

# 5 Environmental Consequences

This chapter describes the environmental consequences for the management alternatives (see chapter 3) considered for the Laramie Plains refuges.

The planning team assessed the environmental consequences of implementing each alternative on the biological, physical, social, economical, cultural, and historical resources of the refuges.

This chapter contains descriptions of the (1) effects common to alternatives, (2) consequences by alternative, and (3) cumulative impacts of the alternatives. Table 2 in chapter 3 includes a summary of these consequences in relation to the actions for each alternative.

## 5.1 EFFECTS COMMON TO ALL ALTERNATIVES

Some projected effects would be similar for all alternatives.

- The implementation of any alternative would follow the Service's best management practices.
- The alternatives would minimize impacts to federally threatened and endangered species, to the extent possible and practicable.
- The refuges' staff, contractors, researchers, and other consultants would continue to acquire all applicable permits, for example, for future construction activities.

The sections below describe other projected effects common to all alternatives.

### Cultural Resources

As a whole, cultural resources would be enhanced through protecting existing resources and extending such protections to newly discovered cultural resources.

Cultural resource surveys at the refuges have been limited. Therefore, additional surveys would be required prior to any new construction or excavation to fully satisfy provisions of NEPA and applicable acts and policies related to historical and archaeological resources.

Potentially negative effects from construction of trails or facilities would require review by the

regional archaeologist (region 6) and consultation with the Wyoming State Historic Preservation Office.

### Environmental Justice

None of the management alternatives described in this EA would disproportionately place any adverse environmental, economic, social, or health effects on minority or low-income populations.

Implementation of any action alternative that includes visitor services and environmental education is anticipated to benefit minority and low-income citizens living near the Laramie Plains refuges by stimulating the economy and creating jobs.

### Air Quality

No adverse effects on air quality are expected. Short-term effects on air quality from prescribed burning on the refuges should not vary significantly between any of the alternatives. Prescribed burning operations are planned to reduce impacts to neighbors through ignitions that move the smoke up and out of the vicinity quickly. Rapid mop-up is completed to reduce overnight impacts to neighbors.

### Global Warming

The actions proposed in this draft CCP and EA would conserve or restore land and habitat, thus retaining existing carbon sequestration at the refuges. This action would contribute positively to efforts to mitigate human-induced global climate change.

The use of prescribed fire, which releases CO<sub>2</sub>, would result in no net loss of carbon because new vegetation would quickly replace the burned-up biomass. Overall, there should be little or no net change for carbon sequestered at the refuges from any of the management alternatives. As it relates to global climate change, the documentation of long-term changes in vegetation, species, and hydrology is an important part of research and monitoring. Adjustments in management may be necessary over time to adapt to a changing climate.

### Soils

All alternatives would positively affect soil formation processes on the refuge lands. Some

disturbances to surface soils and topography would occur at those locations selected for: (1) administrative, maintenance, and visitor facilities; (2) introduced and invasive species removal and eradication; and (3) restoration of native habitat.

## Water Quality, Wetlands, and Floodplains

All alternatives would positively affect water quality. Positive effects are anticipated from protecting groundwater recharge, preventing runoff, retaining sediment, and minimizing nonpoint source pollution. The management alternatives are not anticipated to have any adverse effects on the area's wetlands and floodplains, pursuant to EO 11990 and EO 11988.

## Public Health and Safety

Based on the nature of each alternative, the location of the refuges, and current land use, all alternatives are anticipated to have no significant negative effects on the quality of the human environment, including public health and safety.

## Socioeconomics

Bamforth NWR and Mortenson Lake NWR will remain closed to public use under all three management alternatives; therefore, no significant negative effects on the socioeconomics of the study area would occur as a result of the CCP.

## Economic Impacts

Laramie Plains refuges staff have indicated that few, if any, refuge visitors come from outside the study area, thus the Laramie Plains refuges have little economic impact on the region. None of the management alternatives under consideration would substantially alter the visitation profile of the refuge. The economic impacts of any of the management alternatives under consideration would likely be outweighed by regional and national economic influences.

## 5.2 DESCRIPTION OF CONSEQUENCES BY ALTERNATIVE

Management actions are prescribed by alternative as the means for responding to problems and issues raised by Service managers, the public, and governmental partners. Because management would differ for each alternative, the environmental and social effects resulting from implementation would likely differ as well.

The following section provides an analysis of the effects estimated to result from alternative A

(no action), alternative B (proposed action), and alternative C. A summary of this narrative is contained in table 2 in chapter 3.

## Alternative A—No Action

The estimated potential effects of alternative A are described by the major topics discussed throughout this document.

### Upland Habitat Management

The current level of habitat management would be maintained at approximately the same intensity with the same resources (staff and funding). In addition, the scarce attention given to the refuges may cause currently good habitat conditions on the refuges to experience degradation over time (such as invasive plant overruns).

Poor fencing and a lack of adequate water supplies would not allow proper management of the grazing program to meet management objectives. A continued lack of knowledge regarding upland habitat conditions may result in negative grazing impacts to habitat and wildlife.

