use of water impoundments brings people and pets into direct contact with native wildlife, which can have negative effects. Additionally, predators and game fish use these areas and can have a negative effect on amphibians and reptiles (Maxell and Hokit 1999). Increased use by waterfowl can lead to increased predation on amphibians and reptiles and is associated with decreased water quality, and in some cases, decreased habitat for amphibians and reptiles.

Alternative A would not change management of water impoundments, and therefore would not affect amphibian, reptile, and fish species that depend on them. Efforts under alternative C to evaluate existing impoundments for rehabilitation, removal, or new pond development would likely result in negligible to minor benefits to species that use those areas. The removal of many water impoundments in alternatives B and D would result in moderate short-term localized impacts to some amphibian, reptile, and fish populations. However, this open water habitat need would likely be served over the long term by the restoration of native riparian systems, resulting in moderate long-term benefits to species that use lentic wetlands.

Roads and Access

Indirect effects from roads on riparian areas include impacts to wildlife that use riparian areas. Large numbers of reptiles, amphibians, birds, and small mammals are killed on roads. Some reptiles and amphibians undergo mass migrations to and from breeding habitats and may be killed while crossing roads.

Northern leopard frogs exposed to loud noises (120 decibels) become immobilized, possibly leading to increased mortality while crossing roads. Vehicle noise may prevent amphibians from hearing and moving toward breeding areas leading to negative effects. Contaminated runoff from roads and increased sedimentation from road construction could enter riparian areas, negatively affecting amphibians and fish. The density of roads is negatively associated with the probability that amphibians would occupy a pond (Maxell and Hokit 1999).

Pesticides used to control invasive plants cause negative effects on amphibians and reptiles (Maxell and Hokit 1999).

Alternative A

There would be no changes from the current status or management practices for other wildlife species under this alternative. All small mammal species would be protected from harvesting, resulting in maximum abundance if not already obtained.

Maintaining upland habitat, restoring riparian habitat, continuing an active fire management program, and progressively moving towards a prescriptive livestock-grazing program would benefit small mammals. For small mammal species that are currently below maximum population levels, there could be major positive benefits because of not hunting and by promoting range expansion. However, selection of this alternative would have a negligible effect on remaining populations that are currently at viable, self-sustaining levels.

The use of prescribed fire would have mixed results on small mammal communities. Short-term, negative effects would result from fire due to reduction of residual cover as well as a temporary reduction in forage availability. Species that require larger patches of residual cover would be negatively affected; however, the effect would be short-term as fire-return intervals mimic historical levels. Overall, an increase in prescriptive fire in areas that were historically suppressed would result in a long-term, positive effect for small mammal communities.

This alternative would also result in positive effects to raptors and other predatory species that rely on small mammals for survival.

Alternatives B and D

Specific objectives and strategies targeted towards reptiles, amphibians, and fish would contribute to the long-term benefits for these species. The completion of inventory plans or baseline surveys for high priority areas would benefit these species by improving the ability of the Service to monitor and evaluate the success of habitat objectives.

In addition to the effects of alternative A, management actions in alternatives B and D would continue to have long-term, negligible to minor benefits

to the small mammal community. Active removal of continued, season-long grazing would increase many small mammal species found in upland and riparian habitats. Season-long grazing has shown to decrease small mammal diversity and relative abundance by limiting residual cover and forage availability for granivorous species (Giuliano and Homyack 2004, Chapman and Ribic 2002). Prescriptive grazing techniques could have short-term, moderate impacts on small mammal communities. However, small mammal communities would be expected to recover after short-term grazing prescriptions.

Continued research and monitoring would provide additional data on nongame species with limited distributions or specific habitat requirements (for example, bat rookery or roosting sites). Once identified, adaptive management practices could provide additional protection for high-priority species and habitat requirements.

Alternative C

As in alternatives B and D, alternative C has specific objectives and strategies for amphibians, reptiles, and fish. Alternative C would further emphasize the restoration of native reptile, amphibian, and fish that provide recreational and wildlife-viewing opportunities, which would benefit the populations that are being restored.

Small mammal communities would be negatively affected under this alternative. Continued fire suppression in native prairie habitats would negatively affect small mammal communities by allowing the invasion of exotic species, increasing the encroachment of woody plants, and increasing heavy accumulations of litter (Cid et al. 1991, Larson et al. 2001, Howe 1994, Samson and Knopf 1994). Although some small mammal species that require large amounts of residual cover or greater habitat structure (woody vegetation) would be positively affected (for example, western harvest mouse); the small mammal community composition would be expected to diminish over time by the reduction of native plant species.

Similar to alternative B, prescriptive grazing techniques should have short-term, moderate impacts to small mammal communities. However, small mammal communities would be expected to recover after short-term grazing prescriptions. Under this alternative, a management objective of more grasses and less forbs and shrubs, would negatively affect small mammal communities by eliminating the amount forage available for certain species. Particularly, species that forage on forbs and shrubs would be negatively affected and a reduction in range would be expected.

Overall effects of alternative C would be negligible to minor over the long-term.

Conclusion

Baseline information on amphibian, reptile, and fish diversity and abundance is limited. Effects to amphibians, reptiles, and fish would be based mostly on changes to the habitat on which they depend, including uplands, riparian areas, and water impoundments. Amphibians and reptiles occupy a range of habitat types on the refuge, and serve as key indicators for the environmental health of the ecosystem. Nineteen species of amphibians and reptiles have been identified on the refuge, while numerous fish species have been identified in both large rivers and small streams during various sampling surveys.

There would be no changes from the current status or management practices for small mammal species under alternative A. Alternatives B and D would continue to have long-term, negligible to minor benefits to the small mammal community. While prescriptive grazing techniques could have short-term, moderate impacts, small mammal communities would be expected to recover after short-term grazing prescriptions. Some small mammal communities would be negatively affected under alternative C from continued fire suppression in native prairie habitats by allowing the invasion of exotic species, increasing the encroachment of woody plants, and increasing heavy accumulations of litter.

Efforts under all alternatives to maintain and improve upland habitats, including prescriptive livestock grazing, prescribed fire, and invasive species management would generally benefit species that depend on those habitats for portions of their life cycle. The short-term impacts of habitat management actions would be outweighed by the long-term benefits. Overall, these benefits would be moderate to major under alternative D, followed by alternatives B (moderate) and C (minor). Alternative A would result in minor incremental impacts to upland habitats and their value for amphibians and reptiles.

Alternative A would not change management of water impoundments, and therefore would not affect amphibian, reptile, and fish species that depend on them. Efforts under alternative C to evaluate existing impoundments for rehabilitation, removal, or new pond development would likely result in negligible to minor benefits to species that use those areas. The removal of many water impoundments in alternatives B and D would result in moderate short-term localized impacts to some amphibian, reptile, and fish populations, followed by long-term benefits.

The use of pesticides to control invasive weeds could harm amphibians and reptiles, but the effects could be minimized through proper training in the application of chemicals. Under any alternative some reptiles and amphibians are likely to be negatively affected from the large network of roads on the ref-

uge. Road closures in alternatives B and D could benefit amphibians and reptiles in localized areas.

Mitigation

Whenever possible, the Service would avoid spraying pesticides in sensitive riparian habitats. However, invasive species such as saltcedar are found along the riparian habitat, and the harm by the lack of treatment could have a greater long-term impact on amphibians and reptiles. Developing and implementing a step-down plan for invasive species management, together with the rigorous training of personnel in the use of any chemicals could limit impacts on amphibians, reptiles, and native fish species (refer to chapter 3). The implementation of an inventory and monitoring program on the refuge would be a first step in identifying the most sensitive areas, particularly for species of concern such as the northern leopard frog. Alternatives to spraying could be necessary in these areas.

EFFECTS on THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN

Threatened or endangered species at the refuge are black-footed ferret, piping plover, least tern, and pallid sturgeon. Species of concern are black-tailed prairie dog, swift fox, mountain plover, northern leopard frog, sicklefin chub, sturgeon chub, and greater sage-grouse. The grizzly bear (threatened) and gray wolf (endangered), although not currently found on the refuge, are included in the discussion.

All Alternatives

The Service manages threatened and endangered species as trust species and is responsible for assisting in the recovery of these species that occur within the Refuge System. Hence, everything proposed as objectives in chapter 3 for all of the alternatives would attempt to have beneficial effects for threatened and endangered species or at worst, be neutral. Similar consideration and expected effects apply to species of concern.

Hunting is currently permitted under all of the alternatives for greater sage-grouse on the refuge in accordance with State regulations. The Service determined in March 2010 that greater sage-grouse was “warranted but precluded” for listing under the Endangered Species Act. That determination places it on the candidate list. That status does not offer any protection from take, but does raise the level of concern and public scrutiny, places them in the queue for eventual listing and requires an annual status review.

The refuge is not planning to conduct any specific actions related to pallid sturgeon, sicklefin chubs or sturgeon chubs so no effects on those species are expected to result from the proposed actions under any of the alternatives. Least terns and piping plovers are relatively rare on the refuge. Negligible to minor positive benefits are expected under all of the alternatives while working with USACE on invasive plant control and shoreline habitat management to promote attractiveness and nesting success of these shorebirds.



USFWS

Black-footed ferrets were “rediscovered” in Wyoming in 1981.

Should the grizzly bear or gray wolf recolonize on the refuge, the Service would follow the recovery plans for these species. In addition, the Service would develop management plans in cooperation with MFWP, which would be a proactive approach for dealing with the conflicts that would occur.

Alternative A

Black-footed ferrets were “rediscovered” in Wyoming in 1981, and the 1986 the refuge EIS called for maintaining viable black-tailed prairie dog colonies suitable for ferret reintroduction when animals became available. Ferret reintroductions began in 1994 (refer to chapter 4) and about a dozen animals remained at the UL Bend refuge by the end of 2009. In response to sylvatic plague-caused prairie dog die-offs, the Service and partners have taken measures, including translocation and pulicide (agent to kill fleas) applications, to repopulate colonies and to prevent plague outbreaks in prairie dog populations.

Overall, efforts contributing to the conservation of black-tailed prairie dogs and associated species would continue to benefit these species. Maintaining and expanding prairie dog colonies have contributed to habitat and wildlife diversity, natural processes and ecological health. Continuation of these efforts under alternative A would result in minor, incremental benefits to prairie dogs, black-footed ferrets, and other associated species over the long term.

Gray wolf management was not addressed in the 1986 EIS. Given there are no objectives or strategies for wolf management under this alternative, it is difficult to anticipate what environmental consequences may ensue. Should wolves continue to be absent, progress in restoring ecological processes would remain incomplete. Should wolves become established, ecological systems would move closer to full restoration and their presence would likely result in a host of subsequent effects. Some of these potential effects may include altered big game population dynamics, behaviors and habitat use, changes in habitats, changes in public hunting programs, and livestock depredations. The range of environmental consequences with, and without wolf presence, is more fully explored in the action alternatives.

Alternative A does not include specific management objectives for other threatened and endangered species and species of concern. While the lack of specific management guidance could be detrimental to these other species, any such effects would be negligible due to the Service’s requirement to manage for special status species on the refuge.

Alternative B

Consistent with the theme of alternative B, resources would be directed toward maintaining, and enhancing where appropriate, population levels of all threat-

ened and endangered species and species of concern to the maximum extent possible and practicable. Such actions would all contribute to achieving biological integrity and managing for biological diversity. Working collaboratively with the many involved partners is a theme within the specific objectives for each of the special status species listed in chapter 3. If successful, an environmental consequence of that approach will be improvement of habitats and wildlife populations at a scale larger than the refuge.

Several of the objectives in alternative B include various monitoring efforts to assess population status and trends of special status species. None of those activities is anticipated to have any significant environmental consequences or effects on special status species.

The Service would follow the Northern Rockies Recovery Plan for the gray wolf. By itself, development of a refuge-specific gray wolf management plan would not have any environmental consequences, but the contents and direction of that management plan would set the stage for subsequent effects should wolves recolonize the Missouri River Breaks. An important aspect of developing a refuge-specific wolf management plan is that it is scheduled to be completed before anticipated wolf recolonization and would afford the opportunity for ordered and coordinated development with the public and other agencies before a crisis-management situation should a plan not be in place before wolf population establishment. It is likely there would be a high degree of conflict and controversy for how wolves would be managed during the interim while the plan was developed.

Alternative B emphasizes the abundance of target species. The philosophy of the plan under this alternative would be toward promoting wolf abundance (within ecological constraints) and providing for recreational viewing opportunities. Wolf presence would add one more native wildlife species that would add diversity and move ecological processes toward more naturally functioning systems. Wolves would provide predation pressure on ungulates that would likely influence their population dynamics, behavior, and habitat use. Changes in how native ungulates use the landscape would likely result in effects on vegetation and habitat dynamics. Those changes are expected to be complex interrelationships among many factors and cannot be predicted at this time, other than to expect an ecological system that includes wolves is closer to restoration of natural processes than a system where wolves are absent.

There would likely be livestock depredation issues should wolves recolonize the Missouri River Breaks. Management responses to livestock depredations under this alternative would be most protective of wolves and public hunting of wolves on the refuge would not be permitted. As a result, wolf populations

would likely be greater than under management that uses approaches that are more aggressive and would probably result in greater influences on native ungulates and related population and habitat responses.

Transitioning to prescriptive grazing would occur most rapidly under this alternative and would benefit many species of wildlife. Reductions in livestock grazing could benefit species like sage-grouse and provide optimum residual cover for nesting. Similarly, more intensive grazing could be directed to some areas to promote prairie dog expansion and increase habitat for mountain plovers and other prairie-related species of concern.

Managing fire by protecting or preventing sagebrush areas from burning would be a moderate to major benefit for sage-grouse. Similarly, fire could be used to remove sagebrush in some areas and promote prairie dog expansion that could also result in benefits associated species. In general, all of the management actions that promote native vegetation and healthy, functioning riparian systems will benefit native fauna. Actions aimed at reducing invasive species will also benefit native flora, fauna, and naturally functioning systems.

Overall, alternative B is anticipated to result in moderate to major long-term benefits for threatened and endangered species and species of concern on the refuge.

Alternative C

Most of the threatened and endangered species and species of concern management objectives for alternative C are the same as alternative B. Therefore, the effects are anticipated to be the same as those described under alternative B (moderate to major long-term benefits), with the following exceptions.

Under alternative C, an ecological system with at least some gray wolves present would be closer to restoring natural processes than a system where they were absent, but the ecological effects and resulting changes in aspects of native ungulate ecology and habitat effects would be less than under alternatives B or D.

Efforts to work with USACE to maintain suitable shoreline nesting habitats, if successful, would moderately benefit least tern and piping plover populations over the long term. Likewise, efforts to maintain at least 50 percent of sage-grouse habitat would contribute some habitat to help support sage-grouse population on and surrounding the refuge, but would be less effective than maintaining 100 percent of the habitat as proposed under alternative B.

The emphasis under alternative C to provide more opportunities for public viewing would likely result in more disturbance impacts on wildlife from people. As those opportunities are developed, care will be taken to minimize such disturbance. Over the

long term, the extent of those effects would likely be negligible to minor.

Transitioning to prescriptive grazing would occur most slowly under this alternative and fewer benefits for species like sage-grouse would be expected. Similarly, management actions designed to improve habitat conditions are least aggressive and occur over longer timeframes so effects on threatened and endangered species and species of special concern would be least pronounced under this alternative. Fires would be aggressively suppressed under this alternative and that approach would probably benefit sage-grouse in most situations. However, opportunities to use the appropriate management response to benefit threatened and endangered species and species of concern and other wildlife may be missed.

Alternative D

The threatened and endangered species and species of concern management objectives, as well as their benefits, would be the same as alternative B. Maintenance, restoration and enhancement of special status species is essential to restoration of natural ecological processes, the theme of this alternative.

Alternative D would have added emphasis on research to document and better understand how wolves influence natural ecological processes.

Habitat management actions such as patch burning in sagebrush habitats could help promote prairie dog expansion that would in turn benefit species associated with prairie dog colonies. In contrast, fires in sagebrush habitats, either prescribed or wildfire, could have major negative effects on sage-grouse. In general, all of the management actions that promote native vegetation and healthy, functioning riparian systems will benefit native fauna. Actions aimed at reducing invasive species will also benefit native flora, fauna, and naturally functioning systems.

Conclusion

Alternative A does not include specific management objectives for other threatened and endangered species and species of concern. While the lack of specific management guidance could be detrimental to these other species, any such effects would be negligible. Under alternatives B, C, and D, resources would be directed toward maintaining, and enhancing where appropriate, population levels of all threatened and endangered species and species of concern to the maximum extent possible and practicable, resulting in moderate to major benefits over the long term.

With no objectives and strategies established for gray wolf management under alternative A, it would be difficult to predict any consequences should they colonize the refuge. Under alternatives B, C, and D, the development of a refuge-specific wolf management plan would not have any environmental con-

sequences, but the contents and direction of that management plan would set the stage for subsequent effects should wolves recolonize the Missouri River Breaks. Completion of a management plan under alternatives B and D would likely be more effective, because it would be completed before wolf population establishment. The completion of a plan in alternative C after wolves were established would be more contentious and potentially less effective.

Mitigation

Mitigation of livestock impacts would need to be addressed in any wolf management plan.

CUMULATIVE IMPACTS on BIOLOGICAL RESOURCES

None of the proposed alternatives would result in cumulative effects on shoreline habitat, wolf management, furbearers, small mammals, fish, reptiles, and amphibians.

While direct and indirect effects of the Enhancement Act of 2000 (conveyance of cabin sites) are outside the scope of this analysis, cumulative effects are discussed. Implementation of the Enhancement Act of 2000 would potentially result in the addition of between 10,000 and 40,000 acres of upland and riparian habitat to the refuge. Under any refuge management alternative, the addition of these lands to the refuge, which would include large tracts of unbroken native prairie sagebrush steppe habitat, and riparian areas, would result in minor cumulative benefits to upland and riparian habitat, and the wildlife species that depend on those areas, by removing inholdings, reducing existing habitat fragmentation, and improving potential management (FWS 2005).

Implementation of the Fort Peck Dam/Fort Peck Lake Master Plan may result in cumulative benefits on several biological resources on the refuge. Efforts to improve and maintain tern and plover habitat on the lakeshore, would result in minor cumulative benefits to those species when combined with the benefits of the refuge management objectives that are common to all alternatives. Reestablishing cottonwood bottomland in the Nelson Dredge area, may result in cumulative benefits to river bottom restoration efforts throughout the Fort Peck and refuge region by providing another opportunity to learn from successful or unsuccessful practices. The overall cumulative benefit to bottomlands on the refuge would be negligible to minor.

MFWP has developed management plans for various big game species that include population objectives for the refuge. Most of the refuge management objectives for big game are consistent with MFWP's objectives, with the exception of mule deer management and herd composition targets in alternatives B

and D. While this difference in management plan objectives/philosophy exists, it would be speculative to suggest that such a conflict in management plans would result in cumulative effects on mule deer or any other big game species. Under all alternatives, the Service would continue to work with MFWP to manage big game populations on the refuge.

The American Prairie Foundation has created an 87,000-acre reserve on public and private lands adjacent to the refuge. The Nature Conservancy manages the 63,000-acre Matador Ranch near the northwest edge of the refuge. The continued management of American Prairie Foundation and The Nature Conservancy lands for conservation purposes would provide general cumulative benefits to big game species, grassland birds, and listed species and species of concern, including black-footed ferret and sage-grouse by either providing habitat or by buffering habitat and populations on the refuge. These cumulative benefits would be minor to moderate under any alternative, depending on the species, its habitat needs, and metapopulation dynamics. The restoration of bison on American Prairie Foundation lands could provide moderate cumulative benefits to bison restoration planning or implementation on the refuge, by providing a local example of bison management with additional opportunities for cooperation. These moderate cumulative benefits would be limited to alternatives B, C, and D, contingent on the pursuit of bison restoration plans on the refuge.