Because of a scarcity of resources to perform outreach in neighboring communities, management actions the Service needs to perform (prescribed fire, grazing, haying, and mowing) may be misunderstood by some, which could lead to a lack of support for these and other important habitat management tools.

Native plant abundance and diversity would continue to decline. Introduced cool-season grasses would continue to gradually increase.

### Wetlands and Alkali Flats Habitat Management

Wetland habitats continue to be dependent on natural processes. No managed drawdown of wetlands and little movement of water between impoundments would result in the degradation of wetland habitats over time and likely adversely affect the health and size of the migratory bird populations and resident wildlife populations dependent on these habitats, although a decline has not been evident during annual bird surveys by refuge staff.

In drought years and years with little runoff wetland water levels would remain low, creating shallow water on large mud flats, which may benefit shorebirds during their migration.

Many wetland units would lack capacity to provide the full spectrum of wetland conditions, including dry marsh, densely vegetated marsh (regenerative phase), hemi-marsh, open marsh (degenerative phase), and open water.

Wetland soils would be infrequently oxidized, resulting in the rare germination of important annual plants that provide food sources for wetland-dependent migratory birds.

### **Water Rights**

Wetland conditions and wildlife habitat would be dependent on existing minimal water rights. The Service would have an inadequate understanding of water rights held or needed by the refuges to achieve its vision and goals. The Service would have minimal knowledge of Mortenson Lake NWR water quality and the impacts on the Wyoming toad.

### **Threatened and Endangered Species**

The Wyoming toad population has steadily declined at Mortenson Lake since the inception of the refuge in 1993. Though reasons for the decline are unknown, it has been attributed to a number of causes ranging from disease to habitat management to past refuge management.

For the first two years, grazing occurred on the entire pasture encompassing Mortenson Lake. In 1994, an electric fence was erected to protect areas considered to be prime Wyoming toad habitat and to concentrate cattle in the more alkali/bulrush vegetation along the lake to thin the vegetation for the toads. All grazing occurred in the fall after the toads had gone underground to hibernate, and water levels in Mortenson Lake were held at a high level from the spring through the fall.

The Wyoming Toad Recovery Team believes these management strategies may have contributed to the toad population decline. As a result, in 2005 the Service changed its management activities at the refuges in an effort to mimic the habitat conditions existing when the toads were first discovered at Mortenson Lake in 1987. These prerefuge management treatments included grazing around Mortenson Lake in the summer to early fall. In addition, Mortenson Lake was drawn down 1 foot each spring to simulate the historical irrigation practices of the previous landowner. A new management tool (prescribed fire) was also used on the north shore of Mortenson Lake in the spring of 2004 to reduce the heavy rush and carex vegetation. Currently, it is not known if these new management practices have had an impact on the Wyoming toad population.

### **Habitat Protection**

The lost opportunity to protect the large wetland complex adjacent to Hutton Lake NWR could cause valuable wildlife habitats to be subjected to land degradation. Valuable wildlife habitats could be subjected to land degradation due to the failure to increase habitat protection for Wyoming toad at Mortenson Lake NWR.

### **Invasive Species**

Continued reactionary management (occurring only after problems are well established) of invasive species could lead to the degradation of some habitats as invasive plants overtake desirable vegetation before detection. Monitoring of invasive plant areas would hasten the response time for treatment. Quick treatment of known infestations would help restore native vegetation and protect adjacent noninfested areas.

### **Public Use**

Because there would be no change in the visitor services' programs and infrastructure, the consequences would be neutral. Hunting and fishing would continue to occur on other public and private lands in the area. Lack of regulatory information about appropriate refuge uses could increase the potential for negative impacts due to uncontrolled access and minimal law enforcement. The refuges would continue to provide minimal environmental education opportunities for the Laramie community.

### **Research and Science**

The limited research and biological monitoring conducted on the refuges would likely be of minimal value to refuge management activities. As a result, refuge staff would have little ability to implement science-based management or defend management actions.

### **Cultural Resources**

Existing cultural resources are protected; protection would be extended to newly discovered resources.

### **Partnerships**

It would be unlikely that the refuges could meet the vision and goals of the Laramie Plains refuges because there would be no increase in partnerships.

The refuges would continue to use existing water rights and receive water from partners when available.

### **Refuge Operations**

Management activities conducted on the refuges remains minimal and reactionary, which may result in some degradation of habitats due to invasive plant encroachment. Current levels of law enforcement would likely lead to inadequate protection of resources and wildlife.

### **Socioeconomics**

Socioeconomic consequences in the local communities would be neutral or minimal, with refuge expenditures and public visitation remaining

near current levels. The lack of information on visitation and public use would limit the refuges efforts for outreach to generate public support for conservation of wildlife and habitats on the refuges.

## Alternative B—Proposed Action

The estimated potential effects of alternative B are described by the major topics discussed throughout this document.

### Upland Habitat Management

Alternative B would increase the level of upland habitat management on the refuges. Evaluation of current upland habitat conditions would yield data to determine appropriate grazing program for the benefit of migratory bird species. Grasslands would be managed using prescribed fire, grazing, haying, and mowing. Grassland-dependent migratory and resident species would likely experience population increases with additional nesting, breeding, and foraging areas available.

Fire and grazing disturbances would approximate historical frequency, timing, and intensity. Associated nutrient cycles would largely be restored.

The relatively arid soil surface environment would be less hospitable to introduced plant species, and the plant community would become increasingly dominated by native herbaceous species.

The diversity and abundance of species that use grassland would increase.

### Wetlands and Alkali Flats Habitat Management

Wetland habitat conditions would be improved to benefit wildlife resources. Wetland management would maintain wetlands in an early successional stage that is dominated by seed-producing annual wetland species and would include a combination of water storage, drawdowns, vegetation removal, prescribed fire, grazing, haying, and mowing.

The capacity to provide the full spectrum of wetland conditions would increase. All phases would be represented, including dry marsh, densely vegetated marsh (regenerative phase), hemi-marsh, open marsh (degenerative phase), and open water.

Wildlife diversity would increase with more diverse wetland conditions.

### Water Rights

Refuge habitats could be improved with the acquisition of additional water rights, resulting in increased irrigation of refuge meadows and uplands, potentially less alkalinity in refuge wetlands, and active management of water levels in wetlands.

Increased knowledge of refuge water quality and its impacts on the Wyoming toad would result in population recovery goals for the Wyoming toad being achieved quicker.

### Threatened and Endangered Species

Increases in management intensity and coordination with the Recovery Team and partners would increase the occurrence and abundance of the Wyoming toad species. Population recovery goals for the Wyoming toad would be achieved quicker.

### Habitat Protection

Long-term protection of wetland complex would expand nesting and foraging areas for waterfowl and other migratory birds. Buffer zones would increase habitat protection for the Wyoming toad.

### Invasive Species

Active management would increase monitoring of invasive species and decrease their occurrence. Target levels for invasive plants would be identified and invasive plants would be reduced to those levels.

### Public Use

Alternative B would enhance opportunities for public use at Hutton Lake NWR. Additional hiking and interpretive trails, viewing blinds, and information kiosks would enhance the visitor experience. Improved signage would help visitors learn about the refuge and increase public awareness of natural resource ecology and refuge management.

### Research and Science

Knowledge of refuge resources would be enhanced through data collection. The resulting research and monitoring would enable adaptive resource management and direct management activities.

### Cultural Resources

Through increased management activities, and expanded and enhanced partnerships, the refuges would benefit from obtaining more data about cultural resources. The public would benefit from increased identification and protection of previously unknown cultural resources on the refuges.

### Partnerships

Partnerships augment refuge staff ability to understand and manage refuge resources. Partnerships would increase public awareness and involvement in most aspects of refuge management activities. Vandalism would likely decrease as more people become involved in overseeing the refuges.

Local communities would have a better understanding of the local and national benefits of national wildlife refuges, which could lead to new and expanded partnership opportunities to conserve the natural resources of the Laramie Basin.

### **Refuge Operations**

Dedicating (assigning) refuge staff to manage the Laramie Plains refuges would result in active management of the refuges' resources. Active management would improve wildlife habitat, enhance wildlife-dependent recreation opportunities, cultivate partnerships, and promote research and science to help direct management activities on the refuges.

### **Socioeconomics**

Under Alternative B, the refuges would be managed to enhance wildlife habitat. An increase in the diversity and population of wildlife may increase the visitation of wildlife enthusiasts to Hutton Lake NWR, resulting in minor economic benefit to the Laramie community.

## **Alternative C**

The estimated potential effects of alternative C are described by the major topics discussed throughout this document.

### **Upland Habitat Management**

Evaluating current upland habitat conditions would yield data to determine an appropriate grazing program for the benefit of migratory bird species, but success would be dependent on viable partnerships.

### **Wetlands and Alkali Flats Habitat Management**

Alternative C would improve wetland conditions to benefit wildlife resources, but success would be dependent on viable partnerships. Increased knowledge of refuge water quality and its impacts on the Wyoming toad would result in population recovery goals for the Wyoming toad being achieved quicker.

### **Water Rights**

Refuge habitats could be improved with the acquisition of additional water rights, resulting in increased irrigation of refuge meadows and uplands, potentially less alkalinity in refuge wetlands, and active management of water levels in wetlands, but success would be dependent on viable partnerships.

### **Threatened and Endangered Species**

Increases in management intensity and coordination

with the Recovery Team and partners would increase the occurrence and abundance of the Wyoming toad species. Population recovery goals for the Wyoming toad would be achieved quicker, but success would be dependent on viable partnerships.

### **Habitat Protection**

Long-term protection of wetland complexes would expand nesting and foraging areas for waterfowl and other migratory birds, but success would be dependent on viable partnerships. Buffer zones may increase habitat protection for Wyoming toad, but increased protection would be dependent on viable partnerships.

### **Invasive Species**

Active management would increase monitoring of invasive species and decrease their occurrence. Target levels for invasive plants would be identified and invasive plants would be reduced to those levels, but success would be dependent on viable partnerships.