The efforts by the Ranchers Stewardship Alliance to promote ecological, social, and economic conditions that will sustain the biodiversity and integrity of America's northern, mixed-grass prairie would result in general cumulative benefits for grassland-dependent species.

Efforts by the World Wildlife Fund and the National Wildlife Federation to reduce grazing conflict with ground-nesting birds by buying and retiring refuge grazing rights would result in cumulative benefits to those species and other grassland-dependent species (including sage-grouse and black-footed ferret). Under alternatives A and C, the cumulative benefits of these efforts would offset the long-term effects of annual grazing. Under alternatives B and D, the cumulative benefits would complement refuge management efforts to expand prescriptive grazing, though the specific effects would vary by location.

The continued closing of access roads into the refuge by adjacent private landowners has been an ongoing issue. If this practice continues as recent evidence suggests, it could lead to additional increases in elk populations. Although there could be cumulative effects in all alternatives, the greatest effect would be under alternative B where the emphasis is on maximizing populations. This would benefit elk populations because of reducing disturbance and

increasing security, particularly when combined with the Service's plans to close 106 miles of road. It could also lead to negative effects on vegetation from too many elk in some areas because of the lack of adequate harvest.

The construction of the proposed Keystone XL Pipeline Project would result in localized adverse impacts to biological resources within the pipeline corridor. None of the refuge management alternatives, when combined with the effects of the pipeline, are anticipated to result in cumulative effects to biological resources.

5.6 Environmental Consequences for Visitor Services

Visitors to the refuge have the potential to be affected by opportunities, their experiences, and the setting where the use occurs (Manfredo 2002). Service policy emphasizes the need to provide for quality opportunities when providing for wildlife-dependent recreational activities. Wildlife-dependent recreation programs are evaluated based on the goal of providing for quality programs that would include the following elements: safety and compliance with

applicable laws, minimizes conflicts with wildlife and habitat goals, or other public uses, promotes accessibility for all; promotes resource stewardship, and provides for reliable and reasonable opportunities to experience wildlife (FWS 2006c). This section addresses the priority public uses and the activities and facilities that support those uses and how visitors would be affected by the actions in chapter 3. Table 26 compares visitation, miles of road, and level of facility development between the alternatives.

EFFECTS on HUNTING

This section discusses the effect of habitat management, number of hunters, reintroductions, predator management, hunting opportunities, access, and commercial outfitting would have on the hunting program. Information about effects resulting from harvest objectives is discussed for big game under wildlife in section 5.6 above.

Alternative A

Over the long term, there would be little change from current hunting opportunities on the refuge. Big game, upland birds, waterfowl, and migratory game birds would be open to hunting, and there would be limited coyote hunting opportunities. If the bighorn sheep population continued to expand, it would benefit hunters seeking this experience. Most

Table 26. Comparison of access, visitation, and facilities between the CCP alternatives for the Charles M. Russell and UL Bend refuges.

<i>Visitation Aspect</i>	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Miles of open refuge roads	670	564	670	647
Miles of all-weather access on refuge roads	60	60	76	65
Fishing visits	60,000*	60,000	60,000	60,000
Hunting visits	103,900	100,000	118,500	108,000
Participation visits in nonconsumptive activities (wildlife observation, photography, interpretation)	40,000	44,000	48,000–68,000	46,000–50,000
All nonconsumptive visits (includes office and other visits)	87,100	93,000	117,585	95,800
Increase in environmental education programs	Limited (with a few informal programs)	5% increase (with formal programs, 5+/- yearly)	10% increase (with formal programs, 8+/- yearly)	10% increase (with formal programs, 8+/- yearly)
Number of visitor facilities	Limited (tour route, visitor center, hunting blind, signage)	5%–10% more than A	10%–15% more than A	10% more than A
Total visitation	250,000	253,000	296,085	263,810

*These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.

hunting seasons for species open on the refuge would coincide with season and harvest quotas established by the State, although in some instances, the refuge would promulgate special regulations to provide for more restrictive harvest of a specific game species when necessitated by a refuge-specific goal or objective for that species.

Over the long term, hunting would remain near current levels of about 103,900 hunters annually (refer to table 26). Current resource management programs on the refuge would result in a positive trend in habitat for game species of wildlife which in turn would likely result in increasing opportunities for hunting and hunter success over time, but it would have a negligible effect on the numbers of hunters on the refuge. Nationwide, the trend in hunting has been decreasing (FWS 2008f). Although hunting on the refuge would likely remain stable, it would not likely grow without a significant effort to increase hunter numbers.

Access would remain as it is today (refer to table 26 and access below), with a mix of hunting areas open to motorized vehicle access and areas where roadless hunting opportunities exist with little or no influence by mechanized equipment. Some hunters believe little or no direct road access into some areas of the refuge limits their ability to harvest big game, especially cow elk. Others suggest minimal road access is a treasured value to get away from the "road hunters," seek solitude and enjoy a quality experience not available elsewhere.

The annual number of permits for commercial hunting (outfitters) would be limited to eleven. Some individuals could feel commercial outfitters would negatively affect their opportunities or experience, particularly where they compete for the same space and resource, but overall it would have a negligible effect on most hunters. As outfitters retire, the refuge would continue the practice of holding those permits and not issuing new permits until a new visitor services plan is completed.

Alternative B

Alternative B would affect hunting in several ways. The resource management programs on the refuge would shift to a blending of both natural processes such as fire and grazing (by wild and domestic) ungulates and artificial processes such as planting food and cover crops and construction of water development projects to benefit fish and wildlife. Game wildlife species would be managed according to mutually agreed to population objectives with the State, taking into consideration tolerance of adjacent landowners and land managers as well as ensuring no negative effects to refuge habitats or other nongame wildlife species. Populations would be managed at levels considered natural in terms of densities and

natural age classifications. As a result, there could be some unique opportunities for hunting bull elk or mule deer in the 8-year class, which would benefit some hunters.

The numbers of hunters would remain near existing levels. With an emphasis in maximizing wildlife numbers, it might be necessary to limit harvest rates, at least temporarily; therefore, the number of hunters would be expected to decline slightly to 100,000, but the effect would be negligible overall.

This alternative also encompasses several wildlife reintroductions including Rocky Mountain bighorn sheep where the habitat would support it and there is a social acceptance for such reintroductions. Sheep hunting is an important and highly sought after opportunity on the refuge and would benefit hunters seeking this opportunity.

This alternative would lead the refuge to consider additional hunting opportunities for mobility-impaired hunters as well as for young hunters that may or may not exist on other areas. This would result in a positive benefit in the overall hunting experience for some users and increase the diversity of the current hunter user group.

With road closures and access agreements with neighboring entities, access would be managed to benefit and increase wildlife populations and in some instances be managed to promote harvest opportunities. The refuge would promote nonmotorized access to some portions of the refuge but also provide for additional motorized access in other areas where currently there are strategies that are more restrictive. This could mean allowing game retrieval with motorized vehicles on seasonally closed roads. This would be considered an improvement by those interested in broader use of motorized vehicles but also a negative change by those advocates of roadless hunting opportunities as many seasonally closed roads essentially bisect a larger block of roadless refuge hunting areas.

Specific consideration is given in this alternative to the monitoring and analysis of all terrain vehicles and motorized watercraft as they relate to both wildlife use and visitor experience. This could potentially result in regulating these motorized uses in a manner to ensure that they are not negatively affecting wildlife or visitors if it is determined that they are doing so. This alternative would also lead the refuge to improve areas for visitor use and access such as improving camping areas, boat ramps, and all-weather roads that lead to these types of facilities. This would be a long-term benefit to visitors that desire these facilities. However, it could have a negative effect on wildlife populations, distribution and hunter success in areas that are near to these areas due to increased visitation to specific sites. This alternative also notes that following a review of proposed

wilderness units it could recommend increasing proposed wilderness acres by 25,037 acres (refer to wilderness below). This may result in improved game populations of specific species and a corresponding increase in opportunity for this type of hunting experience and improved hunter success.

Under this alternative outfitting/guiding for hunting would be evaluated to ensure there are no conflicts with other hunters on the refuge. Outfitters would still be required to submit annual report with the number of clients, number of days hunted and game species sought and harvested. The number of outfitting permits for hunting would be adjusted during the life of the CCP to meet wildlife and/or habitat objectives. The refuge would work to reduce conflicts between guides, clients, and the public.

Overall, the implementation of alternative B would result in negligible to minor benefits to hunting opportunities and experiences.

Alternative C

This alternative would maximize wildlife-dependent public uses and economic uses while protecting wildlife populations and habitat to the extent possible, striking a balance between livestock grazing and wildlife utilization of habitat. There would be a considerable emphasis placed on the refuge's hunting program with maximization of opportunity and harvest attempted while at the same time providing for diverse opportunities and healthy wildlife populations and habitats. These efforts would benefit hunting opportunities on the refuge. Some of the artificial processes discussed under alternative B would also be included in this alternative such as food plots and water developments.

Compared to alternative A, the number of hunters would be a minor increase of 14,600 (14 percent) hunters to about 118,500 hunters over the long term.

The wildlife reintroductions also discussed in alternative B would be included in this alternative. As it relates to hunting, bighorn sheep reintroductions are most notable with the positive benefits to hunters. This alternative also addresses the potential inclusion of mountain lion hunting with the associated benefits and negative effects also noted in alternative B.

Increases in hunting opportunities noted in alternative B as it relates to mobility-impaired hunters and young hunters are included in this alternative to even a greater degree. In addition, some "niche hunting" opportunities would also be considered such as traditional or primitive weapon hunts or specific predator hunts.

With a greater emphasis placed on maximizing hunter opportunity and visitation, public use facilities and access would be managed accordingly. This would mean improved access to boat ramps and improving

camping facilities, more restrooms and parking facilities. There would be some emphasis placed on non-motorized access hunting but also provisions to allow motorized access on seasonally closed roads for game retrieval. There would also be consideration for designation of bicycle use in areas currently not open to such use. There would also be consideration given to designated horse camping with some facilities development to accommodate increasing interest in this type of hunting visitor. The overall benefits of these improvements are for the visiting public and would be positive for those interested in this type of experience. There could be negative effects to wildlife habitat and wildlife distribution in specific sites where increased visitor impacts would occur.

This alternative includes removal from consideration of approximately 35,881 acres of proposed wilderness that is currently under consideration for future designation. This would be viewed as a positive by some proponents of increased motorized vehicle access and a negative by those advocating for current or new roadless type management of the refuge.

This alternative encourages the refuge to develop and expand commercial activities that would be consistent with the wildlife purpose. In this alternative, additional outfitter permits would be issued as long as they are consistent with refuge policy and procedures for issuing permits, along with anticipated time and space restraints, would reduce conflicts with the public and between guides. Additional outfitting/guide permits would be issued for pack and retrieval services to facilitate the harvest of big game species in roadless areas. This would result in minor economic gain for outfitter/guides and could result in a small increase in the number of visitors to the refuge. The extent of these impacts is unknown due to incomplete data on the interest by the public for retrieval services in proposed wilderness units and guided wildlife-viewing activities.

Overall, alternative C would result in minor to moderate benefits to hunting opportunities and experiences.

Alternative D

This alternative is based on an ecological processes emphasis where various approaches would be used to restore the natural function of plant communities and wildlife interactions with habitat, the role of fire, water and other influences (refer to objectives and strategies in chapter 3). Wildlife populations and the subsequent opportunities provided to the public through a hunting program would be driven primarily by how these activities would fit into the role of the broader ecological processes. This could mean short-term loss of opportunity if it is beneficial to the overall system to maintain or reduce specific game populations. It could result in a long-term benefit to hunting

programs if, when restoration is achieved, the system supports larger and more diverse game populations.

Over the long term there would be a modest increase of about 4,100, to about 108,000, in the number of hunters as compared to alternative A due to focus on providing for high quality experiences, additional opportunities to hunt bighorn sheep, more young people hunting, and more mobility-impaired hunters. Overall, this would be negligible increase.

As compared to alternative A, this alternative would consider additional reintroductions of wildlife including Rocky Mountain bighorn sheep. This alternative would base the implementation of these reintroductions on the appropriateness of how they would benefit the landscape from an ecological function perspective. The short- and long-term benefits of this initiative were discussed in previous alternatives. In the long term, this would benefit hunters seeking this opportunity.

A mountain lion hunting season would be considered in this alternative. This would be viewed as a positive action by those holding an interest in this type of hunting opportunity on the refuge, as well as the State of Montana's desire to see the refuge participate in this type of hunting, which is currently managed by them on existing hunting units immediately outside the refuge. Those opposed to seeing the refuge open to top predator hunting would view this hunting opportunity negatively.

Alternative D considers the opening of various furbearer seasons not currently permitted on the refuge. This would include species such as fox, coyote, raccoon, and badger. This hunting opportunity would only be considered in a more limited basis and would be allowed only when the natural role of predators in the system would not be altered through a hunting strategy. This could result in a short-term reduction in this type of hunting opportunity, but potentially a long-term gain as more diverse predator component may become part of a restored system and associated hunting opportunities could be considered if sustainable viable predator populations existed on the refuge.

The overall hunting program on the refuge would be based on hunting quality rather than hunting quantity. Diverse age and sex ratios for game species would be managed for where possible. This could be benefit to those hunters that desire the opportunity to experience game in relatively good abundance and the opportunity to see older age class animals where the opportunity for this is limited in other areas open to public hunting. This approach could also limit participation and reduce hunter numbers at times when it may be necessary to reduce or limit harvest, which could be viewed as a negative aspect to this type of hunting program.

Access under this alternative would be managed according to what best provides for improving

wildlife habitat and overall functioning of the refuge as an ecological system. The road system would be dynamic and managed with seasonal and permanent closures as well as open roads that contribute positively to improving function and health from an ecological perspective. Where possible, roads would be managed to improve harvest when necessary. This approach would have the positive and negative effects as outlined in previous alternatives as it relates to hunter access, participation, and success. The effects of all terrain vehicles and motorized watercraft would be the same as alternative B.

Proposed wilderness units would be evaluated and if determined to still meet the wilderness criteria, consideration would be given to expanding the boundary and area of some existing proposed wilderness units and removing wilderness protection in three areas for a net loss of about 8,185 acres. As discussed under alternatives B and C, there would be negative and positive effects on the refuge's overall hunting program including from the viewpoint of hunters.

Outfitting and guiding under this alternative would be managed similarly to alternative B.

Overall, alternative D would result in minor to moderate benefits to hunting opportunities and experiences, depending on the type of experience that individual hunters prefer.

Conclusion

The actions in the alternatives would have negligible to minor benefits on hunting opportunities across the refuge for big game, upland birds, waterfowl, and migratory game birds. The reasons for these benefits vary by alternative, and are largely dependent on the preferences and values of individual hunters.

In the long term, there would be negligible to minor differences in the number of hunters using the refuge annually with a slight decrease of about 3,900 hunters in alternative B as compared to alternative A, a minor increase of about 14,600 hunters in alternative C and a slight increase of about 4,100 hunters in alternative D. Hunters would continue to enjoy a wide variety of access for hunting in all alternatives, although there would be some distinct differences in the amount of road access and proposed wilderness acreage, which would positively benefit or negatively affect hunters depending on their point of view.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on FISHING

Because fishing is a popular activity that occurs on the refuge, fishing pressure, access to fishing areas, and opportunities are evaluated.

All Alternatives

Under all alternatives, the State of Montana (MFWP) would continue to have primary responsibility for all fisheries management within the refuge, which is consistent with Service policy on fishing (FWS 2008f). This includes regulating harvest, egg collecting efforts, and stocking activities. Similarly, The USACE manages the permitting requirements for any commercial fishing activities (including recreational tournaments). The Service would have little control over harvest opportunities for individual anglers. Patterns of fishing pressure have historically followed reservoir levels, with periods of high water levels tending to result in increased fishing pressure and vice versa. This pattern would remain in place under all alternatives. As a result, the numbers of fishing visits attributed to the refuge would likely remain the same under all alternatives (about 60,000 annually; the USACE attributes nearly 160,000 fishing visits to lake and recreation areas).

The Service would work with USACE to extend boat ramps to the water's edge as the lake recedes and identify roads that provide direct access to the lake including ATV access (refer to access below), which would provide long-term benefits for fisherman desiring better access to the lake.

Alternatives A, B, and D

Alternatives A, B, and D would not result in noticeable changes to fishing pressure or opportunities on the waters within the refuge. Existing use patterns would likely continue due to the isolated nature of the reservoir.

Alternative C

Alternative C would likely result in expanded fishing opportunities, since the Service would be placing a higher priority on improving existing lake and river access sites and possibly creating additional access sites. However, water level management would not change, so the high and low use patterns would persist, and the overall number of fishing visits would remain at current levels. New or expanded boat access would require considerable road improvements (refer to access in chapter 3). The USACE would need to be a partner in any new boat ramp development. Improvements in access would provide moderate benefits for anglers in the long term.

Conclusion

Under alternatives A, B, and D, there would be few noticeable changes in fishing pressure or opportunities on the waters of the refuge, resulting in negligible effects. In alternative C, the Service would expand opportunities by improving boat access including better boat ramp development, but overall, there would not be significant changes in the num-

ber of fishermen regardless of the alternative due to existing use patterns and isolated nature of the reservoir. Alternative C would have negligible benefits.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on WILDLIFE OBSERVATION and PHOTOGRAPHY

This section addresses effects on users and the quality of the wildlife observation and photography program including opportunities and facilities. Like other forms of wildlife-dependent recreation, Service policy (FWS 2008f) encourages refuges to provide quality opportunities for observing and photographing wildlife.



Brett Billings/USFWS

Refuge staff help visitors identify wildlife species.

All Alternatives

The refuge would provide the public with many opportunities to observe and photograph wildlife. Commercial photographers would be required to have a special use permit, which would enable the refuge to control the number of permits issued and minimize impacts to wildlife or other users. For example, the Service would not authorize off-road travel or access into the elk-viewing area. Given the few permits that would be issued for commercial photographers, there would be negligible conflicts with other user groups or refuge resources. Since the Service would be able to use any images or footage produced by a commercial photographer in brochures and other information, the public would benefit from the high quality imagery.

Alternative A

The current trend of increases in wildlife observation and photography visits would likely continue despite few changes in facilities or programs (refer to chapters 3 and 4), but in the long term, with only negligible improvements in the overall program or facilities

and the remoteness of the refuge, visitation would remain stagnant. Ongoing habitat improvements and land acquisition would improve the quality of opportunities for these uses in some areas providing some minor benefits. However, this alternative would not meet the demand for facilities related to observation and photography (trails, tour routes, overlooks, blinds) as gauged by inquiries, past visitation trends, and growing tourism visits to the refuge area.

During peak seasons, visitors would be concentrated in some popular areas like the Elk Viewing Area. Dust, crowds, and inadequate parking facilities (refer to interpretation in chapter 4) would negatively affect some users. There would not be a staff person dedicated to the visitor service's program to develop a comprehensive visitor program that could address conflicts and improve the overall program. Although the refuge would remain a great place to view wildlife, over the long term, the Service would not meet its goal of providing a quality wildlife observation and photography program for a wider audience.

Alternative B

An increased emphasis on habitat improvements and land acquisition would improve the quality of wildlife observation and photography in some areas. The Service would hire one outdoor recreation planner and a visitor service plan would be developed within 5 years of plan implementation. Having a staff member assigned to the visitor service's program would result in improved programming and facility development that could address some conflicts in popular areas. The modest increases in viewing facilities and programs (5 percent over alternative A) would improve the quality of the overall program in the long term, and visitation would be anticipated to grow by about 5–10 percent above alternative A. Improvements in the overall program could be somewhat offset as most of the staff would be directed to more important fish and wildlife-related work. Overall, it would only partially enable the Service to provide a quality wildlife observation and photography program on the refuge.