### **Public Use**

Alternative C would increase and enhance opportunities for wildlife-dependent recreation at Hutton Lake NWR. Additional hiking and interpretive trails, viewing blinds, and information kiosks would enhance the visitor experience. Improved signage would help visitors learn about the refuge and increase public awareness of natural resource ecology and refuge management, but enhanced opportunities for wildlife-dependent recreation would be dependent on viable partnerships.

### **Research and Science**

Knowledge of refuge resources would be enhanced through data collection. The resulting research and monitoring would enable adaptive resource management and direct management activities, but success would be dependent on viable partnerships.

### **Cultural Resources**

Through increased management activities and expanded and enhanced partnerships the refuges would benefit from obtaining more data about cultural resources, but success would be dependent on viable partnerships. The public would benefit from increased identification and protection of previously unknown cultural resources on the refuges.

### **Partnerships**

Partnerships augment refuge staff ability to understand and manage refuge resources.

Partnerships would increase public awareness and involvement in all aspects on refuge management activities. Vandalism would decrease as more people take ownership of the refuges.

Local communities would have a better understanding of the local and national benefits of national wildlife refuges. This could lead to new and expanded partnership opportunities to conserve the natural resources of the basin.

### Refuge Operations

Dedicating (assigning) refuge staff to manage the Laramie Plains refuges would result in active management of the refuges' resources. Active management would improve wildlife habitat, enhance wildlife-dependent recreation opportunities, cultivate partnerships, and promote research and science to help direct management activities on the refuges.

### Socioeconomics

Under Alternative C, partnerships would become a priority for the refuges. Through these partnerships, the Hutton Lake NWR could improve wildlife habitat and populations, thereby slightly increasing wildlife-enthusiast visitations to the refuge. Visitation increases to the refuges could offer some economic benefit to the Laramie community.

## 5.3 CUMULATIVE IMPACTS

Cumulative impacts are the potential effects of each alternative in combination with past, present, and future actions. NEPA regulations define cumulative effects as “the impact on the environment which results from the incremental impact of the actions 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. Cumulative impacts can result from individually minor, but collectively significant actions taking place over time.” (40 CFR 1508.7)

The cumulative effects analysis for this project is based on reasonably foreseeable future actions that, if carried out, would contribute to the effects of the alternatives. No reasonably foreseeable actions are anticipated. Impacts will be monitored during the implementation of the final CCP. Implementation over an extended period will reduce the likelihood of negative cumulative impacts.

The NEPA requires mitigation measures when the environmental analysis process detects possible significant impacts to habitats, wildlife, or the human environment. All activities proposed under alternative B are not expected or intended to produce significant levels of environmental impacts that would require mitigation measures. Nevertheless, the final CCP will contain the following measures to preclude significant environmental impacts from occurring:

- Federally listed species will be protected from intentional or unintentional impacts by having activities banned or restricted where these species occur.
- All proposed activities will be regulated to reduce potential impacts to wildlife and plant species, especially during their sensitive reproductive cycles.
- Monitoring protocols will be established to determine goal achievement levels and possible unforeseen impacts to resources for application of adaptive management to ensure wildlife and habitat resources, as well as cultural resources, are preserved.
- The final CCP can be revised and amended after 5 years of implementation, for application of adaptive management to correct unforeseen impacts that occur during the first years of the plan.

# 6 Implementation of the Proposed Action (Draft CCP)

Once a management alternative has been selected and finalized, the CCP has been approved, and the Service has notified the public of its decision, the implementation phase of the CCP process begins.

During the next 15 years (2007–2022), the objectives and strategies presented below would be realized. The final CCP will serve as the primary management document for the Laramie Plains refuges until it is formally revised. The Service will carry out the final CCP with assistance from existing and new partner agencies and organizations, and the public.

Although a number of needs were identified during the planning process, there are no assurances that projects identified in this draft CCP will be fully or even partially funded. However, within every planning effort, there are opportunities to examine current funding and resources to determine the best available uses based on a comprehensive evaluation of critical needs. If this CCP were never completed, issues could go unresolved due to a lack of public and administrative understanding and support.

## 6.1 IDENTIFICATION OF THE PROPOSED ACTION (DRAFT CCP)

The planning team for the Laramie Plains refuges developed three unique management alternatives based on the issues, concerns, and opportunities expressed during the scoping process (see chapter 1). The issues discussed throughout this draft CCP and EA were derived from the collective input of local citizens and communities, cooperating agencies, conservation organizations, and refuge staff.

In identifying the alternative for proposed action, the team determined probable effects of each alternative on ten program areas: (1) refuge habitats; (2) threatened and endangered species; (3) water rights; (4) habitat protection; (5) invasive species; (6) public use; (7) research and science; (8) cultural resources; (9) partnerships; (10) budget and staffing. Effects on habitats and threatened and endangered species received stronger consideration than effects projected for other program areas. Below is a brief description of the determination of the proposed action alternative, as well as the other two alternatives, in ranked order of desirability.

### 1. Alternative B—Proposed Action, Draft CCP

Alternative B is ranked the first of three alternatives as the proposed action (draft CCP) for best addressing the vision and goals for the Laramie Plains refuges. The proposed action is fully developed under “Draft CCP” for each refuge later in this chapter.

This alternative would increase management activities on the refuges. Refuge habitats would be actively managed to achieve the goals and objectives identified for the refuges. Refuge staff would strive to better understand the effects of management actions on the refuges. An emphasis on adaptive management, including monitoring the effects of habitat management practices and use of the research results to direct ongoing management, would be a priority.

Research activities for habitat and wildlife would be expanded to evaluate the effects of management activities on species diversity and habitat conditions. Refuge staff would conduct biological monitoring on the refuges and facilitate applied research to direct management decisions. Refuge staff would partner with universities and other entities to conduct specific research to identify refuge resources and obtain a better understanding of the effects of management activities.

Refuge upland habitats would be evaluated to determine appropriate grazing programs to achieve refuge goals. Boundary fencing would be installed and maintained to permit active management of the grazing programs. Prescribed fire would be used, as appropriate, to (1) reduce hazardous fuels, (2) reintroduce fire to ecosystems that evolved with fire as a disturbance factor, and (3) improve habitat for selected species.

Wetlands management would use existing water rights and other management treatments (prescribed fire, grazing, haying, and mowing) to benefit migratory birds and resident wildlife. Management efforts would be expanded to benefit species of conservation concern. Refuge staff would research the availability of additional water rights for the refuges, and consider obtaining additional water rights where appropriate for the benefit of wetland-dependent wildlife.

Monitoring and management of invasive species on the refuges would be increased. Greater emphasis would be placed on maintaining existing partnerships and developing new partnerships to achieve the goals and objectives of the refuges. Cultural resources management would protect known and newly discovered artifacts and sites.

## 2. Alternative C—Partnerships

Alternative C ranked second of three alternatives as the proposed action. This alternative ranked below the proposed action, alternative B, because success in achieving refuge goals and objectives is dependent upon the development and maintenance of viable partnerships where success and prediction of outcomes do not lie within the control of the Service.

The development and maintenance of successful partnerships requires intensive, focused efforts on behalf of all members of the partnership. As funding and priorities of cooperating agencies vary over time, the ability to achieve refuge goals and objectives may change. Because funding and priorities of cooperating partners lies outside the control of the Service, this alternative was viewed as ranking lower in ability to address the vision and goals of the Laramie Plains refuges than the proposed action.

## 3. Alternative A—Current Management

Alternative A ranked last of three alternatives because management issues would not be adequately addressed.

The CCP process offers an opportunity for the Laramie Plains refuges to assess effects of past and current management. This timely and introspective analysis encouraged development, consideration, and selection of alternatives to current management that better address old and emerging management issues.

### 6.2 SUMMARY OF THE PROPOSED ACTION

For the past 40 years, the Laramie plains national wildlife refuges have received little to no active management due to the relatively small staff of the Arapaho NWR Complex and competing refuge priorities. Bird surveys are conducted and boundary fences and signs are maintained, but little to no proactive management, monitoring, or other activities have occurred.

Using data and information from other wetland-complex areas, some biological goals have been established for these refuges. Future studies may indicate whether these goals are appropriate or

need to be revised. It is hoped that this plan will demonstrate the need to actively manage these refuges for the benefit of migratory bird species. An increase of one FTE, dedicated to the Laramie Plains refuges and Pathfinder NWR (located 50 miles southwest of Casper, Wyoming), would have a noticeable impact on the ability to conduct site-specific research; build and maintain partnerships; develop specific biologically based, goal-oriented, step-down habitat management plans; and guide future management direction for these stations.

The planning team developed objectives in support of goals identified in chapter 2 to carry out the proposed action (alternative B) for management of the Laramie Plains refuges. Strategies to achieve objectives are suggested. Rationale is included that supports goals, objectives, and strategies. In addition, assumptions are discussed.

Biological goals and objectives emphasize management of plant communities as habitat for wildlife, especially migratory birds, and are organized by major habitat types represented at the three refuges. Goals and objectives are habitat based rather than wildlife based, because wildlife often respond to factors beyond the control of local refuge management (for example, disease outbreaks or habitat conditions on important staging or wintering sites can affect populations of migratory birds). Furthermore, management practices (for example, prescribed fire, grazing, and water-level manipulation) usually benefit plant communities rather than wildlife populations. Habitat-based objectives emphasize monitoring of important vegetation attributes such as community composition and vegetation structure over time. In most cases, wildlife population responses to habitat changes are not monitored. Rather, site-specific inventories, applied research, and literature reviews allow for reasonable predictions of wildlife response to habitat management.

Additional goals, objectives, and strategies are developed for visitor services, cultural resources, research and science, and refuge operations.

The National Wildlife Refuge system Administration Act of 1966 required the Secretary of the Interior, before permitting uses, to ensure that those uses are compatible with the purposes of the refuge. The CCP process requires a compatibility determination for all existing and proposed refuge uses. Draft compatibility determinations for the Laramie Plains national wildlife include wildlife observation and wildlife photography (appendix J), environmental education and interpretation (appendix K), and prescribed grazing (appendix L).