The reintroduction of bighorn sheep on the south side of the river could provide additional wildlife-viewing opportunities for some visitors. Because this CCP and EIS is addressing the potential of wolves colonizing in Missouri River Breaks at some point and the interest by many in bison restoration, if wolves colonized the refuge or bison were reestablished in cooperation with MFWP (refer to wolves and bison restoration under wildlife in chapter 3) under alternatives B and D, additional wildlife-viewing opportunities could be provided.

Alternative C

With an emphasis on maximizing public use opportunities, wildlife observation and photography vis-

its would increase by 20–50 percent due to habitat improvements, accelerated land acquisition, and a 10-percent increase in related facilities such as trails, tour routes, overlooks, and blinds. Two additional staff would focus on providing public use programs and facility development, which could enhance the quality and quantity of observation and photography opportunities by a moderate amount. Increased facilities and visitation would result in some minor disturbances to wildlife, although this would result in negligible effects on wildlife-viewing opportunities given the size of the refuge. The development of a visitor services plan and travel management plan would minimize intrusion into important wildlife locations and habitat through better planning and facility programming. Any increased use in popular areas like the elk-viewing area without any improvements to offset conflicts would negatively affect some users. This alternative would likely result in long-term positive public and political support, which could positively affect projects and funding for improving the quality of fish and wildlife habitat.

Similar to alternative B, reintroduction of bighorn sheep on the south side of the river would provide additional wildlife-viewing opportunities. Because this CCP and EIS is addressing the potential of wolves colonizing in Missouri River Breaks at some point and the interest by many in bison restoration, it is likely, if wolves immigrated to the refuge or bison were reestablished in cooperation with MFWP and others visitation would increase (refer to wolves and bison restoration under wildlife in chapter 3).

Alternative D

With an emphasis on integrating the wildlife management and public use focus, under this alternative, wildlife observation and photography visits are estimated to increase by a minor to moderate amount of 15–25 percent more in the long term. Similar to alternative C, two additional staff would be focused on providing a comprehensive program that incorporated better planning and facility development. Similar to alternative B, when combined with an emphasis on improving habitat conditions and land acquisition, quality opportunities to see and photograph wildlife would increase by a moderate amount. As with alternatives A and B, any increased use in popular areas without any improvements to offset existing conflicts would negatively affect some users.

Conclusion

Under existing conditions, visitation levels would remain flat in alternative A. Although the refuge would provide many opportunities to view and photograph wildlife, without a dedicated staff person to oversee the public use program or any additional facilities to attract visitors seeking nonconsumptive activities, there would be little growth in visi-

tation. Alternative B would add an outdoor recreation planner, and combined with habitat improvements and modest increases in facilities and programs, the number of visitors coming to the refuge would increase by negligible to minor amount (5–10 percent). Alternatives C and D would add two outdoor recreation planners although the programming would look considerably different. Alternative C would seek to increase a wide-range of opportunities that would also provide economic benefit for the adjacent communities. Visitation would increase moderately by 20–50 percent over existing levels with improved facilities and programs. Alternative D would also seek to improve facilities and programs but there would be a higher emphasis placed on quality over quantity and habitat management. Visitation would increase by a minor to moderate of 15–25 percent amount. Any increased use in popular areas without addressing issues such as parking, dust, and crowding would negatively affect some users.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on ENVIRONMENTAL EDUCATION

National wildlife refuges that are open to the public should strive to provide some level of environmental education. Environmental education programs should be based on guidelines specified in the Service's Environmental Education Policy (FWS 2008f). The guidelines stress that environmental education programs should connect people's lives to the natural world around them, advance environmental and scientific literacy through an interdisciplinary approach to learning, strengthen the Refuge System by fostering public knowledge about environmental conservation, allow for participants to experience wildlife, wildlife habitat, and cultural resources, and instill a sense of stewardship for conservation. This section primarily addresses opportunities for environmental education programs between the alternatives.

Alternative A

The Service would provide environmental education programs on an opportunistic basis but in large part the Service would miss opportunities to educate the public about the values of the refuge and the Refuge System. The Service would not meet the guidance for environmental education in Service policy (FWS 2008f) because there would be little or no contact with refuge staff to answer questions and foster public knowledge or interest in the Service's messages.

Alternative B

The addition of an outdoor recreation planner would enable the refuge to develop a visitor services plan

that incorporated a modest increase (5 percent) in environmental education programming, compared to existing conditions. Specific curriculum-based programming would allow staff to train teachers to deliver programs independently and additional teacher workshops would further expand educational capabilities. In the short term, there would be few changes in environmental education opportunities, but once the staff position was hired and the step-down was implemented, in the long term, it would result in minor benefits for visitors, which ultimately would be aimed at garnishing greater support for future refuge and Refuge System programs.

Alternative C

Two outdoor recreation planners, as well as increased use of volunteers and partnerships, would enable the refuge to increase environmental education programs by about 10–15 percent as compared to alternative A. In the long term, creating refuge-specific curricula could moderately enhance awareness of the refuge's wildlife and habitat resources. Providing teacher workshops would allow staff to train teachers to deliver programs independently, further expanding educational capabilities. The addition of a education and interpretive center at Sand Creek Field Station would enable the Service to advance its goals for environmental education for both children and adults. This alternative could have long-term benefits in terms of public and political support that could positively affect projects and funding.

Alternative D

Similar to alternative C, there would be an addition of two outdoor recreation planners to the staff. There would be a minor increase of 10 percent in environmental education programming as compared to alternative A. The emphasis would be on providing quality programming over quantity that met the guidelines specified in Service policy. Specific curriculum-based programming would allow staff to train teachers to deliver programs independently and additional teacher workshops would further expand educational capabilities. Students would gain an improved understanding of refuge's natural history, wildlife and ecology as well as the mission and importance of the Refuge System. Similar to alternative C, the addition of a science and interpretive center at Sand Creek Field Station would enable the Service to advance the Service's goals for environmental education for both children and adults, although the messages and programming would differ to some degree. In the long term, it would provide a moderate benefit in terms of generating greater support for future refuge and Refuge System programs.

Conclusion

Under existing conditions, very limited environmental education would be offered at the refuge. Under alternative B, the Service would hire one staff person and begin to offer some additional programming and teacher-led workshops, resulting in negligible benefits. Two staff positions would be filled in alternatives C and D, which would enable the Service to provide more programming. In addition, an interpretive center at Sand Creek Field Station or combination interpretive and science center would enable the Service to advance its goals for environmental education, resulting in minor benefits.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on INTERPRETATION

The guiding principles for the Refuge System's interpretive programs involve developing opportunities, facilities and programs where visitors can develop an understanding and appreciation for America's natural and cultural resources through safe, informative, enjoyable, and accessible activities that ultimately lead to a sense of stewardship about the refuge's resources (FWS 2008f).

All Alternatives

Under all alternatives, visitors would continue to enjoy the refuge's interpretive facilities from the auto tour route, elk-viewing area, an accessible hunting blind, the Fort Peck Interpretive Center, and other contact stations (refer to interpretation in chapter 4), Interpretive signs, exhibits, materials, brochures, and informational kiosks would continue to provide visitors an opportunity to enjoy and learn about the refuge.

Alternatives A and B

As compared to alternative A, under alternative B, there would be modest improvements in the number and quality of interpretative facilities and programs. In addition to hiring an outdoor recreation planner, there would be a 5-percent increase in the number of facilities and programs, but overall this would result in negligible benefits furthering the Refuge Systems principles for interpretation.

Alternatives C and D

Alternative C would have the greatest improvements in interpretive facilities (5–15 percent) and alternative D would be intermediate at about 10 percent. A small visitor center located at Sand Creek Field Station under alternative C and a combination science and interpretive center under alternative D would enable the refuge to provide more quality

information where the most popular activities occur like elk viewing during the fall. Under alternatives C and D, the hiring of two outdoor recreation planners would enable the refuge to improve programming, facilities, signage, and exhibits as compared to alternative A by a moderate amount.



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Conclusion

Similar to wildlife observation, photography and environmental education, under existing conditions, there would be limited interpretive facilities and programs available under alternative A. By hiring one staff person in alternative B and two persons in alternatives C and D, the Service could increase programs and develop additional facilities (10 percent more in alternative D and 15 percent more in alternative C). A small interpretive center in alternatives C and D would enable the refuge to provide quality interpretive programs across the refuge.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on OUTREACH

Effective outreach depends on open and continuing communication and collaboration between the refuge and its many publics. It involves determining and understanding the issues, identifying audiences, listening to interested groups and the public, creating messages, selecting the most effective delivery techniques, and evaluating effectiveness (FWS 2008f).

Under alternative A, the Service would occasionally participate in State and local events, make presentations, recruit some volunteers to support staff efforts, seek grants in partnership with others, and use the internet to keep the public informed about the refuge's programs and activities.

Under alternative B, the Service would increase its outreach efforts resulting in a negligible, 5-percent targeted increase in requests for information

about the refuge. Additionally, there would be a modest increase in efforts to give presentations or host open houses annually. Alternative C would result in the greatest improvement in outreach efforts resulting in a 15-percent, or minor, targeted increase in requests for information by the public. Alternative D would be intermediate with a 10-percent, or minor, targeted increase.

As compared to alternative A, alternatives B, C, and D, the Service would develop a friends group although the timing would vary in the implementation of the group.

Mitigation

No mitigation measures would be necessary under any alternative.

EFFECTS on ACCESS

This section addresses how access to the refuge is affected under each alternative. Refer to the rationales in chapter 3 under access for an explanation of how and why access would change.

All Alternatives

Visitors to the refuge would continue to have many opportunities for accessing the refuge ranging from the wide network of roads, river access, and designated landing areas on Fort Peck Reservoir for planes. Licensed motor vehicles would be allowed on refuge roads (refer to access under section 4.5 in chapter 4), along with other types of users like boaters, bicyclists, snowmobilers, cross-country skiers, and others. There would continue to be an extensive network of roads although there would be some minor differences between the alternatives (refer to table 26 above; also see figures 7–10 alternative maps in chapter 3).

The Wilderness Society (2009) modeled the accessibility of the refuge by foot from a road for each alternative, assigning values for the time it takes to travel across different vegetation classes while accounting for the steepness of the slope. As shown in figures 45 and 46, within an hour of walking from a road, regardless of the alternative selected, between 90 and 100 percent of the refuge would be accessible for average hikers. Even with reductions in the miles of road under alternative B (106 miles) and D (23 miles), it would result in negligible to minor differences in the amount of time it would take to access the majority of the refuge within 30 minutes of a road. Figures 45 and 46 show various travel times across the refuge.

The Service has little information on the number of boat users across the refuge, but none of the alternatives would negatively affect boat users. Bicyclists could continue to access the refuge from any numbered open road or seasonally closed road.

Alternative A

Under alternative A the current road system on the refuge would remain in place (about 670 miles of road). Current refuge data indicates about 62 percent of the refuge is within 1 mile of an open road, and 82 percent is within 1 mile of motorized access. Minor modifications to the current road system would take place over the life of the plan. Where a private landowner has closed access to the refuge, the Service would work with the counties and others to provide access to the refuge. This would be an ongoing challenge as private lands within and immediately adjacent to the refuge restrict access to public land. In addition, safety concerns and maintenance could require that some roads be rerouted or closed to provide for public safety. Under this alternative, the impacts on vehicular access are negligible. Figure 47 displays areas of the refuge accessible by foot within certain amounts of time; almost all of the refuge is accessible by foot within 90 minutes, and most of the refuge is accessible by foot within 30 minutes. This assumes that access occurs from within the refuge and not from outside the refuge where an extensive road network provides access to many boundary areas.

Alternative B

Under alternative B approximately 106 miles of road would be closed to improve habitat for wildlife and/or better define true public access. In some situations, roads would be closed that are inaccessible to the public because of private land ownership within or outside the refuge. Although a primary reason for road closures would be for wildlife benefit, roads also would be closed to eliminate exclusive use in areas where access to the refuge has been closed by private landowners. This alternative would close roads that are not available to the entire public and would eliminate exclusive use of some roads on the refuge. Road closures in this alternative would have a moderate positive benefit for wildlife populations (more security), especially big game. It would result in minor negative effects on road access with 8 percent fewer roads as compared with alternative A.

Alternative C

The refuge road system under alternative C would be very similar to the current road system that exists under alternative A. Several roads (Routes 209 and 108) would be improved (all-weather access), which would provide minor benefits for accessibility in those areas.

Alternative D

About 23 miles of road would be seasonally closed or permanently closed on the refuge. Route 209 would be improved to all-weather access. In addition, those roads that currently do not provide vehicle access to

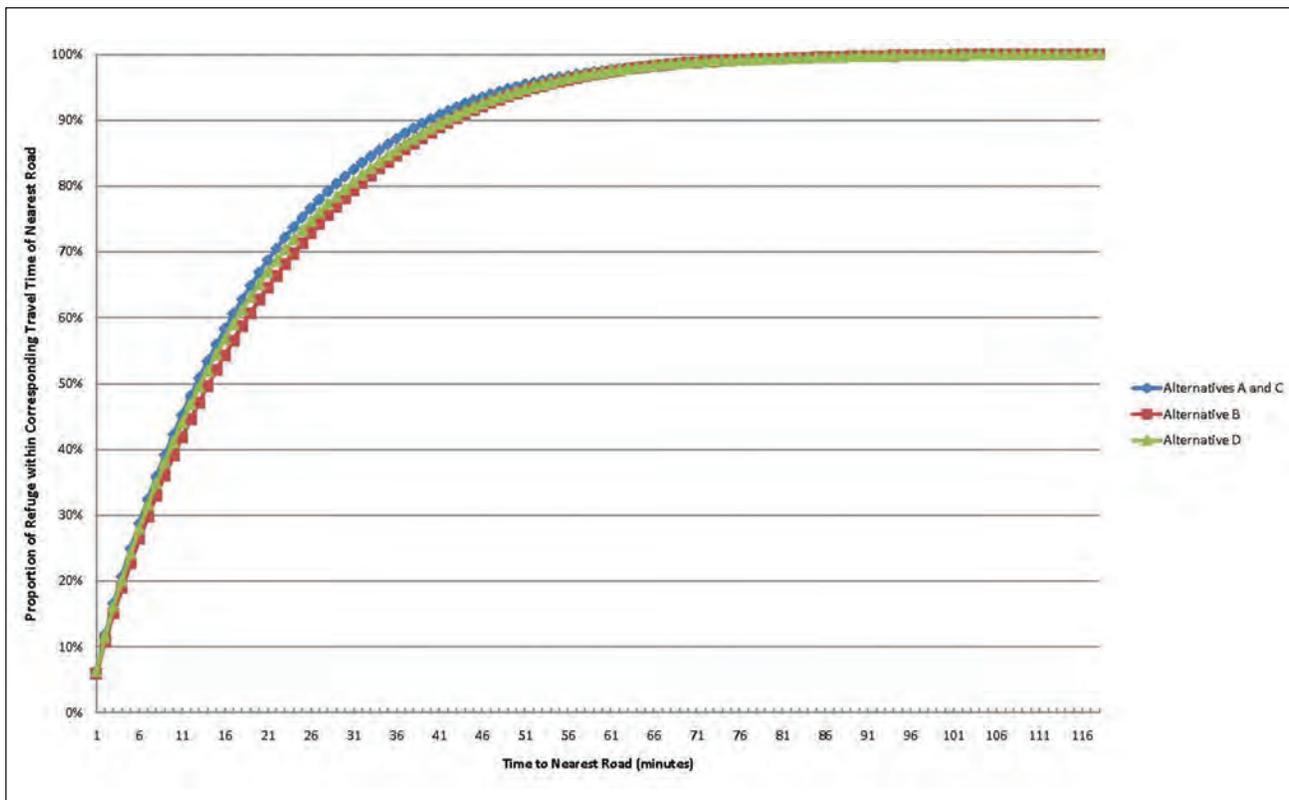


Figure 45. Graph of the proportion of the Charles M. Russell and UL Bend refuges within the corresponding travel time of the nearest road, by CCP alternative. Source: The Wilderness Society (2009).

the public would be closed to eliminate exclusive use. Effects on access would be negligible (about 5 percent).

Conclusion

Visitors to the refuge would continue to access the refuge through a variety of means and opportunities. Alternatives A and C would have the most miles of road open for travel at 670 miles. Alternative B would result in 106 miles of closed road and alternative D would close about 23 miles of road. Under all alternatives, nearly 80 percent of the refuge would be accessible within 30 minutes of walking time and 90 percent or more would be accessible within an hour of walking. Alternative C would have the most all-weather access with 76 miles of road, and alternative D would have about 65 miles as compared to alternatives A and B with about 60 miles. The overall effect on refuge access would be minor impacts from alternative B, minor benefits from alternative C negligible effects from alternative D.

Mitigation

No mitigation would be required.

EFFECTS on RECREATION SITES

None of the Service's actions would affect USACE's management of its developed recreation areas. The

Service would continue to manage the primitive recreation sites (refer to chapter 4) under all alternatives.

EFFECTS on COMMERCIAL RECREATION

This section evaluates the effects of wildlife-outfitting and guiding and commercial fishing.

Alternative A

Wildlife outfitting/guiding activities would continue at the current permitted level of 11 outfitters operating on the refuge. Outfitters would still be required to submit annual report with the number of clients, number of days hunted and game species sought and harvested. As outfitters retire, the refuge would continue the practice of holding those permits and not issuing new permits until a new visitor services plan is completed. There would continue to be some conflict with the public in some areas as guides and clients compete for the same space and resource. Commercial fishing and fishing tournaments are managed by MFWP and the USACE on Fort Peck Lake. Since USACE has primary jurisdiction on recreational activities on Fort Peck Lake, the Service would continue to support MFWP and USACE in managing those activities.

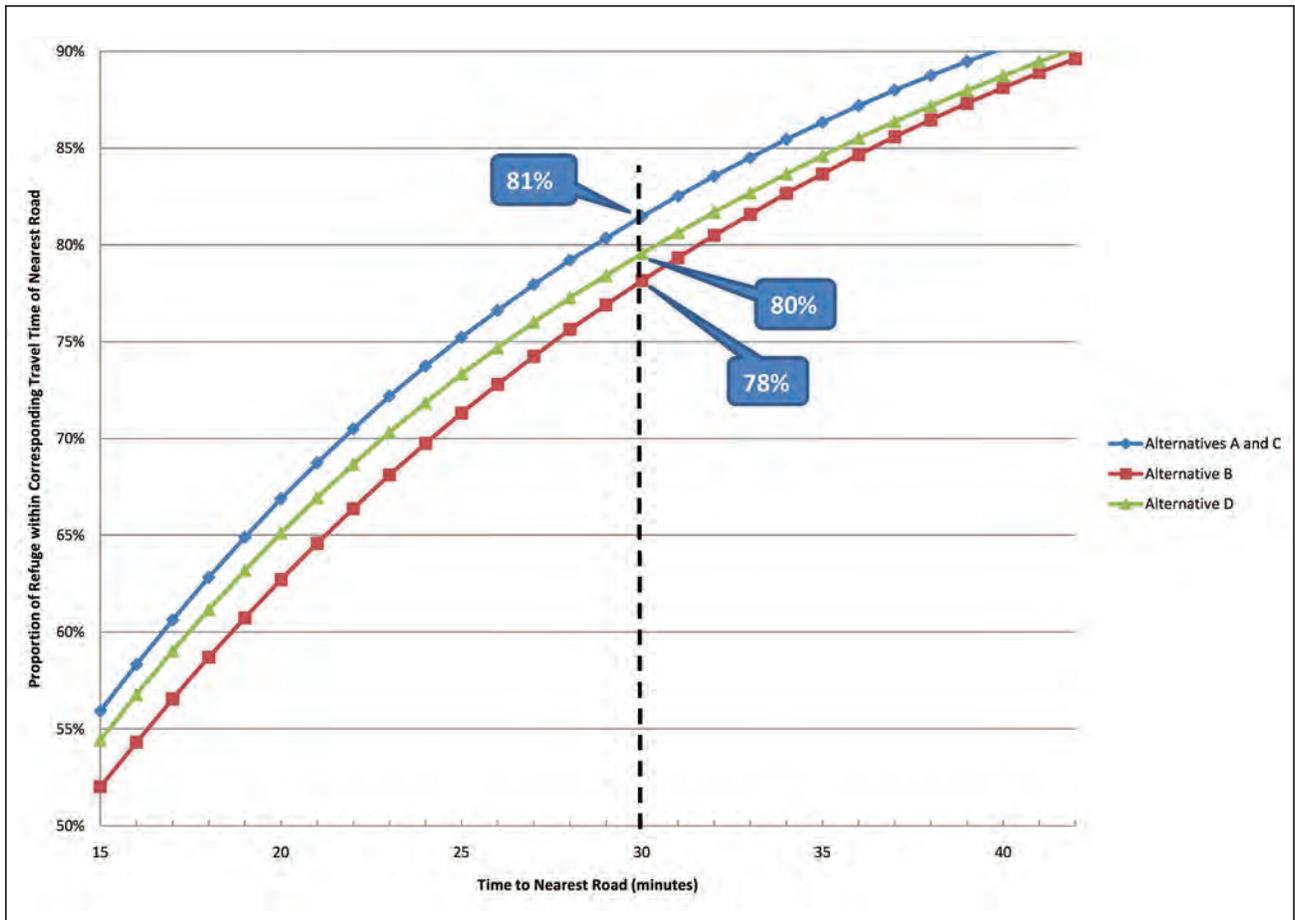


Figure 46. Graph of the proportion of the Charles M. Russell and UL Bend refuges to the nearest road at 30 minutes.
 Source: The Wilderness Society (2009).

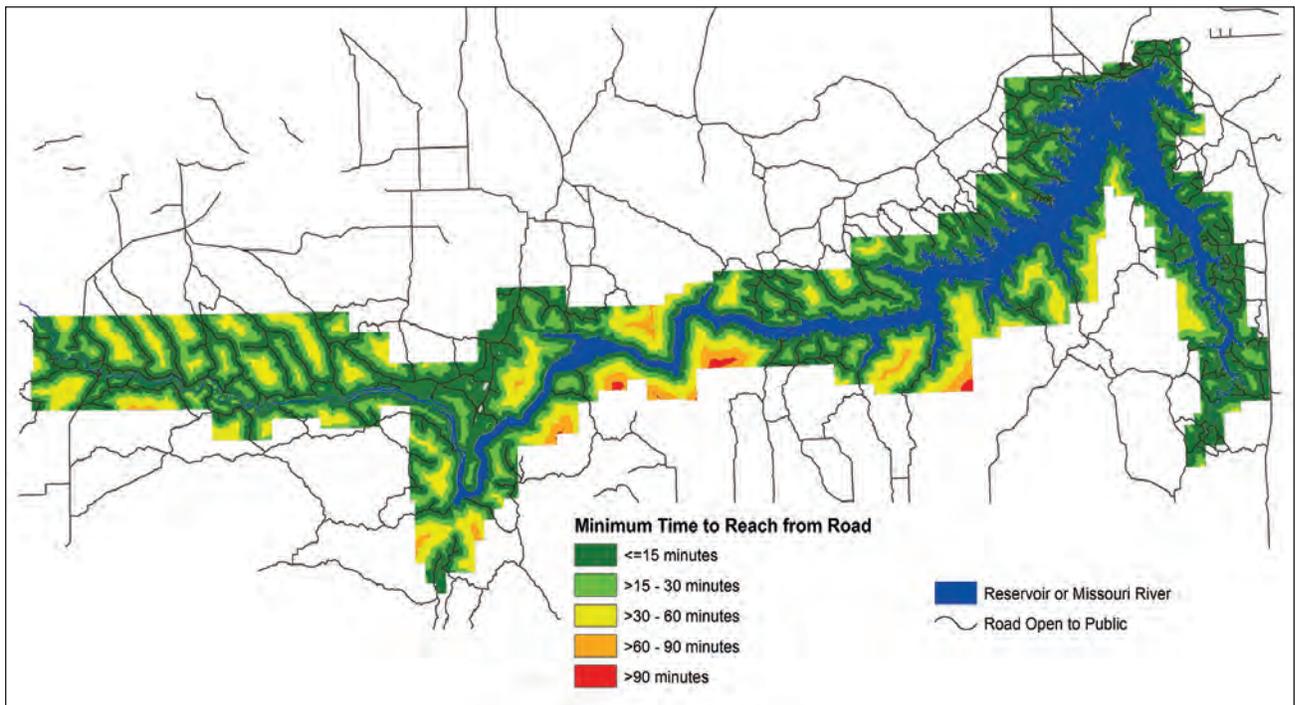


Figure 47. Map of accessibility by foot to the Charles M. Russell and UL Bend refuges under CCP alternative A.
 Source: The Wilderness Society (2009)

Alternatives B and D

Under alternatives B and D outfitting/guiding for hunting would be evaluated to ensure there are no conflicts with other hunters on the refuge. Outfitters would still be required to submit annual report. The number of outfitting permits for hunting would be adjusted during the life of the CCP to meet wildlife and/or habitat objectives. The Service would evaluate permitting outfitting/guide services for wildlife viewing, resulting in minor economic gain for outfitter/guides and a small increase in the number of visitors to the refuge. The extent of these effects is unknown due to incomplete data on the interest by the public for guided wildlife-viewing activities. Conflicts between guides, clients, and the public would be minimized. For commercial fishing and commercial-fishing tournaments, the refuge would work with MFWP and USACE to ensure these activities are consistent with Service policy.

Alternative C

Same as alternatives B and D except additional permits would be issued as long as they are that consistent with refuge policy and procedures for issuing permits, along with anticipated time and space restraints, would reduce conflicts with the public and between guides. Additional outfitting/guide permits would be issued for pack and retrieval services to facilitate the harvest of cow elk in proposed wilderness units and to promote wildlife viewing, resulting in minor economic gain for outfitters/guides and a small increase in refuge visitors.

Conclusion

Under existing conditions, outfitting permits would remain at about 11 outfitters operating on the refuge. Alternatives B and D would evaluate the program to ensure there were no substantial conflicts with other hunters. The number of hunters could be adjusted to meet wildlife and habitat objectives if necessary. Under alternative C, additional permits could be issued provided they were consistent with refuge policies and procedures and there were no substantial conflicts with other hunters. There could be additional permits issued for pack and retrieval services to facilitate harvest in wilderness or to promote wildlife viewing.

Mitigation

No mitigation measures would be necessary under any alternative.

CUMULATIVE IMPACTS on VISITOR SERVICES

The Fort Peck Dam/Fort Peck Lake Master Plan describes proposed upgrades and expansions of recreational facilities at existing sites. Proposed

upgrades include expanded camping facilities, improved sewage treatment, improved boat ramps, improved day use facilities, and increased interpretive facilities. Implementation of the proposed master plan would directly benefit recreational uses on Fort Peck Lake and at existing facilities. Since many of these areas are used by refuge visitors, implementation of the master plan would also result in minor to moderate cumulative benefits to recreational access and experiences and commercial uses on the refuge (under any refuge management alternative).

The direct and indirect effects of the Enhancement Act of 2000 (conveyance of cabin sites) are outside the scope of this analysis. Implementation of the Enhancement Act of 2000 would not result in any cumulative effects on refuge recreation areas.

As part of the Upper Missouri River Breaks National Monument Resource Management Plan, the BLM will limit special use permits commercial recreational use on the Missouri River and related lands (BLM 2008). This may adversely affect some users in the short term, but would likely result in long-term benefits due to a predictable and equitable permit system that maintains the quality of the resource. Under any refuge management alternative, this may result in minor to moderate short-term cumulative impacts and long-term cumulative benefits on commercial river access on the refuge.

Implementation of the Upper Missouri River Breaks National Monument Resource Management Plan includes management actions to improve recreational access and experiences along the Missouri River (BLM 2008). Under any refuge management alternative, these actions may result in minor cumulative benefits to recreational river access opportunities on the refuge.

5.7 Environmental Consequences for Special Areas

This section addresses the effects on land areas with special land designations, including wilderness. Refer to specific topics under visual resources and soundscapes for additional information.

EFFECTS on SPECIAL MANAGEMENT AREAS

None of the alternatives would change the special management areas including the Upper Missouri Breaks Wild and Scenic River, research natural areas, national natural landmarks, and the Lewis and Clark Historic Trail (refer to section 4.4 in chapter 4).

EFFECTS on WILDERNESS

This section evaluates the effects of changes in wilderness protection across the four alternatives. The acreage of proposed wilderness protection on the refuge and the opportunities to experience wilderness as defined in the Service's wilderness stewardship policy (FWS 2008d) are evaluated. For complete information about the Service's review on wilderness and for a breakout of each wilderness unit, refer to appendix E and the alternative maps (figures 7–10) in chapter 3. The specific effects from habitat management or other activities in wilderness are addressed under the specific resource topic being affected such as visual resources, vegetation, wildlife, access, and others and is not addressed here.

Several studies have been completed showing the potential irreversible effects of recreation on valuable wilderness. A publication put out by the Wilderness Society and the USDA Forest Service, *Keeping It Wild: A Citizen Guide to Wilderness Management* (1992), is a summary from the Wilderness Act and subsequent legislation. It notes that wilderness should provide for human use while preserving the wilderness character, providing outstanding opportunities for solitude or a primitive and unconfined recreational experience. In addition, recreation should favor wilderness-dependent activities when managing wilderness use. Other non-wilderness-dependent recreation activities taking place in wilderness can be enjoyed elsewhere.

In this analysis, the refuge is examining what proposed wilderness units should remain wilderness because the areas meet the criteria in the Wilderness Act, and the units where other wildlife-dependent recreational activities can be accommodated. In some of the existing proposed areas, the Service has a legal responsibility to allow access to State and private inholdings, and some of these lands are being considered for removal from wilderness protection. While the habitat within those areas is still valuable for wildlife, nonetheless, under existing conditions, it has been fragmented.

Table 27 summarizes the amount of wilderness that would be protected under each alternative. The narratives that follow describe the effects of the various levels of protection.

All Alternatives

There would be no effects to the 20,819 acres of designated wilderness in UL Bend Wilderness. It would continue to protect important habitat and wildlife values including the black-footed ferret (endangered) and other species of concern such as the greater sage-grouse. It would offer outstanding opportunities for solitude and primitive and unconfined recreation. No motorized vehicles would be allowed.

Game carts would not be allowed in UL Bend Wilderness, but they would be allowed in all proposed wilderness units. In proposed wilderness units where livestock grazing still occurred, some wilder-

Table 27. Wilderness protection under the CCP alternatives for the Charles M. Russell and UL Bend refuges.

	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i>	<i>Alternative D</i>
Acres in UL Bend Wilderness ¹	20,819	20,819	20,819	20,819
Acres of current proposed wilderness ²	155,288	155,288	155,288	155,288
Increase in acres	0	+25,037	0	+18,559
Decrease in acres	0	0	-35,881	-26,744
Acres in proposed wilderness alternatives	155,288	180,324	119,407	147,103
Acres of total wilderness protection (designated and proposed)	176,107	201,143	140,226	167,922
% Change in wilderness protection	0	+14	-20	-5
% of refuge with wilderness protection ³	16	18	13	15

¹ Based on the legal acreage .

² The actual proposed wilderness acreage sent forth to Congress was 155,288 acres, but with advances in technology, current GIS acreages may differ slightly.

³ Based on the 1.1 million-acre refuge boundary.

ness users could be negatively affected by the visual impact of livestock grazing (refer to visual resources in section 5.4 above and see figure 16 in chapter 4).

Alternative A

Under alternative A, the acreage of proposed wilderness would remain at 155,288 acres as proposed in 1974 (note: current GIS calculations estimate the acreage as 158,619 acres, which is within the accepted 2-percent differential margin). Within the refuge boundary, about 16 percent of the refuge would be protected as wilderness. Overall, maintaining the current size and location for proposed wilderness units would have negligible effects on wildlife-dependent recreation opportunities or other wilderness values. Recreationists looking for solitude and primitive recreation would be able to find multiple opportunities across the refuge as well as for those who want better access with their recreational experience (refer to access in section 5.7 above). A higher level of land protection would continue for all 15 pro-

posed wilderness units protecting the characteristics that make them primitive and allowing natural processes to operate freely, sustaining the ecological processes that create the interconnected web of life in wilderness. (The Wilderness Society 1992).

Alternative B

Under alternative B, there would be a net gain of 25,037 acres of protected wilderness land. This would result in a 14-percent increase in wilderness lands across the refuge (refer to table 27). Nineteen percent of the refuge would be protected as wilderness as compared to 16 percent in alternative A. By adding acreage to several of the current proposed wilderness units, the refuge would increase protection of natural ecosystems and allow natural processes to operate freely. Road closures surrounding wilderness will total about 13 miles. Most of the closures are short spur roads. The reduction in disturbance to wildlife within those areas would have a minor benefit, allowing wildlife to forage and migrate between



USFWS

UL Bend Wilderness protects habitat for the greater sage-grouse, a species of concern on the refuge.

forage sites with less possibility of disturbances and hindrance due to roads. In a few localized areas, the closures could make it more difficult to manage big game through hunting, but given the overall accessibility of the refuge, the impact would be negligible (figures 45, 46, and 47). Although some species tolerate road systems, there are other species, particularly large carnivores, that are usually absent in landscapes with high road densities (Noss 1991). Overall, the proposed wilderness changes in alternative B would have minor benefits on wilderness and values on the refuge.

Alternative C

There would be a net loss of 35,881 acres of proposed wilderness through the elimination of four wilderness units and a decrease in acreage of one currently proposed wilderness unit. A 20-percent decrease in wilderness protection (refer to table 27) would have a minor to moderate negative effect on wilderness as a resource and its inherent values. Removing wilderness protection would allow for some additional wildlife-dependent recreation opportunities, better access, and fewer restrictions on livestock owners. Increased opportunities and access also have the potential to disturb wildlife. The level of disturbance would vary depending on the extent, longevity, and intensity of the activity (Cole 1996). In those areas where the protection of wilderness is removed, it could allow for easier access and eliminate issues over the use of game carts.

One area being considered for elimination is the East Hell Creek proposed wilderness unit. It contains 14,744 acres, a private inholding, a State section, and a network of refuge roads that by law are required to remain open to allow for access to both. While this area of the refuge contains valuable habitat, due to the encumbrance of inholdings and roads, the habitat is fragmented and some of the wilderness values are limited. Within the vicinity of wilderness, some formerly seasonally closed could be opened, allowing for additional access to the refuge. However, no new roads would be proposed in the draft CCP and EIS. While the additional access will have a minor impact on wildlife and habitat, it would allow for increased use of the refuge and provide for additional recreation such as hunting and game retrieval. Overall, the proposed wilderness changes in alternative C would have minor impacts on wilderness and values on the refuge.

Alternative D

Under alternative D, there would be a net loss of 8,185 acres of proposed wilderness. About 18,559 additional acres would be protected in six proposed wilderness units, and 26,744 acres would be eliminated in three areas. With a 5-percent loss of designated

and proposed wilderness acres as compared to alternative A, it would result in minor negative effects for wilderness protection values and negligible effects refugewide. There would be 6 miles of road closures associated with the additional proposed wilderness acres. These road closures would allow wildlife to migrate between forage sites with fewer disturbances. With the potential increase in recreational activities and reduced restrictions on access within those areas, there is the potential for additional wildlife and habitat disturbance and destruction.

Wilderness areas are intended to be large enough to allow landscape-scale ecological processes to occur naturally, providing a standard of healthy, intact, relatively unmodified land (Noss 1991). By consolidating proposed wilderness units within alternative D, it allows for the protection of larger landscapes and the ecological processes associated with these landscapes, while allowing more liberal land use to those areas encumbered by roads and private inholdings. Those areas removed from proposed wilderness (such as East Hell Creek mentioned above), still contain valuable habitat, however from a management standpoint it should no longer contain wilderness protection due to its proximity to roads and inholdings. The consolidation of proposed wilderness units is seen as an overall benefit to the habitat by allowing larger areas natural process to operate freely keeping the land as wild and natural as possible.

Overall, the proposed wilderness changes in alternative B, including the consolidation of proposed wilderness units, would have minor benefits on wilderness and values on the refuge.

Conclusion

Under all alternatives, 20,819 acres of designated wilderness in UL Bend Wilderness would remain protected as identified in the Wilderness Act of 1964. No motorized vehicles would be allowed. Game carts would not be allowed in UL Bend Wilderness, but until a minimum tool analysis was completed, they would be allowed in all proposed wilderness units. Increases in proposed wilderness would provide additional protection of those natural ecosystems and allow natural processes to operate freely.

Under alternative A, the proposed wilderness acreage would remain at 155,288 acres as proposed in 1974. Within the refuge boundary, about 16 percent of the refuge would be protected as wilderness. In alternative B, there would be a net gain of 25,037 acres of proposed wilderness, resulting in a 14-percent change refugewide. Alternative C would see a net loss of 35,881 proposed wilderness acres (20 percent less), while alternative D have a net loss of 8,185 acres (5 percent less). The effects on total designated and proposed wilderness acres, and the values that they provide, would be minor benefits in alternative B,

minor impacts in alternative C, and minor benefits in alternative D. The effects of reduced total wilderness acres in alternative D would be offset by the improved arrangement of wilderness to be more efficient and effective.

Mitigation

No mitigation measures would be necessary under any alternative.

CUMULATIVE IMPACTS on SPECIAL AREAS

The BLM has three wilderness study areas that are contiguous with existing designated wilderness on the refuge. The existing configuration and management of these areas to preserve wilderness values provides moderate cumulative benefits to the management and integrity of wilderness on the refuge by expanding the total size of wilderness areas. These moderate cumulative benefits would be the same under alternatives A, B, and D, and would be slightly less in alternative C (figure 9), which would remove wilderness protections from one of the units that abuts BLM wilderness study areas (east of Forchette Creek Recreation Area).

None of the alternatives would result in cumulative impacts on other special land designations.

5.8 Environmental Consequences for Cultural and Historical Resources

Many of the refuge's prehistoric and historic resources have not been surveyed. Formal investigations have been sporadic and there is still a lot the Service does not know regarding these resources (refer to section 4.6 in Chapter 4—Affected Environment).

EFFECTS COMMON to ALL ALTERNATIVES

Activities outlined in each alternative have the potential to negatively affect cultural resources, either by direct disturbance during construction of habitat projects and facilities related to public use or administration and operations, or indirectly by exposing cultural and historic artifacts during management actions such as habitat restoration or prescribed burning. The presence of cultural resources including historic properties would not prevent a Federal undertaking or project, but any undertaking would be subject to Section 106 of the National Historic Preservation Act, or other laws protecting cultural resources (refer to Appendix D—Key Legislation and Policy). Many negative effects to cultural resources

would be identified and options for minimizing impacts would be discussed prior to any implementation of the project. The Service would provide the Regional Historic Preservation Officer a description and location of all projects, activities, routine maintenance, and operations that could negatively affect ground and structures, details on requests for allowable uses, and the options being considered. The region 6 archaeologist would analyze these undertakings for their potential to affect historic properties and enter into consultation with the State Historic Preservation Officer and other parties as appropriate. As necessary, the refuge would notify the public and local government officials. The Service would protect all known gravesites. Any collection of plant or other materials for tribal ceremonial purposes would be conducted under a special use permit.

EFFECTS of ALTERNATIVES B, C, and D

As compared to alternative A, under alternatives B, C, and D, the Service would increase protection and preservation of cultural resources found on the refuge primarily through better planning and additional survey work. Development of a step-down plan early in the implementation of the CCP would benefit cultural resources, particularly if it were integrated early with habitat management plans. Additional survey work would enable the refuge to identify areas with a high or moderate likelihood of historic properties, and actions could be taken to limit negative effects on cultural resources.