Management direction to achieve the vision for the Laramie Plains refuges is presented first for goals, objectives, and strategies shared by all three refuges —Bamforth NWR, Hutton Lake NWR, and

Mortenson Lake NWR—followed by refuge-specific goals, objectives, and strategies for:

- Bamforth NWR
- Hutton Lake NWR
- Mortenson Lake NWR

### 6.3 DRAFT CCP

## Draft CCP—Bamforth NWR, Hutton Lake NWR, and Mortenson Lake NWR

The following goals, objectives, and strategies apply to all three Laramie Plains refuges and outline the actions needed to achieve the vision of the refuges.

### Research and Science Goal

Conduct natural resource management using sound science and applied research to advance the understanding of natural resource function.

#### Objective 1

Within 2 years, identify and prioritize biological monitoring needs to meet the refuges' goals and objectives. Expand research activities for habitat and wildlife to evaluate the effects of management activities on species diversity and habitat conditions. Conduct applied research to direct management decisions.

#### Strategies

- Identify and prioritize habitat management research needs.
- Conduct research in collaboration with others on priority needs.
- Encourage research that focuses on the refuges' habitat management goals.
- In cooperation with others, develop step-down management plans.
- Refuge staff partner with universities and other entities to conduct specific research to identify refuge resources and obtain a better understanding of the effects of management activities.

#### Rationale and Assumptions

The lack of active management has resulted in sparse biological information regarding these

refuges. It will be important to prioritize and plan active and long-term research programs to gather biological data.

#### Objective 2

Within 6 years, actively utilize research data to guide management decision making.

#### Strategies

- Initiate highest-priority studies to enable time to conduct studies and evaluate data.
- Reach out to partners and others to conduct research in highest-need areas.
- Apply for grants, Science Support Program funding, and other funding initiatives to fund applicable research.

#### Rationale and Assumptions

Research will focus on providing baseline data and achieving identified habitat goals. Projects would be evaluated and limited to those that will answer questions needed for improved refuge management. The scope and impacts of individual and cumulative research projects would be evaluated to ensure minimal disturbance to wildlife. Projects may be delayed or denied if wildlife or habitat impacts were determined to be too great.

### Partnerships Goal

Work with partners to determine the wildlife and habitat resources on the refuges, to maximize wildlife habitat protection, and to increase understanding of wildlife needs, as well as the benefits wildlife offer to individuals and communities, on and off the refuges.

#### Objective 1

Throughout the life of this plan, promote existing partnerships and develop new partnerships to achieve refuge goals and objectives.

#### Strategies

- Engage in partnerships that result in collecting baseline data for the refuges.
- Work with partners to evaluate mineral holdings, and where applicable, gain mineral rights to protect surface habitats.
- Work with partners to evaluate water rights, and where applicable, gain additional water rights to benefit refuge management for migratory bird species.

**Rationale and Assumptions**

Partnerships are important to the Service to achieve refuge management goals and objectives. If the Service does not cultivate partnerships, which take time and resources to develop and maintain, opportunities to work with others in conserving wildlife habitat will be missed.

Current partnerships include Albany County Weed and Pest, local landowners, and Wyoming Audubon. Efforts would be increased to focus research-based partnerships on collecting baseline data for the refuges.

**Cultural Resources Goal**

Identify and protect cultural resources on the refuges.

**Objective 1**

Within the 15-year life of this plan, accomplish a complete cultural resources survey.

**Strategy**

- Conduct a cultural resources survey on the refuges. Document, map, and protect any resources found. Coordinate protection on a case-by-case basis with the regional archeologist.

**Rationale and Assumptions**

After consulting with the regional archeologist, the Service determined a comprehensive survey could be scheduled and completed within the life of this plan, which would provide important information regarding any cultural resources at these refuges and help guide project management. Cultural resource program priorities include Section 106 reviews to ensure historic sites are evaluated and protected. Any project that could affect structures older than 50 years or disturb the ground should go through this review process. A second concern is identifying sensitive areas, which would help staff and law enforcement protect these resources from vandalism or theft.

Secondary goals include conducting comprehensive reviews to assist in long-term refuge project planning, interviewing locals and long-term staff, and protecting historic records and information when alteration or removal of historic structures is required.

**Refuge Operations Goal**

Secure and demonstrate the effective use of funding, staffing, and partnerships for the benefit of all resources in support of the refuges and the Refuge System.

**Objective 1**

Within 2 years of plan approval, hire and assign to the Laramie Plains refuges and Pathfinder NWR one full-time Service employee to perform increased management activities on the refuge.

**Strategies**

- Hire a refuge manager or refuge operations specialist and assign to the Laramie Plains refuges and Pathfinder NWR.
- Increase funding to improve management activities at the refuges.

**Rationale and Assumptions**

The Laramie Plains refuges are administratively managed by the Arapaho NWR Complex. The complex includes Arapaho NWR, Bamforth NWR, Hutton Lake NWR, Mortenson Lake NWR, and Pathfinder NWR. The current staffing of the complex precludes a dedicated staff member for the three Laramie refuges, which has resulted in minimal management at these refuges.

The Laramie Plains refuges were managed by Service staff headquartered in Laramie until the Arapaho NWR was established in 1967, when headquarters and priorities shifted to Walden, Colorado. Since that time, management of the Wyoming refuges has been minimal.