Visitors who are interested in the refuge's historical past would benefit from an increased emphasis on interpretation of the refuge's cultural resources and the efforts to preserve its rich past.

CONCLUSION

The Service would continue to follow all cultural resources laws for any project work on the refuge. Under alternatives B, C, and D, the Service would increase protection efforts largely through better planning, survey work, and law enforcements. Tribes would be allowed to collect and use plants and other resources for ceremonial purposes under a special use permits. These efforts would result in negligible to minor benefits to cultural resources.

MITIGATION

For cultural resources, any mitigation measures would be addressed with the State Historic Preservation Officer.

CUMULATIVE IMPACTS on CULTURAL and HISTORICAL RESOURCES

None of the alternatives would result in cumulative impacts on cultural and historical resources.

5.9 Environmental Consequences for Paleontological Resources

The primary effects would be on Hell Creek and Bug Creek.

EFFECTS COMMON to ALL ALTERNATIVES

Paleontological resources would be protected on the refuge in accordance with the Paleontological Resources Protection Act of 2009. However, the digging of fossils, even when done under a special use permit would result in direct, negative, and long-term effects from the excavation of these resources from their original context. In keeping with the provisions of the Protection Act, the excavation of these important fossils by credible research facilities would contribute to the knowledge and interpretation of the fossil history of the area. The refuge would continue to issue permits to the Museum of the Rockies or others to collect paleontological resources. Recreational digging would be prohibited. The landmarks at Hell Creek and Bug Creek would be conserved.

EFFECTS of ALTERNATIVES B, C, and D

As required by the Protection Act, the Service would work with Montana State University to develop a step-down plan to protect paleontological resources and facilitate uniform permitting for research for credible research. Increased law enforcement, educational, and interpretive exhibits would ensure protection of these resources while providing opportunities for the public to enjoy and learn about these resources. These measures would result in minor benefits to paleontological resources.

CONCLUSION

Under all of the action alternatives, the continued adherence to the Paleontological Resources Protection Act of 2009, along with the completion of a step-down plan and increased management, interpretation, and law enforcement would result in minor benefits to paleontological resources on the refuge over the long-term.

MITIGATION

No mitigation measures would be necessary under any alternative.

CUMULATIVE IMPACTS on PALEONTOLOGICAL RESOURCES

None of the alternatives would result in cumulative impacts on paleontological resources.



5.10 Environmental Consequences for the Socioeconomic Environment

The Service contracted with the USGS through the Policy and Science Assistance Branch of the Biological Resources Division, Fort Collins Science Center for the economic impact analysis for this CCP and EIS. It is important to note that the economic value of a refuge encompasses more than just the effects of the regional economy. Refuges also provide substantial nonmarket values (values for items not exchanged in established markets) such as maintaining endangered species, preserving wetlands, educating future generations, and adding stability to the ecosystem (Carver and Caudill 2007). However, quantifying these types of nonmarket values is beyond the scope of this study.

The methods used to conduct a regional economic impact analysis are described below. An analysis of the management objectives and strategies found in chapter 3 that could affect stakeholders and residents and the local economy is then presented. The refuge management activities of economic concern in this analysis follow:

- Refuge purchases of goods and services within the local community.
- Refuge personnel salary spending.
- Grazing operations.
- Spending in the local community by refuge visitors.
- Revenues generated from Refuge Revenue Sharing program.

METHOD for the REGIONAL ECONOMIC IMPACT ANALYSIS

Economic input-output models are commonly used to determine how economic sectors will and will not be affected by demographic, economic, and policy changes. The economic impacts of the management alternatives for the refuge were estimated using IMPLAN (Impact Analysis for Planning), a regional input-output modeling system developed by the USDA Forest Service. IMPLAN is a computerized database and modeling system that provides a regional input-output analysis of economic activity in terms of 10 industrial groups involving more than 400 economic sectors (Olson and Lindall 1999). The IMPLAN model draws on data collected by the Minnesota IMPLAN Group from multiple Federal and State sources including the Bureau of Economic Analysis, Bureau of Labor Statistics, and the

U.S. Census Bureau (Olson and Lindall 1999). The year 2007 IMPLAN county level data profiles for McCone, Garfield, Fergus, Phillips, Petroleum, and Valley were used in this study. The IMPLAN county level employment data estimates were found to be comparable to the US Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System data for the year 2007.

Because of the way industries interact in an economy, a change in the activity of one industry affects activity levels in several other industries. For example, if more visitors come to an area, local businesses will purchase extra labor and supplies to meet the increase in demand for additional services. The income and employment resulting from visitor purchases from local businesses represent the direct effects of visitor spending within the economy. Direct effects measure the net amount of spending that stays in the local economy after the first round of spending; the amount that does not stay in the local economy is termed a leakage (Carver and Caudill 2007). To increase supplies to local businesses, input suppliers must also increase their purchases of inputs from other industries. The income and employment resulting from these secondary purchases by input suppliers are the indirect effects of visitor spending within the economy. Employees of the directly affected businesses and input suppliers use their incomes to purchase goods and services. The resulting increased economic activity from new employee income is the induced effect of visitor spending. The indirect and induced effects are known as the secondary effects of visitor spending. "Multipliers" (or "response coefficients") capture the size of the secondary effects, usually as a ratio of total effects to direct effects (Stynes 1998). The sums of the direct and secondary effects describe the total economic impact of visitor spending in the local economy.

For each alternative, regional economic effects from the IMPLAN model are reported for the following categories:

- Local output represents the change in local sales or revenue.
- Employment represents the change in number of jobs generated in the region from a change in regional output. IMPLAN estimates for employment include both full- and part-time workers, which are measured in total jobs.
- Labor income includes employee wages and salaries, including income of sole proprietors and payroll benefits.

The CCP provides long-range guidance and management direction to achieve refuge purposes over a 15-year timeframe. The economic impacts reported in this report are on an annual basis in 2007 dollars. Large management changes often take several years

to achieve. The estimates reported for alternatives B, C, and D represent the final economic effects after all changes in management have been implemented.

ECONOMIC IMPACTS of ALTERNATIVE A

The economic impacts from revenue-sharing payments, refuge administration, public use activities, and other refuge management activities associated with livestock grazing are analyzed.

Revenue Sharing

Forty percent of the acreage within the refuge boundary is under the primary jurisdiction of the Service. The majority of the acreage (51 percent) falls under the primary jurisdiction of the USACE, with the Service having secondary jurisdiction in those areas. The Montana DNRC and private landowners own the remaining acreages. Under provisions of the Refuge Revenue Sharing Act, local counties receive an annual payment for lands that have been purchased by full fee-simple acquisition by the Service. Table 28 shows the Service fee acquisition acreage in each surrounding county.

Table 28. Full fee-simple acquisition acreage and refuge revenue-sharing payments for the Charles M. Russell and UL Bend refuges (fiscal year 2008).

<i>County</i>	<i>Full Fee-simple Acquisition (acres)</i>	<i>Refuge Revenue-sharing Payment (\$)</i>
Fergus	2,512	2,626
Garfield	5,952	6,819
McCone	2,784	1,325
Petroleum	2,981	2,360
Phillips	12,715	17,347
Valley	6,455	4,652
Totals	24,935	25,684

Refuge revenue-sharing payments are based on the greater of 75 cents per acre or 0.75 percent of the fair market value of lands acquired by the Service. The exact amount of the annual payment depends on Congressional appropriations, which in recent years have tended to be less than the amount to fully fund

the authorized level of payments. In 2008, the six-county area surrounding the refuge received refuge revenue-sharing payments totaling \$25,684 (refer to table 28). Table 29 shows the resulting economic impacts of refuge revenue-sharing payments under alternative A. Accounting for both the direct and secondary effects, refuge revenue-sharing payments for alternative A generate total annual economic impacts of \$32.6 thousand in local output, \$7 thousand in labor income, and less than one third of a job in the local impact area.

Refuge Administration

The spending by refuge employees and work-related purchases are identified.

Employees' Personal Purchases. Refuge employees reside and spend their salaries on daily living expenses in communities near the refuge thereby generating impacts within the local economy. Household consumption expenditures consist of payments by individuals/households to industries for goods and services used for personal consumption. The IMPLAN modeling system contains household consumption spending profiles that account for average household spending patterns by income level. These profiles also capture average annual savings and allow for leakage of household spending to outside the region. The current approved refuge staff consists of 28 permanent and 21 seasonal employees for alternative A, as shown in table 6 in chapter 3.

Based on fiscal year 2008 salary charts, it was estimated that annual salaries for alternative A would total over \$2.3 million. Table 30 shows the economic impacts associated with spending of salaries in local area by refuge employees under alternative A. For alternative A, salary spending by refuge personnel would directly account for \$1.5 million in local output, 11 jobs, and \$277.2 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional \$375.2 thousand in local output, four jobs, and \$98.9 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative A would generate total economic impacts of \$1.9 million in local output, 15 jobs, and \$376.1 thousand in labor income.

Table 29. Annual economic impacts from refuge revenue-sharing payments by the Charles M. Russell and UL Bend refuges for CCP alternative A (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	25.5	5.0	0
Secondary effects	7.1	2.0	0
Total Economic Impact	32.6	7.0	0

Table 30. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative A (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	1,502.1	277.2	11
Secondary effects	375.2	98.9	4
Total Economic Impact	1,877.3	376.1	15

Work-related Purchases. A wide variety of supplies and services are purchased for refuge operations and maintenance activities. Refuge purchases made in the six-county area, contribute to the local economic impacts associated with the refuge. According to refuge records, approximately 40 percent of the annual nonsalary budget expenditures are spent on goods and services purchased in the six-county area. Major local expenditures include supplies and services related to building maintenance and construction; auto repairs, parts, and fuel; and utilities. Average annual nonsalary expenditures for alternative A are anticipated to be \$1.45 million. Table 31 shows the economic impacts associated with work-related expenditures in the six-county area. For alternative A, work-related expenditures would directly account for almost \$597 thousand in local output, two jobs, and \$59 thousand in labor income in the local economy. Accounting for both the direct and secondary effects, work-related purchases for alternative A would generate total economic impacts of \$670.8 thousand in local output, three jobs, and \$79.8 thousand in labor income.

Public Use and Access

The impact from expenditures by refuge visitors is evaluated.

Refuge Visitors' Expenditures in the Local Economy.

Spending associated with recreational visits to national wildlife refuges generates significant economic activity. The Service report "Banking on Nature: The Economic Benefits of National Wildlife Refuges Visitation to Local Communities" estimated the impact of national wildlife refuges on their local economies (Carver and Caudill 2007). According to the report, more than 34.8 million visits were made to national wildlife refuges in fiscal year 2006, which generated

\$1.7 billion of sales in regional economies. Accounting for both the direct and secondary effects, spending by national wildlife visitors generated nearly 27,000 jobs, and over \$542.8 million in employment income (Carver and Caudill 2007). Approximately 82 percent of total expenditures were from nonconsumptive activities, 12 percent from fishing, and 6 percent from hunting (Carver and Caudill 2007).

The refuge offers a wide variety of year-round accessible recreational opportunities including big game hunting, upland game hunting, fishing, migratory game bird and waterfowl hunting, and nonconsumptive wildlife-viewing, education and photography opportunities. Information on State and regional trends and associated economic impacts of these recreational activities were presented in the previous section. This section focuses on the local economic impacts associated with refuge visitation. Annual refuge visitation estimates are based on several refuge statistic sources including: visitors entering the visitor center or other offices, traffic counters, hunting permits, and general observation by refuge personnel. Annual refuge visitation estimates are on a per visit basis. Table 32 summarizes estimated refuge visitation by type of visitor activity for alternative A.

To determine the local economic impacts of visitor spending, only spending by persons living outside the local six-county area are included in the analysis. The rationale for excluding local visitor spending is twofold. First, money flowing into the local area from visitors living outside the local area (hereafter referred to as nonlocal visitors) is considered new money injected into the local economy. Second, if residents of the local six-county area visit the refuge more or less due to the management changes, they will correspondingly change their spending of their money elsewhere in the six-county area, resulting in no net change to the

Table 31. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative A (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	596.8	58.8	2
Secondary effects	74.0	21.0	1
Total Economic Impact	670.8	79.8	3

Table 32. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative A.

Visitor Activity	Number of Visits	Percentage of Nonlocal Visits	Number of Nonlocal Visits	Number of Hours Spent at the Refuge per Visit	Number of Non-local Visitor Days ²
Consumptive Use					
Fishing	60,000 ¹	50	30,000	8	30,000
Big game hunting	90,000	70	63,000	8	63,000
Waterfowl and migratory bird hunting	2,900	70	2,030	8	2,030
Upland game hunting	10,000	75	7,500	8	7,500
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	87,100	70	60,970	4	30,485
Totals	250,000	—	163,500	—	133,015

¹ These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.

² One visitor day = 8 hours.

local economy. These are standard assumptions made in most regional economic analyses at the local level. Refuge visitation statistics and hunting permits were used to determine the percentage of nonlocal refuge visitors. Table 33 shows the estimated percentage of nonlocal refuge visits for alternative A.

A visitor usually buys a wide range of goods and services while visiting an area. Major expenditure categories include lodging, restaurants, supplies, groceries, and recreational equipment rental. In this analysis we use the average daily visitor spending profiles from the Banking on Nature report (Carver and Caudill 2007) that were derived from the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. The survey reports trip-related spending of State residents and nonresidents for several different wildlife-associated recreational activities. For each recreation activity, spending is reported in the categories of lodging, food and drink, transportation, and other expenses. Carver and Caudill (2007) calculated the average per-person per-day expenditures by recreation activity for each region of the Service. Residents were defined as living within 30 miles of the refuge and nonresidents as living outside the 30-mile radius (Carver and Caudill 2007). For this analysis, nonlocal visitors match the nonresident spending profile definition. Therefore, the spending profile for nonresidents for the Service's region 6 (where the refuge is located) was used. Nonresident average daily spending profiles for big game hunting (\$190.38 per day), small game hunting (\$156.87 per day), migratory bird hunting

(\$67.62 per day), and freshwater fishing (\$112.02 per day) were used to estimate nonlocal visitor spending for refuge hunting and fishing-related activities. The average daily nonresident spending profile for nonconsumptive wildlife recreation (observing, feeding, or photographing fish and wildlife) was used for nonconsumptive wildlife-viewing activities (\$140.46 per day).

The visitor spending profiles are estimated on an average per day (8 hours) basis. Because some visitors only spend short amounts of time on the refuge, counting each refuge visit as a full visitor day would overestimate the economic impact of refuge visitation. To properly account for spending, the annual number of nonlocal refuge visits was converted to visitor days. Refuge personnel estimate that nonlocal hunters and anglers spend a full visitor day (8 hours) on the refuge. Nonlocal visitors that view wildlife on nature trails or participate in other wildlife observation activities typically spend 4 hours (one-half of a visitor day) on the refuge. Table 32 above shows the number of nonlocal visitor days by recreation activity for alternative A.

Total spending by nonlocal refuge visitors was determined by multiplying the average nonlocal visitor daily spending by the number of nonlocal visitor days. Table 33 above summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive (wildlife viewing) visitation for alternative A. Nonlocal refuge visitors would spend over \$20.9 million in six-county area annually. This spending would directly account for \$14.6 million in local output, 204 jobs,

Table 33. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative A (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	8,913.9	2,606.0	123
Wildlife viewing	3,337.6	975.4	51
Subtotal	14,619.2	4,227.8	204
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	3,519.7	946.6	36
Wildlife viewing	1,438.0	379.2	15
Subtotal	5,875.3	1,570.3	60
Total Effects			
Fishing	3,285.3	890.9	39
Hunting	12,433.6	3,552.6	159
Wildlife viewing	4,775.6	1,354.6	66
TOTAL Economic Impact	20,494.5	5,798.1	264

and \$4.2 million in labor income in the local economy. The secondary or multiplier effects would generate an additional \$5.9 million in local output, 60 jobs, and \$1.6 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative A would generate total economic impacts of \$20.5 million in local output, 264 jobs and \$5.8 million in labor income.

Livestock Grazing

Service records indicate there were 42 cattle permits on the refuge in 2008 (refer to table 34). During 2008, approximately 24,000 AUMs were permitted; however, only 18,872 AUMs were actually used. Garfield County had the largest number of permits and AUMs (38.1 percent and 36.2 percent respectively). Both McCone and Phillips Counties had 19 percent of the permits, but Phillips accounted for 25.7 percent of total refuge AUMs while McCone only accounted

for 14.4 percent. Valley County had 11.9 percent of total permits, and accounted 19.2 percent of total refuge AUMs. Both Fergus and Petroleum received less than 10 percent of total permits (9.5 percent and 2.4 percent respectively), while accounting for only 1.9 percent and 2.5 percent of total refuge AUMs.

While total AUMs supplied by the refuge have decreased from 2001 to 2008, revenues received from refuge grazing permits have risen due to increases in refuge grazing fees from \$9.50 per AUM in 2001 to \$17.20 per AUM in 2008.

Table 35 summarizes the estimated economic impact of one AUM of refuge grazing to the six-county area economy if the refuge grazing is considered in isolation. This analysis, conducted by Dr. David Taylor (agricultural economist at the University of Wyoming), was estimated from a modified 2007 IMPLAN model of the six-county area. These estimates are based on the 1999–2008 average value of production for cow/calf operations in the northern Great Plains region of the United States (Economic Research Service 2009), which includes the refuge area, and a 2006 University of Idaho cow/calf budget (a specific budget for the six-county area was not available, the Idaho budget was determined to be the best match). On a per AUM basis, the average value of production was \$41.09. Due to economic linkages between ranching and the rest of the six-county area economy, the total output from the production associated with one AUM of grazing was estimated to be \$79.52. This represents the total economic activity that occurs within the region from production from one AUM of livestock grazing. Because of this eco-

Table 34. Grazing permits and AUMs for the Charles M. Russell and UL Bend refuges (2008).

<i>County</i>	<i>Number of Permits</i>	<i>Number of AUMs</i>
Fergus	4	359
Garfield	16	6,839
Petroleum	1	468
Phillips	8	4,849
McCone	8	2,726
Valley	5	3,631
Total	42	18,872

Table 35. Economic impact of grazing on the Charles M. Russell and UL Bend refuges (2007\$).

<i>Impact Aspect</i>	<i>Value Per AUM</i>	<i>Total for AUMs Permitted (24,000) at the Refuge</i>	<i>Total for AUMs of Actual Use (18,872) at the Refuge</i>
Value of production	\$41.09	\$986,160	\$775,450
Total economic impact (output)	\$79.52	\$1,908,480	\$1,500,620
Total labor earnings	\$18.17	\$436,080	\$342,993
Total employment	0.000741 job	18 jobs	14 jobs
Average earnings per job	\$24,532.00	\$24,532	\$24,532

Source: David Taylor, University of Wyoming (2009).

conomic activity, it is estimated that \$18.17 of labor income are generated throughout the local economy and .000741 jobs are supported per AUM of livestock grazing. The .000741 jobs represent about one job for every 1,350 AUMS of livestock grazing. Average earnings per job for this employment are \$24,532 per year.

For alternative A, the current level of permitted refuge grazing (24,000 AUMs) would generate \$986.2 thousand of production in six-county area annually. This production would account for \$1.9 million in total economic output, \$436 thousand in labor earnings, and 18 jobs in the local economy (refer to table 35). The current level of AUMs actually used on the refuge (18,872 AUMs) would generate \$775.5 thousand of production in six-county area annually. This production would account for \$1.5 million in total economic output, \$343 thousand in labor earnings, and 14 jobs in the local economy (refer to table 35).