Through discussions, the planning team determined that the addition of one full-time Service member assigned to the Laramie Plains refuges and Pathfinder NWR would provide adequate staff to actively manage the lands. Refuge management activities would be increased and enhanced, and refuge staff would strive to better understand the effects of management actions on the refuges. An emphasis on adaptive management, including monitoring the effects of habitat management practices and using research results to direct ongoing management, would be a priority.

**Draft CCP—Bamforth NWR**

The following goals, objectives, and strategies for Bamforth NWR outline the actions needed to achieve the vision of the Laramie Plains refuges.

**Natural Resources Goal**

Conduct baseline surveys to identify refuge resources and the role these resources serve in the Laramie Plains ecosystem and the Refuge System.

**Objective 1**

Within 5 years, identify and prioritize biological monitoring needs and gather baseline data to

evaluate refuge management needs. Conduct applied research to direct management decisions.

### Strategies

- Identify and prioritize habitat management research needs.
- Conduct research in collaboration with others on priority needs.
- Encourage research that focuses on developing plans for the future of this refuge.
- In cooperation with others, evaluate the role Bamforth NWR plays in the Refuge System.

### Rationale and Assumptions

The Laramie Plains refuges are primarily native grasslands. The decline of grassland nesting birds has been attributed to habitat loss and conversion, fragmentation, and the disruption of ecological factors, such as fire, which created a mosaic of habitat types across the landscape. As a result, many grassland bird species are now considered species of biological concern (USFWS 2002). Managing natural areas for these bird species involves providing the nesting habitat requirements and food resources essential for their reproduction and survival. These requirements include large, treeless patches containing within them diversity in vegetation structure.

Though these and other birds have been identified in the area, the Service has no data on the effects of current grazing, condition of uplands, or other biological information due to inactive management. The lack of site-specific biological information on these species' use of refuge lands and personnel dedicated to guide management practices (grazing, rest, prescribed fire) needs to be corrected by gathering data and evaluating management practices (grazing, rest, prescribed fire) for the benefits they offer to wildlife resources. Baseline information on vegetative structure, composition and quality as well as water quality are imperative to guide proper management decisions.



Bobolink

USFWS

### Objective 2

Within 6 years of hiring an FTE assigned to Arapaho NWR but responsible for managing the Laramie Plains refuges and the Pathfinder NWR, actively use research data to guide management decision making.

### Strategies

- Initiate highest-priority studies to enable time to conduct studies and evaluate data.
- Reach out to partners and others to conduct research in highest-need areas.
- Apply for grants, Science Support Program funding, and other funding initiatives to fund applicable research.

### Rationale and Assumptions

A lack of information is hampering management direction. Detailed step-down plans will be developed and implemented as information is gathered. Projects will be evaluated and limited to those that will effectively address the need for improved refuge management. The scope and impacts of individual and cumulative research projects will be evaluated to ensure minimal disturbance to wildlife. Projects may be delayed or denied if wildlife or habitat impacts were determined to be too great.

## Draft CCP—Hutton Lake NWR

The following goals, objectives, and strategies for Hutton Lake NWR outline the actions needed to achieve the vision of the Laramie Plains refuges.

### Wetlands Goal

Manage refuge impoundments and other wetlands to create diverse habitat for wetland-dependent wildlife.

### Objective 1

Over a 5-year average, manage Rush Lake at approximately 60–80 percent emergent vegetation and 20–40 percent open water during the waterfowl breeding season (May–June) for the benefit of colonial nesting birds (white-faced ibis, black-crowned night-herons), as well as other emergent-dependent species (yellow-headed blackbirds, marsh wrens, ruddy ducks, Wilson's phalarope).

### Strategies

- Graze cattle to stimulate or maintain habitat conditions.

- Use prescribed fire to stimulate or maintain habitat conditions.
- Use mechanical manipulation (mow) to stimulate or maintain habitat conditions.
- Manipulate water (flood and drawdown) to stimulate or maintain habitat conditions.
- Develop vegetative monitoring protocol.

### **Rationale and Assumptions**

Previous research has indicated that wetlands with an approximate 50:50 ratio of open water and emergent vegetation (cattails, bulrushes), often termed “hemi-marshes,” attract the highest densities and diversities of wetland birds (Weller and Spatcher 1965). The Wyoming Partners in Flight, Wyoming Bird Conservation Plan (Nicholoff 2003) notes that depending on the situation, cover: water ratios of 65:35 to 35:65 might be considered optimum as well. A good interspersed vegetation and open water is probably more important than the ratio of the two. Key species of concern on the refuge include white-faced ibis and other birds that require dense emergent cover. White-faced ibis require high amounts of emergent vegetation, such as bulrushes, in their breeding habitat (Dark-Smilely and Keinath 2003).