Summary of Economic Impacts for Alternative A

Table 36 summarizes the direct and total economic impacts of refuge management activities for alternative A in the six-county area. Under alternative A,

refuge management activities directly related to all refuge operations generate an estimated \$16.7 million in local output, 217 jobs and \$4.6 million in labor income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$23.1 million in local output, 282 jobs, and \$6.3 million in labor income. In addition, grazing on refuge lands generates \$1.5 million in total output, 14 jobs, and \$343 thousand in labor income in the six-county area economy. The economic impacts associated with grazing were not included in the summary of refuge management activities for alternative A (refer to table 36). Grazing would be on a prescriptive basis for all other alternatives where the specific number of AUMs are unknown; therefore, grazing impacts were not analyzed.

In 2007, total labor income was estimated at \$466.4 million and total employment was estimated at 17,945 jobs for the six-county area (Minnesota IMPLAN Group 2007). Excluding grazing operations, total economic impacts associated with refuge operations under alternative A represents 1.3 percent of total income and 1.6 percent of total employment in the overall six-county area economy. Total

Table 36. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative A (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,098.9	336.0	13
Total effects	2,548.1	455.9	18
Public Use			
Direct effects	14,619.2	4,227.8	204
Total effects	20,748.6	5,798.1	260
Aggregate Impacts			
Direct effects	16,743.6	4,568.8	217
Total effects	23,075.2	6,261.0	282

Note: Economic impacts associated with grazing are not included.

economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, Fort Peck, Jordan, and Malta where most of the refuge's public use-related economic activity occurs.

ECONOMIC IMPACTS of ALTERNATIVE B

The economic impacts under alternative B from revenue sharing, refuge administration, public use activities, and other management activities are analyzed.

Revenue Sharing

The effects would be the same as for alternative A.

Refuge Administration

The impact from staff purchases and work-related purchases are evaluated.

Employees' Personal Purchases. Proposed staff for alternative B includes all approved staff positions (refer to table 6 in chapter 3) plus five additional positions. The new positions are an outdoor recreation planner, law enforcement officer, refuge operations specialist, range technician, and a technician. Table 37 shows the economic impacts associated with spending of salaries in the six-county area by refuge employees under alternative B. For alternative B, salary spending by refuge personnel would directly account for \$1.7 million in local output, 13 jobs, and \$306.7 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional \$415.1 thousand in local output, four jobs, and \$109.8 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative B would generate total economic impacts of \$2.1 million in local output, 17 jobs, and \$416.5 thousand in labor income.

Due to the increased personnel levels for alternative B, the associated economic effects of staff salary spending would generate \$199.6 thousand more in local output, two more jobs, and \$40.4 thousand more in labor income than alternative A.

Work-related Purchases. Nonsalary expenditures for alternative B are anticipated to increase in proportion with the salary increase for the new staff positions for a total annual nonsalary budget of \$1.61 million (an 11-percent increase compared to alternative A). Table 38 shows the economic impacts associated with work-related expenditures in the six-county area for alternative B. These estimates assume 40 percent of the nonsalary budget will be spent on goods and services purchased in the six-county area (same as current and alternative A). Work-related expenditures under alternative B would directly account for \$660.3 thousand in local output, two jobs, and \$65.1 thousand in labor income in the local economy. Accounting for both the direct and secondary effects, work-related purchases for alternative B would generate a total economic impact of \$742.2 thousand in local output, three jobs, and \$88.4 thousand in labor income. Due to the increased nonsalary expenditures for alternative B, the associated economic effects of work-related purchases would generate \$71.3 thousand more in local output and \$8.6 thousand more in labor income than alternative A.

Public Use and Access

Visitor expenditures are evaluated.

Refuge Visitors' Expenditures in the Local Economy. Changes in refuge management activities can affect recreational opportunities offered and visitation levels. Table 39 shows the estimated visitation levels

Table 37. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative B (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	1,661.8	306.7	13
Secondary effects	415.1	109.8	4
Total Economic Impact	2,076.9	416.5	17

Table 38. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative B (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	660.3	65.1	2
Secondary effects	81.9	23.3	1
Total Economic Impact	742.2	88.4	3

Table 39. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative B.

<i>Visitor Activity</i>	<i>Number of Visits</i>	<i>Percentage of Nonlocal Visits</i>	<i>Number of Nonlocal Visits</i>	<i>Number of Hours Spent at the Refuge per Visit</i>	<i>Number of Non-local Visitor Days²</i>
Consumptive Use					
Fishing	60,000 ¹	50	30,000	8	30,000
Big game hunting	85,000	70	59,500	8	59,500
Waterfowl and migratory bird hunting	3,000	70	2,100	8	2,100
Upland game hunting	12,000	75	9,000	8	9,000
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	93,000	70	65,100	4	32,550
Totals	253,000	—	165,700	—	133,150

¹ These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.

² One visitor day = 8 hours.

associated with each visitor activity for alternative B. Under alternative B, annual visitation is anticipated to increase for waterfowl hunting (3 percent), upland game hunting (20 percent), and nonconsumptive use activities (7 percent) compared to alternative A (refer to table 33 under alternative A above). No change is anticipated for fishing activities while big game hunting is anticipated to decrease by 6 percent compared to alternative A.

Table 40 summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive visitation for alternative B. Nonlocal refuge visitors would spend over \$20.8 million in the six-county area annually. This spending would directly account for \$14.6 million in local output, 203 jobs, and \$4.2 million in labor income in the local economy. The secondary or multiplier effects would generate an additional \$5.9 million in local output, 60 jobs, and \$1.6 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative B would generate total economic impacts of \$20.4 million in local output, 263 jobs, and \$5.8 million in labor income. Even though visitation increased slightly (135 total nonlocal visitor days) compared to alternative A, the increase in waterfowl hunting (70 visitor days with an average spending of \$67.62 per day), upland game hunting (1,500 visitor days with an average spending of \$156.87 per day), and nonconsumptive use activities (2,065 visitor days with an average spending of \$140.46 per day) does not off-

set the decrease in big game hunters (3,500 visitor days with an average spending of \$190.39 per day). Therefore, for alternative B, the associated economic effects of refuge visitation would be less than alternative A by \$54.9 thousand in local output, one job, and \$12.5 thousand in labor income.

Livestock Grazing

For alternative B, refuge management will move towards a prescriptive grazing regime to meet specific wildlife and/or habitat goals and objectives. Within 4–7 years, a prescriptive grazing plan would be developed for 50–75 percent of the refuge. As a result, the level of grazing could be reduced or increased for short periods.

As shown in table 23 in chapter 4, the refuge supplies less than 1 percent of total AUMs in the six-county area. Therefore, changes to refuge grazing levels would not be significant for the six-county economy but could impact individual ranches with refuge grazing permits. The refuge grazing impacts in table 35 under alternative A assume that the only affect on the ranching operation from refuge grazing is the direct production associated with the refuge AUMs. Although most ranches are typically only partially dependent on Federal land grazing for forage, this forage source can be a critical part of their livestock operation due to the rigidity of seasonal forage availability (Taylor et al. 2008). Therefore, potential reductions in income and net ranch returns can be greater than just the direct economic loss from reduc-

Table 40. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative B (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	8,641.8	2,529.0	119
Wildlife viewing	3,563.7	1,041.5	54
Subtotal	14,573.2	4,216.9	203
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	3,413.4	919.3	35
Wildlife viewing	1,535.4	404.9	16
Subtotal	5,866.4	1,568.7	60
Total Effects			
Fishing	3,285.3	890.9	39
Hunting	12,055.2	3,448.3	154
Wildlife viewing	5,099.1	1,446.4	70
TOTAL Economic Impact	20,439.6	5,785.6	263

tions in Federal grazing AUMs (Rowe and Bartlett 2001, Taylor et al. 2008, Van Tassell and Richardson 1998). The level of an increased impact above the direct production associated with refuge AUMs would depend on a number of factors including the individual ranch's level of dependency on refuge grazing, the magnitude of the proposed change in grazing, the financial solvency of the ranch, and the availability of alternative sources of forage (Taylor et al. 2008).

Summary of Economic Impacts for Alternative B

Table 41 summarizes the direct and total economic impacts of refuge management activities for alternative B in the six-county area. Excluding grazing operations, refuge management activities directly related to refuge operations would generate an estimated \$16.9 million in local output, 218 jobs and \$4.6 million in labor income in the local economy under

Table 41. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative B (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,322.1	371.8	15
Total effects	2,819.1	504.9	20
Public Use			
Direct effects	14,573.2	4,216.9	203
Total effects	20,439.6	5,785.6	263
Aggregate Impacts			
Direct effects	16,920.8	4,593.7	218
Total effects	23,291.3	6,297.5	283

Note: Economic impacts associated with grazing are not included.

alternative B. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$23.3 million in local output, 283 jobs and \$6.3 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative B represents 1.4 percent of total income and 1.6 percent of total employment in the overall six-county area economy. Total economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, Fort Peck, Jordan, and Malta where most of the refuge public use-related economic activity occurs.

Table 42 summarizes the change in economic effects associated with refuge operations under alternative B as compared to alternative A. Due to increases in refuge administration and decreases in big game hunting, alternative B would generate \$216.0 thousand more in local output, \$36.4 thousand more in labor income and one more job as compared to alternative A.

ECONOMIC IMPACTS of ALTERNATIVE C

The economic impacts under alternative C as a result of revenue sharing, refuge administration, public use activities, and other management activities are evaluated.

Revenue Sharing

The effects would be the same as for alternative A.

Refuge Administration

The purchases by staff in the communities or other work-related purchases are evaluated.

Employees' Personal Purchases. Proposed staff for alternative C includes all current staff positions (refer to table 6 in chapter 3) plus seven additional positions. The new positions are: two outdoor recreation planners; two maintenance workers, law enforcement officer; station manager (UL Bend National Wildlife Refuge), and a range technician. Table 43 shows the economic impacts associated with spending of salaries in the six-county area by refuge employees under alternative C. For alternative C, salary spending by refuge personnel would directly account for \$1.7 million in local output, 13 jobs, and \$321.5 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional \$435.1 thousand in local output, four jobs, and \$114.7 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative C would generate total economic impacts of \$2.2 million in local output, 17 jobs, and \$436.2 thousand in

Table 42. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative B compared with CCP alternative A (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Refuge Revenue Sharing			
Direct effects	0	0	0
Total effects	0	0	0
Refuge Administration			
Direct effects	+223.2	+35.8	+2
Total effects	+270.9	+48.9	+2
Public Use			
Direct effects	-46.0	-10.9	-1
Total effects	-309.0	-12.5	+3
Aggregate Impacts			
Direct effects	+177.2	+24.9	+1
Total effects	+216.0	+36.4	+1

Table 43. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative C (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	1,742.0	321.5	13
Secondary effects	435.1	114.7	4
Total Economic Impact	2,177.1	436.2	17

labor income. Due to the increased personnel levels for alternative C, the associated economic effects of staff salary spending would generate \$300 thousand more in local output, two more jobs, and \$60.1 thousand more in labor income than alternative A.

Work-related Purchases. Nonsalary expenditures for alternative C are anticipated to increase in proportion with the salary increase for the new staff positions for a total annual nonsalary budget of \$1.68 million (16-percent increase compared to alternative A). Table 44 shows the economic impacts associated with work-related expenditures in the six-county area for alternative C. These estimates assume 40 percent of the nonsalary budget will be spent on goods and services purchased in the six-county area (same as current and alternative A). Work-related expenditures under alternative C would directly account for \$692.2 thousand in local output, two jobs, and \$68.2 thousand in labor income in the local economy. Accounting for both the direct and secondary effects,

work-related purchases for alternative B would generate a total economic impact of \$778.0 thousand in local output, three jobs and \$92.6 thousand in labor income. Due to the increased nonsalary expenditures for alternative B, the associated economic effects of work-related purchases would generate \$107.2 thousand more in local output and \$12.8 thousand more in labor income than alternative A.

Public Use and Access

The impact from visitor expenditures is evaluated.

Refuge Visitors' Expenditures in the Local Economy. In Table 45, the estimated visitation levels associated with each visitor activity are shown for alternative C. Under alternative C, visitation increases are anticipated for all activities except fishing as compared to alternative A (refer to table 32).

Table 46 summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive visitation for alterna-

Table 44. Local economic impacts of work-related purchases by the Charles M. Russell and UL Bend refuges for CCP alternative C (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	692.2	68.2	2
Secondary effects	85.8	24.4	1
Total Economic Impact	778.0	92.6	3

Table 45. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative C.

<i>Visitor Activity</i>	<i>Number of Visits</i>	<i>Percentage of Nonlocal Visits</i>	<i>Number of Nonlocal Visits</i>	<i>Number of Hours Spent at the Refuge per Visit</i>	<i>Number of Non- local Visitor Days²</i>
Consumptive Use					
Fishing	60,000 ¹	50	30,000	8	30,000
Big game hunting	100,000	70	70,000	8	70,000
Waterfowl and migratory bird hunting	3,500	70	2,450	8	2,450
Upland game hunting	15,000	75	11,250	8	11,250
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	117,585	70	82,310	4	41,155
Totals	296,085	—	196,010	—	154,855

¹ These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.

² One visitor day = 8 hours.

Table 46. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative C (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	10,240.0	2,990.2	141
Wildlife viewing	4,505.8	1,316.8	69
Subtotal	17,113.5	4,953.4	240
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	4,045.0	1,087.5	41
Wildlife viewing	1,941.3	511.9	20
Subtotal	6,903.9	1,843.9	70
Total Effects			
Fishing	3,285.3	890.9	39
Hunting	14,285.0	4,077.7	182
Wildlife viewing	6,447.1	1,828.7	89
TOTAL Economic Impact	24,017.4	6,797.3	310

tive C. Nonlocal refuge visitors would spend almost \$23.4 million in the six-county area annually. This spending would directly account for \$17.1 million in local output, 240 jobs, and \$5 million in labor income in the local economy. The secondary or multiplier effects would generate an additional \$6.9 million in local output, 70 jobs, and \$1.8 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative C would generate total economic impacts of \$24 million in local output, 310 jobs and \$6.8 million in labor income. Due to the increased visitation levels (except for fishing) under alternative C, the associated economic effects of visitor spending would generate \$3.5 million more in local output, 46 more jobs, and \$999.2 thousand more in labor income than alternative A.

Livestock Grazing

For alternative C, refuge management will gradually move towards a prescriptive grazing regime on those units that are fenced or are currently not assigned a permit holder. As with alternative B prescriptive grazing will be initiated to meet specific wildlife and/or habitat objectives. As a result, the level of grazing will remain consistent from year-to-year with some fluctuations due to units being prescriptive grazed to meet goals and objectives.

As shown in table 23 in chapter 4, the refuge supplies less than 1 percent of total AUMs in the six-county area. Therefore, changes to refuge grazing levels would not be significant for the six-county economy but could impact individual ranches with refuge grazing permits. The refuge grazing impacts in table 35

under alternative A assume that the only affect on the ranching operation from refuge grazing is the direct production associated with the refuge AUMs. Although most ranches are typically only partially dependent on Federal land grazing for forage, this forage source can be a critical part of their livestock operation due to the rigidity of seasonal forage availability (Taylor et al. 2008). Therefore, potential reductions in income and net ranch returns can be greater than just the direct economic loss from reductions in Federal grazing AUMs (Van Tassell and Richardson 1998, Rowe and Bartlett 2001, Taylor et al. 2008). The level of an increased impact above the direct production associated with refuge AUMs would depend on a number of factors including the individual ranch's level of dependency on refuge grazing, the magnitude of the proposed change in grazing, the financial solvency of the ranch, and the availability of alternative sources of forage (Taylor et al. 2008).

Summary of Economic Impacts for Alternative C

Table 47 summarizes the direct and total economic impacts of all refuge management activities for alternative C in the six-county area. Under alternative C, refuge management activities directly related to all refuge operations generate an estimated \$19.6 million in local output, 255 jobs, and \$5.4 million in labor income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$27 million in local output, 330 jobs, and \$7.3 million in labor income. Excluding grazing operations, total economic impacts

Table 47. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative C (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,434.2	389.7	15
Total effects	2,955.1	528.8	20
Public Use			
Direct effects	17,113.5	4,953.4	240
Total effects	24,017.4	6,797.3	310
Aggregate Impacts			
Direct effects	19,573.2	5,348.1	255
Total effects	27,005.1	7,333.1	330

Note: Economic impacts associated with grazing are not included.

associated with refuge operations under alternative C would represent 1.6 percent of total income and 1.8 percent of total employment in the overall six-county area economy. Total economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, Fort Peck, Jordan, and Malta where most of the refuge public use-related economic activity occurs.

Table 48 summarizes the change in economic effects associated with refuge operations under alternative C as compared to alternative A. Due to increases in refuge administration and visitation, alternative C would generate \$3.9 million more in local output, 48 additional jobs and \$1 million more in labor income as compared to alternative A.

ECONOMIC IMPACTS of ALTERNATIVE D

The economic impacts under alternative D from revenue sharing, refuge administration, public use activities, and other management activities are evaluated.

Revenue Sharing

The effects would be the same as for alternative A.

Refuge Administration

The purchases by staff in the communities or other work-related purchases are evaluated.

Employees' Personal Purchases. Proposed staff for alternative D includes all current staff positions (refer to table 6 in chapter 3) plus seven additional positions. The new positions are two outdoor recreation planners; maintenance worker; law enforcement officer; station manager (UL Bend National Wildlife Refuge), range technician, and a technician. Table 49 shows the economic impacts associated with spend-

ing of salaries in the six-county area by refuge employees under alternative D. For alternative D, salary spending by refuge personnel would directly account for \$1.7 million in local output, 13 jobs, and \$321 thousand in labor income in the local economy. The secondary or multiplier effects would generate an additional \$434.4 thousand in local output, four jobs, and \$114.5 thousand in labor income. Accounting for both the direct and secondary effects, salary spending by refuge personnel for alternative C would generate total economic impacts of \$2.2 million in local output, 17 jobs, and \$435.5 thousand in labor income. Due to the increased personnel levels for alternative D, the associated economic effects of staff salary spending would generate \$296 thousand more in local output, two more jobs, and \$59 thousand more in labor income than alternative A.

Work-related Purchases. Nonsalary expenditures for alternative D are anticipated to increase in proportion with the salary increase for the new staff positions, a 16-percent increase (same as alternative C) compared to alternative A. Therefore, the impacts would be the same as for alternative C, as shown in table 44 above.

Public Use and Access

The impact from visitor expenditures is evaluated.

Refuge Visitors' Expenditures in the Local Economy. In table 50, the estimated visitation levels associated with each visitor activity are shown for alternative D. Under alternative D, slight increases in visitation are anticipated for all activities except fishing and upland game hunting as compared to alternative A (refer to table 30 above).

Table 48. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative C compared with CCP alternative A (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Refuge Revenue Sharing			
Direct effects	0	0	0
Total effects	0	0	0
Refuge Administration			
Direct effects	+335.3	+53.7	+2
Total effects	+407.0	+72.8	+2
Public Use			
Direct effects	+2,494.3	+725.6	+36
Total effects	+3,268.8	+999.2	+50
Aggregate Impacts			
Direct effects	+2,829.6	+779.3	+38
Total effects	+3,929.9	+1,072.0	+48

Table 49. Annual local economic impacts of salary spending by employees at the Charles M. Russell and UL Bend refuges for CCP alternative D (2007\$).

<i>Type of Impact</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct effects	1,739.2	321.0	13
Secondary effects	434.4	114.5	4
Total Economic Impact	2,173.6	435.5	17

Table 50. Estimated annual visitation of the Charles M. Russell and UL Bend refuges for CCP alternative D.

<i>Visitor Activity</i>	<i>Number of Visits</i>	<i>Percentage of Nonlocal Visits</i>	<i>Number of Nonlocal Visits</i>	<i>Number of Hours Spent at the Refuge per Visit</i>	<i>Number of Non- local Visitor Days²</i>
Consumptive Use					
Fishing	60,000 ¹	50	30,000	8	30,000
Big game hunting	95,000	70	66,500	8	66,500
Waterfowl and migratory bird hunting	3,000	70	2,100	8	2,100
Upland game hunting	10,000	75	7,500	8	7,500
Nonconsumptive Use					
Nature trails, other wildlife observation, and office visits	95,810	70	67,067	4	33,534
Totals	263,810	—	173,167	—	139,634

¹ These are the fishing visits attributed to the refuge. USACE estimates nearly 160,000 fishing visits annually.² One visitor day = 8 hours.

Table 51 summarizes the total economic impacts associated with current nonlocal fishing, hunting (all types), and nonconsumptive visitation for alternative D. Nonlocal refuge visitors would spend almost \$21.8 million in the six-county area annually. This spending would directly account for \$15.8 million in local output, 221 jobs, and \$4.6 million in labor income in the local economy. The secondary or multiplier effects would generate an additional \$6.4 million in local output, 65 jobs, and \$1.7 million in labor income. Accounting for both the direct and secondary effects, spending by nonlocal visitors for alternative D would generate total economic impacts of \$22.2 million in local output, 287 jobs, and \$6.3 million in labor income. Due to the increased visitation levels (except for fishing and upland game hunting) under alternative D, the associated economic effects of visitor spending would generate \$1.7 million more in local output, 23 more jobs, and \$497.5 thousand more in labor income than alternative A.

Livestock Grazing

For alternative D, refuge management will gradually move towards a prescriptive grazing regime to promote ecological resilience, promote biological diversity, integrity, and heterogeneity across the landscape. Prescriptive grazing will be implemented across 50–75 percent of the refuge within 6–9 years. As a result, the level of grazing could probably be reduced from the current level but could possibly increase for short periods.

As shown in table 23 in chapter 4, the refuge supplies less than 1 percent of total AUMs in the six-

county area. Therefore, changes to refuge grazing levels would not be significant for the six-county economy but could affect individual ranches with refuge grazing permits. The refuge grazing impacts in table 35 under alternative A assume that the only affect on the ranching operation from refuge grazing is the direct production associated with the refuge AUMs. Although most ranches are typically only partially dependent on Federal land grazing for forage, this forage source can be a critical part of their livestock operation due to the rigidity of seasonal forage availability (Taylor et al. 2008). Therefore, potential reductions in income and net ranch returns can be greater than just the direct economic loss from reductions in Federal grazing AUMs (Van Tassell and Richardson 1998, Rowe and Bartlett 2001, Taylor et al. 2008). The level of an increased impact above the direct production associated with refuge AUMs would depend on a number of factors including the individual ranch's level of dependency on refuge grazing, the magnitude of the proposed change in grazing, the financial solvency of the ranch, and the availability of alternative sources of forage (Taylor et al. 2008).

Summary of Economic Impacts for Alternative D

Table 52 summarizes the direct and total economic impacts of all refuge management activities for alternative D in the six-county area. Excluding grazing, refuge management activities directly related to all refuge operations generate an estimated \$18.3 million in local output, 236 jobs and \$5 million in labor income in the local economy under alternative D.

Table 51. Annual economic impacts of spending by nonlocal visitors to the Charles M. Russell and UL Bend refuges for CCP alternative D (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Direct Effects			
Fishing	2,367.7	646.4	30
Hunting	9,803.9	2,872.0	135
Wildlife viewing	3,671.4	1,073.0	56
Subtotal	15,843.0	4,591.4	221
Secondary Effects			
Fishing	917.6	244.5	9
Hunting	3,870.5	1,042.6	40
Wildlife viewing	1,581.8	417.1	16
Subtotal	6,369.9	1,704.2	65
Total Effects			
Fishing	3,285.3	890.9	40
Hunting	13,674.4	3,914.6	175
Wildlife viewing	5,253.2	1,490.1	72
TOTAL Economic Impact	22,212.9	6,295.6	287

Table 52. Summary of economic impacts of all management activities at the Charles M. Russell and UL Bend refuges for CCP alternative D (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Refuge Revenue Sharing			
Direct effects	25.5	5.0	0
Total effects	32.6	7.0	0
Refuge Administration			
Direct effects	2,431.4	389.2	15
Total effects	2,951.6	528.1	20
Public Use			
Direct effects	15,843.0	4,591.4	221
Total effects	22,212.9	6,295.6	287
Aggregate Impacts			
Direct effects	18,299.9	4,985.6	236
Total effects	25,197.1	6,830.7	307

Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$25.2 million in local output, 307 jobs and \$6.8 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative D would represent 1.5 percent of total income and 1.7 percent of total employment in the overall six-county area economy. Total economic effects of refuge operations play a larger role in the communities near the refuge such as Lewistown, Glasgow, and Malta where most of the refuge public use-related economic activity occurs.

Table 53 summarizes the change in economic effects associated with refuge operations under alternative D as compared to alternative A. Due to

increases in visitation and refuge administration, alternative D would generate \$1.6 million more in local output, 19 additional jobs, and \$569.6 thousand more in labor income as compared to alternative A.

IMPACTS on LIVESTOCK PERMITTEES

In addition to economic impacts described above, the effects on livestock grazers from changes in annual grazing to prescriptive grazing including fencing changes, stock pond renovations, and changes in wilderness on current livestock permittees were evaluated. For more information on current livestock grazing, refer to chapter 4 and figure 16.

Table 53. Change in economic impacts for the Charles M. Russell and UL Bend refuges under CCP alternative D compared with CCP alternative A (2007\$).

<i>Impact Aspect</i>	<i>Local Output (\$ thousands)</i>	<i>Labor Income (\$ thousands)</i>	<i>Employment (number of full- and part-time jobs)</i>
Refuge Revenue Sharing			
Direct effects	0	0	0
Total effects	0	0	0
Refuge Administration			
Direct effects	+332.5	+53.2	+2
Total effects	+403.5	+72.1	+2
Public Use			
Direct effects	+1,223.8	+363.6	+17
Total effects	+1,464.3	+497.5	+27
Aggregate Impacts			
Direct effects	+1,556.3	+416.8	+19
Total effects	+2,121.9	+569.6	+25

Alternatives A and C

The alternatives would have varying impacts on current livestock permittees as shown in table 54. Under existing conditions, a minimum of 34 percent of the refuge would be grazed prescriptively, and any change from annual grazing would only occur when grazing units became available through the sale to a third party, or when habitat evaluations are completed and prescriptive grazing is required to meet habitat objectives. Under alternative C, the Service would implement prescriptive grazing on up to 50 percent of the total available grazing lands (this would be about 740,030 acres) within 15 years. The refuge would continue the practice of holding grazing permits as ranches sell their lands to outside parties. Any move to prescriptive grazing would occur mostly on units that would become vacant in the future so the impacts to current permit holders would be minor. Fence removal and stock pond renovations would occur on those units that are managed under prescriptive grazing plan. As compared to alternative A, proposed wilderness units under alternative C would be reduced by 38,114 acres by removing protection on four wilderness units (see figure 9), which

would have minor benefits for some permittees due to fewer access restrictions on fence maintenance work and managing livestock on those units. New boundary fence construction would have negligible to minor impacts on a few permittees that would have pastures that are in common with refuge lands.

Alternatives B and D

Under alternatives B and D there would be moderate to major impacts on some livestock permittees as the Service moved to a greater emphasis on prescriptive grazing over annual grazing (refer to table 54). Under alternative B, the Service would move to prescriptive grazing over 50–75 percent of the refuge in 4–7 years, whereas the timeframe under alternative D would occur over 6–9 years. Over 15 years, a total of 331,278 to 555,023 acres would be prescriptively grazed under alternatives B and D for an increase of 16–41 percent as compared to existing conditions (252,706 acres). Compared to existing conditions where only 662,555 acres of the 740,030 acres are being grazed either by annual or prescriptive grazing under alternatives B and D, the acres with no current Federal grazing allotments could be

Table 54. Acres of grazing lands available under the CCP alternatives for the Charles M. Russell and UL Bend refuges.

EXISTING CONDITIONS 2010							
Total acres of refuge grazing lands = 740,030 ¹							
Acres with no grazing allotments = 77,475 (10%)							
Acres available for grazing = 662,555 (90%)							
Alternative A		Alternative B		Alternative C		Alternative D	
Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total
Area under Annual Grazing							
409,849	55	165,639– 331,278	22–45	331,278– 409,849	45–72	165,639– 331,128	22–45
Area under Prescriptive Grazing ²							
252,706	34+	331,278– 555,023	50–75	252,706– 370,015	Up to 50	331,278– 555,023	50–75
Area with No Grazing Allotments							
77,475	10	Variable		Variable		Variable	
Implementation Timeframe							
Unknown ³		Within 4–7 years		Over 15 years		Within 6–9 years	

¹ Refer to figure 16 in chapter 4. This acreage accounts for all of the Service's lands available for grazing including those with no current grazing allotment, lands grazed under annual grazing, and lands currently grazed under prescriptive grazing. It does not include private or State inholdings within the refuge boundary.

² This acreage would depend on amount of acreage with no grazing allotment. If all of the yellow lands remained with no grazing allotment, 662,555 acres would be available for grazing either prescriptively or under annual grazing; if all of the yellow lands were available for grazing in the future, the highest amount available for prescriptive grazing would be 740,030 acres.

³ This assumes no changes in ranch ownership over 15 years.

prescriptively grazed in the future. Steer operations typically have more flexibility in their operations and could adapt easier to a prescriptive program. Working with existing permittees to develop habitat management plans with a prescriptive grazing component so they can make arrangements in their operations for future grazing needs on the refuge could reduce impacts to some permittees.

Additionally, there would be moderate direct impacts on permittees when the Service removed 25–50 percent of the interior fences; however, there would be a minor economic benefit when the Service issued contracts for this work. There could be moderate to major impacts on permittees when the Service renovated stock ponds to restore natural hydrological conditions of riparian areas down slope. There would be minor to moderate negative impacts due to the closing of 106 miles of road and increasing wilderness acreage in six units by 25,037 acres under alternative B. Under alternative D, the closing of 23 miles of road would result in negligible to minor impacts on livestock owners. There would be a minor benefit with the proposed reduction of three proposed wilderness units (see figure 10) for some permittees due to fewer access restrictions for fence maintenance work or managing livestock on those units.

IMPACTS on STATE GRAZING LANDS

Under all alternatives, the Service would extend agreements that are already in place for aggressive fire suppression activities on DNRC lands. Over time, the use of prescribed fire in Alternatives B and D and to lesser extent in C would reduce heavy fuels, thus reducing the risk for severe wildfires spreading across State lands, but implementation of any alternative would not eliminate the risk for wildfire all together. Implementation of a prescriptive grazing program across 50–75 percent of the refuge in alternatives B and D and up to 50 percent in alternative C could negatively impact DNRC in meeting their statutory obligations of generating revenue for local schools. The degree to which this would occur is not known, but under all alternatives, the Service would work with DNRC to develop special use permits that would allow permittees to continue to graze habitat units. If permittees no longer desired to retain their grazing permit, the Service would work with DNRC to assume permits, providing funding exists.

EFFECTS on ENVIRONMENTAL JUSTICE

Within the spirit and intent of Executive Order 12898, Federal actions to address environmental justice in minority populations and low-income populations, no actions being considered in this draft CCP and EIS would disproportionately place any adverse environ-

mental, economic, social, or health effects on minority or low-income populations as compared to the public.

The Service is committed to ensuring that all members of the public have equal access to America's fish and wildlife resources, as well as equal access to information that would enable them to participate meaningfully in activities and policy shaping.

CONCLUSION

Under alternative A, refuge management activities directly related to all refuge operations generate an estimated \$16.7 million in local output, 217 jobs and \$4.6 million in labor income in the local economy. Including direct, indirect, and induced effects, all refuge activities would generate total economic impacts of \$23.1 million in local output, 282 jobs, and \$6.3 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative A represents 1.4 percent of total income and 1.6 percent of total employment in the overall six-county area economy.

The refuge currently supplies less than 1 percent of total AUMs in the six-county region (about 22,581 AUMs in 2008; see table 23 in chapter 4). While moving toward a greater emphasis on prescriptive grazing could negatively impact individual ranchers holding refuge grazing permits, the overall effects to the counties would be negligible to minor. The specific number of AUMs grazed on the refuge would be difficult to predict with any certainty in light of the uncertainties of ranches changing ownership, potential for droughts, grazing fees, and habitat conditions.

Under alternative B, excluding grazing operations, the refuge would generate an estimated \$16.9 million in local output, 218 jobs, and \$4.6 million in labor income in the local economy, with total economic impacts of \$23.3 million in local output, 283 jobs, and \$6.3 million in labor income. Excluding grazing operations, total economic impacts associated with refuge operations under alternative B represents 1.4 percent of total income and 1.6 percent of total employment in the overall six-county area economy. Due to increases in refuge administration and decreases in big game hunting, alternative B would generate \$216.0 thousand more in local output, 36.4 thousand more in labor income and one more job as compared to alternative A. The overall economic effect of alternative B would be negligible, compared to existing conditions.

Under alternative C, the refuge would generate an estimated \$19.6 million in local output, 255 jobs and \$5.4 million in labor income in the local economy, with total economic impacts of \$27 million in local output, 330 jobs, and \$7.3 million in labor income. Excluding grazing operations, total economic impacts would represent 1.6 percent of total income and 1.8 percent of total employment in the overall six-county area econ-

omy. Due to increases in refuge administration and visitation, alternative C would generate \$3.9 million more in local output, 48 additional jobs and \$1 million more in labor income as compared to alternative A. The overall economic effect of alternative C would be negligible to minor benefits, compared to existing conditions.

Under alternative D, the refuge would generate an estimated \$18.3 million in local output, 236 jobs, and \$5 million in labor income in the local economy, with total economic impacts of \$25.2 million in local output, 307 jobs, and \$6.8 million in labor income. Excluding grazing operations, total economic impacts would represent 1.4 percent of total income and 1.4 percent of total employment in the overall six-county area economy. Due to increases in visitation and refuge administration, alternative D would generate \$2.1 million more in local output, 25 additional jobs, and \$569.6 thousand more in labor income as compared to alternative A. The overall economic effect of alternative D would be minor benefits, compared to existing conditions.

The alternatives would have varying degrees of impacts to livestock permittees as changes in annual and prescriptive grazing, fencing changes, stock pond renovations, and wilderness units occurred. Under existing conditions, about 34 percent of the refuge would be prescriptively grazed and this would not change unless units became available through the sale to a third party, or when habitat conditions dictated a change. Alternative C would implement prescriptive grazing on 50 percent of the refuge in 15 years, but the refuge would continue the practice of holding grazing permits as ranches sold their lands to outside parties. Fence removal or stock pond renovations would only occur on lands that were converted to prescriptive grazing. The elimination of four wilderness units totaling 35,881 acres in alternative C would benefit some permittees due to fewer access restrictions. Overall, there would only be negligible to minor negative impacts in alternatives A and C.

Alternatives B and D would have greater impacts on livestock permittees, and for some these could be moderate to major, as the Service implemented prescriptive grazing on up to 75 percent of the refuge. The schedule would be more aggressive under alternative B than under D. There would be moderate negative impacts on permittees when the Service removed 25–50 percent of the interior fences or renovated stock ponds, although the actual removal of any fencing would bring about a short-term economic benefit as a result of contracting out the work. Alternative B would have the greatest impact on permittees with the closing of 106 miles of road, and an increase in wilderness protection by 25,037 acres, limiting access in some areas. Road closures in alternative D would be minor (23 miles), but some per-

mittees would benefit from the elimination of three wilderness units that reduce access restrictions for fence maintenance or managing livestock. Working with permittees during the development of the HMPs would enable ranchers to make arrangements for future grazing needs.

Implementation of any alternative would not affect existing agreements with DNRC for fire suppression activities nor would it affect access. The greater use of prescribed fire in alternatives B and D and to a lesser extent in alternative C would reduce some of the risk for severe wildfire spreading across State lands. Implementation of a prescriptive grazing program across much of the refuge in alternatives B, D, and to a lesser extent in C could negatively affect DNRC if refuge grazing lands became less attractive to permittees. This could be offset by working with DNRC to assume permits if funding permitted.

MITIGATION

Working closely with ranch permittees and DNRC during the development of the HMPs would enable them to plan in advance for changes in their operations.

CUMULATIVE IMPACTS on the SOCIOECONOMIC ENVIRONMENT

As described in chapter 4, land ownership patterns near the refuge are continuing to see a transition toward nontraditional ownership and management (such as the American Prairie Foundation's 87,000-acre preserve and The Nature Conservancy's 63,000-acre Matador Ranch), along with the purchase of private ranches by absentee owners. The 2009 purchase and retirement of two grazing allotments on the refuge by the National Wildlife Foundation (totaling about 45,000 acres) are consistent with this trend. While the reduction or elimination of grazing on private conservation lands is generally believed to have a negative economic impact on local communities, some individual ranchers have benefitted financially by the opportunity to sell their land or grazing interests to outside entities. The economic impacts of absentee ranch owners are less apparent.

While current economic and demographic trends in the six-county region surrounding the refuge are likely to have negative impacts on local communities, none of the refuge management alternatives would contribute to those impacts. Instead, all of the alternatives would likely result in negligible to minor cumulative benefits to local communities by increasing income, jobs, and (under action alternatives B–D) additional opportunities for recreation and tourism.

Changes in grazing management and stocking rates in alternatives B and D would likely further reduce the availability of grazing land in the region.

However, considering that the refuge currently supplies less than 1 percent of all AUMs in the region, the regional cumulative effect of refuge management actions, when combined with the economic effects of other land management changes, would be negligible.

The real or perceived effect of land use and management changes on the social and traditional values of nearby communities is an important consideration. As described in chapter 4, many residents in the area have had family ties to the land and the agricultural economy for several generations, strive to maintain those economic and social traditions, and feel threatened by land use (particularly grazing) changes both on and off the refuge. Others may see economic opportunities from conservation-oriented property sales or increased recreational activity. It is difficult to quantify these types of impacts, or to identify the differences between perceived or actual impacts. If changes in land ownership patterns and management in the region has a negative impact on social and traditional values, the changes in grazing management under alternatives B and D would result in minor cumulative effects. Alternatives A and C would result in negligible cumulative benefits, by maintaining existing management approaches.

5.11 Irreversible and Irretrievable Resource Commitments

The National Environmental Policy Act requires a discussion of any irreversible or irretrievable commitment of resources that would result from implementing the alternatives. An irreversible commitment of resources means nonrenewable resources are consumed or destroyed. These resources are permanently lost due to plan implementation. In contrast, an irretrievable commitment of resources is the loss of resources or resource production, or use of renewable resources during the 15-year of the plan.

All alternatives would result in an irreversible commitment of soil resources. Topsoil would be removed before a facility construction for the use in revegetation of disturbed areas or the excavation of fossils. Even with the best management practices, some irreversible soil loss due to erosion would occur. Livestock grazing, particularly in riparian areas would continue contributing to soil erosion although the amounts would vary by alternative. The use of prescribed fire would improve plant vigor and health, but there could be some temporary losses of soil. Major wildfires could lead to severe soil erosion.

Loss of soil, as well as changes to visual resources due to facility development would be an irretrievable commitment of resources.

The digging of fossil resources would be an irreversible commitment of resources. These resources would no longer be in the ground in their original context, although they would continue to be available to the public for research and educational purposes.

Federal funding for staff and operation would be an irretrievable commitment of resources. These resources would not be available for other Federal programs or projects.

Fossil fuel used by motor vehicles, boats, and equipment, either by the Service or the public would represent an irreversible commitment of resources because their use is lost for future generations. In addition they would result an irretrievable impact on air quality and global climate change.

Like fossil fuel, prescribed fires and wildfires would emit carbon and particulates in the air and would result in irretrievable impact on air quality and global climate change.

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

Historical uses of the refuge including early settlement, agricultural uses, roads and access, livestock grazing and developed recreational areas, have affected the long-term productivity of the refuge's ecological environment. Short-term uses of the refuge associated with implementing the CCP include: the restoration of former agricultural areas; restoration of riparian areas or water impoundments; construction of facilities or boundary fences; removal of fencing; and improving and/or maintaining roads. In implementing the CCP, modifications, and enhancement of the natural environment using prescribed fire, livestock grazing, and hunting to control wildlife populations would contribute to the maintenance and enhancement of long-term productivity of the refuge environment.

5.13 Adherence to Planning Goals

The following sections are descriptions by goal of how and how well each alternative meets that goal for the refuge. Table 55 summarizes this discussion.

Table 55. Ratings for how well the actions in the CCP alternatives meet the goals for the Charles M. Russell and UL Bend refuges.

Goal	Alternatives—Adherence to Goals*			
	A	B	C	D
Habitat and wildlife management	+	*	*	●
Threatened and endangered species and species of concern	*	●	*	●
Research and science	*	●	*	●
Fire management	+	●	*	●
Public use and education	*	*	●	●
Wilderness	●	●	+	*
Cultural and paleontological resources	●	●	●	●
Refuge operations and partnerships	*	●	●	●

Ratings note that an alternative either satisfies (●) the goal, partially satisfies () the goal, or does not satisfy (+) the goal.

HABITAT and WILDLIFE MANAGEMENT

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

The most important component of this goal is the first sentence. Alternatives A and C would not restore biological integrity, environmental health or ecological diversity. Alternative C would take some steps toward improving existing conditions but would only minimize damaging effects in some areas. Alternative B would only partially improve biological integrity, environmental health, and ecological diversity primarily because maximizing populations would not necessarily improve biological diversity, integrity, and environmental health. Alternative D would fully meet the biological integrity, health, and diversity goal, plus have an emphasis on improving resiliency. All alternatives would work with others to reduce and control the spread of invasive species, but alternative A would only maintain existing program levels whereas alternatives B, C, and D would work to achieve greater reductions (25–50 percent). Therefore, alternative A does not satisfy this goal.

THREATENED and ENDANGERED SPECIES and SPECIES of CONCERN

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

All alternatives would meet basic requirements of this goal; however, alternative A would only maintain the status quo. There would not be any extra effort to contribute to the preservation of threatened and endangered species, so it only partially satisfies the goal, where as alternatives B, C, and D would protect, conserve, and enhance threatened and endangered species.

RESEARCH and SCIENCE

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



A researcher checks a deer for signs of disease.

Alternative A would only maintain existing research programs. Alternative C would not advance the understanding of ecological processes although research would continue under all alternatives. Alternatives B and D would fully meet the goal.

FIRE MANAGEMENT

The goal is to manage wildland fire using a management response that promotes fire's natural role in shaping the landscape while protecting values at risk.

Alternatives A and C would not promote fire's natural role while alternatives B and D would. All alternatives would protect private property.

PUBLIC USE and EDUCATION

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

All alternatives would provide for a variety of hunting and fishing opportunities. Alternative C would focus on more opportunities (quantity) whereas alternative D would focus on providing quality experiences. There would be minor increases in hunting visitors in alternatives C and D and a negligible decrease in alternative B.

Alternative A would not have an outdoor recreation planner and there would very limited environmental education opportunities and few improvements for nonconsumptive wildlife-dependent users. Alternative B would have one outdoor recreation planner, which would enable the refuge to improve programming but would still be limited and would not advance wildlife-dependent public uses or environmental education program to any great degree. Visitation would in essence remain stagnant over 15 years. Alternatives C and D would staff two outdoor recreation planners, which would enable the refuge to provide for more quality wildlife-dependent recreation and environmental education programs and would seek some moderate increases in the number of visitors participating in those programs.

WILDERNESS

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

Alternative A would maintain the status quo and no wilderness would decrease. Alternative B would improve and promote wilderness quality. Alternative C would remove more protected acreage than any other alternative and therefore would not meet

the goal. Alternative D would improve and promote wilderness quality in some areas, but would remove some areas from protected status; therefore, it would only partially meet the goal.

CULTURAL and PALEONTOLOGICAL RESOURCES

The goal is to identify, value, and preserve the paleontology and cultural resources of Charles M. Russell National Wildlife Refuge to connect refuge staff, visitors, and the community to the area's prehistoric and historic past.

All alternatives would identify, value, and preserve paleontological and cultural resources.

REFUGE OPERATIONS and PARTNERSHIPS

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

All alternatives would maintain existing partnerships. Alternative A would not have a volunteer program nor would the refuge work to increase conservation strategies across the landscape, whereas alternatives B, C, and D would seek to increase partnerships across the conservation landscape and initiate a volunteer and friends program.

5.14 Unavoidable Adverse Effects

Generally most adverse and negative environmental effects associated with implementation of the CCP would be short term and minimal. During construction of additional facilities on the refuge, wildlife would be disturbed and temporarily displaced. Facilities construction also would result in minor, short-term disturbance of soils and erosion. Excavation of paleontological resources would result in short-term disturbance of soils and the removal of fossils from the refuge. The use of prescribed fire would result in short-term losses of vegetation. The long-term effects of implementing the CCP would be beneficial to the biological community and the diversity and productivity of the refuge ecosystem. Moving toward a prescriptive grazing and fire program would enable the refuge to use grazing to meet specific habitat objectives. Restoring former agricultural fields would reduce the growing infestation of invasive species on the refuge. There would be some increases in the level of visitation, particularly in alternatives C and D, but they would be minor to

moderate differences over existing conditions. With proper planning and placement of new facilities, effects on refuge resources would be minimal.

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

Actions considered in this environmental impact statement do not appear to conflict with USACE, BLM or tribal goals, objectives, policies, or plans.

Where USACE has primary jurisdiction and the Service has secondary jurisdiction, a memorandum of understanding provides guidance on how habitat and wildlife resources are managed. None of the actions in this CCP and EIS conflicts with any memorandum of understanding the Service has with USACE. The Service did not analyze issues related to lake levels on Fort Peck, the developed recreation areas, real estate activities related to the cabin sales on the east end of the refuge, or fishing tournaments as these are actions where USACE has primary jurisdiction.

The Service has consulted with Fort Belknap and Fort Peck Tribes in the development of this CCP and EIS. The tribes are interested in collecting and using plants or other resources for ceremonial and traditional purposes. The CCP and EIS does not conflict with this interest as the tribes only need to contact the refuge manager and obtain a special use permit. Although bison are not currently managed on the refuge, many of the tribes consider them as central to their culture. This CCP and EIS has proposed and evaluated an option in alternatives B and D to only consider a reintroduction of bison if the MFWP led the issue and addressed all pertinent concerns of the Service and the public. Any future bison restoration would be a part of a separate planning effort involving multiple partners. Additionally, the tribes also have any interest in conducting ceremonial hunts on the refuge as elk and deer are also central to their culture. Because hunting is regulated by the State of Montana, the tribes would need to work with State on arranging for a ceremonial hunt on the refuge.

As a cooperating agency, the State of Montana has played an important role in the development of this CCP and EIS. None of the actions in this CCP and EIS would close or take away access to State lands within the refuge. The Service would eliminate any end-of-route effects such as parking on State lands.

The Service has coordinated closely with MFWP in the development of this CCP and EIS and has re-

viewed all State management plans including those for deer, elk, prairie dogs, fish, and many other wildlife species. Nearly all of the objectives for wildlife management are consistent with MFWP's objectives. There are some differences in opinions with MFWP on the management of mule deer populations under alternatives B and D (the proposed action) about herd composition targets. The refuge views sex and age structure as an important consideration in managing the harvest of native ungulates. Although hunting regulations on national wildlife refuges cannot be more liberal than State hunting regulations, they can be more restrictive. In addition, MFWP would like to see the Service reopen a number of refuge roads that have been closed in the past including those within proposed wilderness units. By policy, roads are not allowed in wilderness, and the Service has not considered an option to reopen roads within wilderness. However, in compliance with the Service's planning policy, the refuge has reevaluated all the proposed wilderness units in this CCP and EIS to make sure they meet the qualities set forth in the Wilderness Act. Under alternatives C and D, the Service has analyzed the removal of several wilderness units from the wilderness study.

Although no new roads would be proposed in the CCP and EIS, the removal of wilderness protection in some units could facilitate easier game retrieval.

The six adjacent counties and the Missouri River Council of Conservation Districts have also been cooperating agencies in this planning effort. The counties and Conservation Districts have expressed a number of concerns regarding the Service's actions in this planning process. Foremost, the counties and the conservation districts are opposed to any change that would negatively affect livestock grazers on the refuge (refer to upland objectives in chapter 3 and the discussion on other effects on livestock operations).

The counties are also concerned about a number of issues related to roads and particularly about recognizing rights-of-way under R.S. 2477 or where they believe they have a valid county-petitioned right-of-way.

This CCP and EIS does not negate any valid rights of way the counties may have, but determining the legal validity of any right of way is outside the scope of the plan. The roads that are reflected in alternative A reflect the refuge's current guide map.

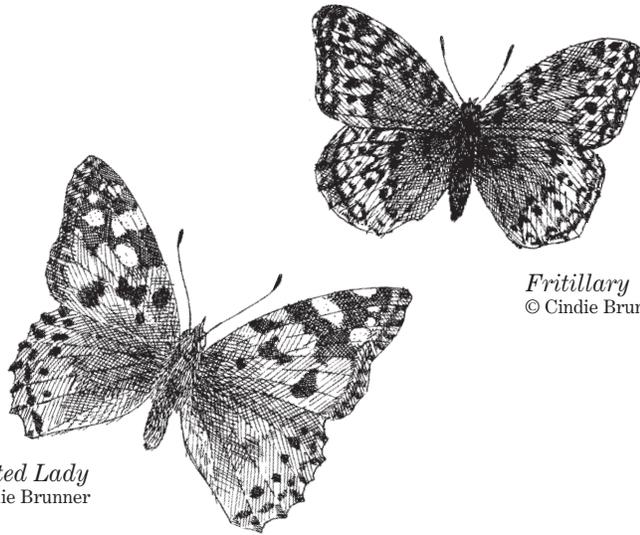
There are a number of other issues that concern the counties and conservation districts including the use of prescribed fire, wilderness protection, land acquisition, wildlife and habitat management and reintroductions. The Service has fully evaluated several alternative options in the Draft CCP and EIS, which consider all of these concerns.

5.16 Comparison of Environmental Consequences

Table 56 summarizes the above environmental consequences—by estimated level of benefit—to compare refuge management under each alternative.



Admiral
© Cindie Brunner



Fritillary
© Cindie Brunner

Painted Lady
© Cindie Brunner

Table 56. Summary of the environmental consequences for actions of the CCP alternatives for the Charles M. Russell and UL Bend refuges.

<i>Alternative A</i> No Action	<i>Alternative B</i> Wildlife Populations	<i>Alternative C</i> Public and Economic Uses	<i>Alternative D</i> Ecological Processes (Proposed Action)
Climate Change			
Habitat management actions would result in benefits; vehicle emissions would result in effects.	→	→	→
Negligible overall effect on global climate change.	→	→	→
Air Quality			
Motorized equipment use would have a negligible effect.	→	→	→
Motorized vehicle use would concentrate emissions during high use periods.	Negligible to minor increases in vehicle emissions due to increased visitation.	→	→
Short-term negligible impacts from prescribed fire; short-term major impacts from large wildfires.	More frequent negligible prescribed fire effects and reduced short-term impacts (moderate) from large wildfires.	Similar to B, except greater effects from large wildfires due to greater biomass.	Same as B.
Visual Resources			
Negligible overall effects from facilities and structures.	→	→	→
Negligible effect based on current road visibility.	Minor benefit due to road closures.	Same as A.	Negligible to minor benefit due to closed roads.
Negligible to moderate benefits from management efforts for invasive species control and river bottom restoration.	→	→	→
Short-term negligible impacts from prescribed fire and wildfire.	Short-term negligible impacts and long-term minor benefits from prescribed fire and wildfire.	Same as A.	Same as B.
Minor impact to some users from livestock grazing.	Moderate benefit to some users due to prescriptive livestock grazing regime.	Negligible impact to some users from livestock grazing.	Same as B.
Soundscapes			
Negligible to minor impacts due to motorized boats, road use, and facility construction.	Same as A, with minor benefits in localized areas due to road closures.	Same as A, with minor to moderate impacts in localized areas due to snowmobile access.	Same as B.
Negligible impact from gunshots.	→	→	→
Soils			
Negligible short-term impacts and long-term benefits from river bottom restoration.	→	→	→

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Soils (continued)			
Negligible short-term impacts and long-term benefits from prescribed fire.	Minor short-term impacts and long-term benefits from prescribed fire.	→	→
Moderate to major short-term impacts due to fire suppression and large wildfires.	Minor to moderate short-term impacts due to fire suppression and large wildfires.	→	→
Continued moderate to major impacts from live-stock grazing in some areas; long-term improvements where prescriptive grazing is implemented.	Same as A, except improvements from prescriptive grazing would be greater.	Same as A.	Same as B.
Minor overall impacts from public use; moderate to major impacts in localized areas. Negligible short-term impacts due to facility construction.	→	→	→
Negligible impacts to localized areas from research excavations for cultural and paleontological resources.	Same as A.	Greater impacts (negligible to minor) due to increased research opportunities for cultural and paleontological resources.	Same as A.
Water Resources			
Negligible effect on hydrology and water quality.	→	→	→
Vegetation			
Minor short-term impacts to uplands; moderate to major long-term impacts due to continuation of existing management.	Variable effects on uplands depending on target species and management emphasis; overall long-term moderate benefits but some overbrowsing could occur.	Minor long-term benefits for uplands due to improved management, including prescriptive grazing and balanced use by wild and domestic ungulates.	Long-term major benefits for uplands due to emphasis on restoring natural processes using prescribed grazing and fire.
Minor to moderate long-term benefits for river bottoms from restoration to native communities; longer timeframe due to minimal commitment of resources.	Minor to moderate long-term benefits for river bottoms (same as A), except more aggressive approach is more likely to succeed in a shorter timeframe.	Same as B, except cooperative approach would allow restoration to begin more quickly.	Same as B, with a less aggressive approach.
Shorelines primarily under USACE jurisdiction; negligible effects.	→	→	→

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Vegetation (continued)			
Minor long-term benefits for riparian areas and wetlands from grazing and habitat management actions. Continued moderate impacts in localized areas from grazing.	Moderate long-term benefits for riparian areas and wetlands due to more extensive prescriptive grazing and water impoundment removal. Continued moderate impacts in localized areas from grazing. (Same as A)	Minor to moderate long-term benefits for riparian areas and wetlands due to more extensive prescriptive grazing and water impoundment rehabilitation. Continued moderate impacts in localized areas from grazing. (Same as A)	Same as B, with moderate to major benefits. Continued moderate impacts in localized areas from grazing. (Same as A)
Wildlife			
Minor benefits for big game from ongoing population management and habitat improvements.	Minor to moderate long-term benefits for big game from management towards natural ecosystem processes and reduced livestock conflicts.	Moderate long-term impacts on big game from management that emphasizes maximum harvests.	Moderate long-term benefits for big game from a balanced approach to population, habitat, and harvest management.
Negligible effects on furbearers and small predators (no changes in management).	Major long-term benefits for furbearers and small predators due to active reintroduction of some species.	Minor to major impacts due to increased harvest of furbearers and small predators.	Negligible impact on furbearers and small predators from harvest opportunities based on acceptable population levels.
Negligible effects on birds. Habitat impacts would generally offset benefits. Moderate to major localized impacts on birds due to grazing.	Moderate to major long-term benefits for birds due to upland and riparian habitat management. Moderate to major localized impacts on birds due to grazing. (Same as A)	Similar to B, with minor long-term benefits. Moderate to major localized impacts on birds due to grazing. (Same as A)	Same as B. Moderate to major localized impacts on birds due to grazing. (Same as A)
Minor incremental impacts on amphibians, reptiles, and fish due to upland and riparian habitat degradation. Negligible effects on small mammals.	Moderate benefits for amphibians, reptiles, and fish due to upland and riparian habitat improvements. Negligible to minor benefits to small mammals from prescriptive grazing and habitat improvements.	Same as B for amphibians, reptiles, and fish, with minor benefits. Negligible to minor impacts on small mammals due to continued fire suppression and loss of native habitat structure.	Same as B for other wildlife, with moderate to major benefits.
Negligible benefits on TES and species of concern (no specific objectives). Direct effects on TES and species of concern from wolf and bison management objectives would be negligible.	Moderate to major long-term benefits due to prescriptive grazing, fire management, and general habitat improvements. Direct effects on TES and species of concern from wolf and bison management objectives would be negligible. (Same as A)	Same as B.	Same as B.

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Special Management Areas			
Negligible impact on wilderness. No effects on other special designations.	Minor benefit due to expanded proposed wilderness units (+25,000 acres).	Minor impact for reduced proposed wilderness units (-36,000 acres).	Minor benefit due to consolidated proposed wilderness units (-8,000 acres).
No effects on other special management areas.	→	→	→
Visitor Services			
Negligible effects on hunting. No long-term change from current hunting opportunities.	Negligible to minor benefits including unique and expanded hunting opportunities and improved access management.	Minor to moderate benefits from an expanded emphasis on hunting opportunities and harvest.	Minor to moderate benefits for hunting, depending on individual preferences.
Negligible effects on fishing.	Same as A.	Same as A, plus negligible benefits from expanded boat ramp access.	Same as A.
Negligible effects on wildlife observation and photography. Visitation levels would remain flat. Facilities would not meet demand.	Negligible to minor benefits for wildlife observation and photography with increased staff (1), facilities, and programs to accommodate increased visitation.	Moderate benefits for wildlife observation and photography with increased staff (2), facilities, and programs with an emphasis on economic benefits.	Moderate benefits for wildlife observation and photography with increased staff (2) and a greater emphasis on quality programs.
Negligible effects on environmental education. Very little environmental education would be offered.	Negligible benefits for environmental education with increased staff (1) and programming.	Minor benefits for environmental education with increased staff (2), programs, and facilities.	Same as C, with greater emphasis on quality programs.
Negligible effects for interpretation (limited programs and facilities).	Negligible benefits for interpretation with increased staff (1) and modest improvements in facilities and programs.	Minor benefits for interpretation with increased staff (2), and expanded facilities.	→
Negligible effects for outreach.	Negligible benefits due to increased outreach efforts.	Minor benefits due to increased and targeted outreach efforts.	→
Negligible effects on access. 670 miles of road open to visitors.	Minor impacts on access due to 106 miles of closed road.	Minor benefits for access due to road improvements or game retrieval on some formerly closed roads (outside of wilderness) and consideration of winter access to fishing areas from the south and north side of the Missouri River.	Negligible impact on access due to 23 miles of closed road. Minor benefits for access due to road improvements or game retrieval on some closed roads (outside of wilderness) and a winter access route to an ice fishing area from the south side of the Missouri River.
Negligible effect for commercial recreation. Current level of permits (11) would remain.	Negligible benefits for commercial recreation due to efforts to minimize conflicts.	Minor benefits for commercial recreation due to additional permits and efforts to reduce conflicts.	Same as B.

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Cultural and Paleontological Resources			
Negligible effects on cultural resources.	Negligible to minor benefits for cultural resources due to increased resource protection.	→	→
Negligible effects on paleontological resources.	Negligible to minor benefits for paleontological resources due to increased management, interpretation, and law enforcement.	→	→
Socioeconomics			
Negligible impact on regional economics.	Negligible impact on regional economics, generating an additional \$216,000 in local output and one more job.	Minor benefits for regional economics, generating \$3.9 million in local output and 48 additional jobs.	Minor benefits for regional economics, generating \$2.1 million in local output and 25 additional jobs.
Negligible to minor impact on livestock permittees.	Moderate to major impact on livestock permittees due to transition to prescriptive grazing, fence removal, and stock pond removal.	Same as A, with minor impact on some permittees due to boundary fence construction.	Same as B, with a minor benefit to some permittees due to the reduction of proposed wilderness units.
No effect on environmental justice.	→	→	→