A habitat model for marsh wrens describes optimum conditions as occurring when there is >80 percent emergent cover (Gutzwiller and Anderson 1987). The emergent vegetation/open water objective for Rush Lake calls for 60–80 percent emergent vegetation to better provide for the habitat needs of the key birds of concern. Wilson’s phalarope will use both fresh and alkali wetlands with three characteristics: open water, emergent vegetation, and open shoreline (Dechant et al. 2001 revised 2003). Though Wilson’s phalarope have been observed, a lack of on-site data concerning water quality and other parameters hamper management actions. From the more freshwater Rush Lake to the more alkaline Lake Creighton, Hutton Lake NWR can provide life-cycle requirements for these bird species, but site-specific information is needed to guide management direction.

### **Objective 2**

Manage Hoge Lake and Lake George to have approximately 70–90 percent open water and 10–30 percent emergent vegetation to benefit migratory birds (lesser scaup, gadwall, black tern) for migration habitat needs and brood rearing.

### **Strategies**

- Graze cattle to stimulate or maintain habitat conditions.
- Use prescribed fire to stimulate or maintain habitat conditions.

### **Rationale and Assumptions**

From the Service’s 1975 “Annual Report” to current day, the lack of good water rights for Hutton Lake NWR and the inability to do more than just fill ponds when possible and watch them evaporate when conditions are dry are constant themes. In the arid Laramie Plains, water is a key resource. Because the Service does not own senior water rights, the refuge wetlands are at the mercy of nature and the generosity of adjoining landowners who hold the rights to the water in Sand Creek. Since the 1980s, the water control structures at Hutton Lake NWR have remained in place with no active water management other than the water commissioner opening or closing the headgate on Sand Creek. From Rush Lake water can flow to Lake George or Hoge Lake, or both. Lake George connects to the largest lake, Creighton Lake, and Hoge Lake connects to Hutton Lake. From Creighton Lake to Hutton Lake the area is a closed basin. The closed basin affects water quality, with Creighton Lake exhibiting some alkali characteristics such as white sediments ringing the dry lakeshore. For these reasons, Hutton Lake NWR is primarily an important resting area for migratory birds and a brood-rearing area of local importance.

A habitat model for lesser scaup notes that broods tend to use expansive areas of open water as security and escape cover, and highly suitable conditions are described as having large amounts of open water and as little as 0–50 percent emergent cover (Allen 1986). Wilson’s phalarope will use both fresh and alkali wetlands with three characteristics: open water, emergent vegetation, and open shoreline (Dechant et al. 2001 revised 2003). Though Wilson’s phalarope have been observed, a lack of data concerning water quality and other parameters hamper management actions. From the more freshwater Rush Lake to the more alkaline Lake Creighton, Hutton Lake NWR can provide life-cycle requirements for these bird species, but site-specific information is needed to guide management direction.

During the postbreeding season, gadwalls are found with diving ducks in deeper water habitats; northern shovelers prefer more open permanent water bodies (Murkin et al. 1997). Ruddy ducks’ fall habitat use patterns show a preference for deeper, more open habitats, as they require large open areas to become airborne. Open lake marshes serve as roosting sites during migration for a wide range of species.

### Objective 3

Inspect impoundments annually for tamarisk and eradicate any plants found as part of the effort for a zero tolerance of this invasive species on the refuge.

#### Strategies

- Improve and rehabilitate water control structures on all wetlands.
- Continue to partner with Albany County Weed and Pest for monitoring and control of invasive species.

#### Rationale and Assumptions

Tamarisk, in low concentrations, has been found on the refuge in Hoge Lake. Plants have been pulled or sprayed in cooperation with Albany County Weed and Pest. The county surveys the refuge and controls tamarisk annually, and found plants are either pulled or sprayed with herbicides.

Tamarisk effectively displaces native vegetation through competition for available resources and germination sites, while offering little suitable habitat for native wildlife (Sudbrock 1993). It has little value to native wildlife and displaces native vegetation where the value of the original habitat is progressively diminished for many native animal species (Lovich 1996).

### Uplands Goal

Evaluate shrub- and grass-dominated uplands for the benefit of migratory birds (willet, horned lark), white-tailed prairie dogs, pronghorn, and other wildlife.

### Objective 1

Within 3 years, initiate baseline inventories to identify flora and fauna species composition and distribution, as well as habitat types and their distribution on the refuge. After initial evaluation, develop quantitative objectives and use, as appropriate and supported by sound science and objectives, potential tools (prescribed fire, grazing, rest, invasive species control).

#### Strategies

- Partner with U.S. Geological Survey (USGS), the University of Wyoming, and Colorado State University to develop and implement research objectives.
- Explore grants and other funding sources to provide for research needs.

#### Rationale and Assumptions

The Laramie Plains refuges are primarily native grasslands. The decline of grassland nesting birds has been attributed to habitat loss and conversion, fragmentation, and the disruption of ecological factors, such as fire, which created a mosaic of habitat types across the landscape. As a result, many grassland bird species are now considered species of biological concern (USFWS 2002). Managing natural areas for these bird species involves providing the nesting habitat requirements and food resources essential for their reproduction and survival. These requirements include large, treeless patches containing within them diversity in vegetation structure.

Many shorebirds also use the refuges. Willet, a breeding shorebird common on the refuges, requires large expanses of short, sparse grasslands for nesting and foraging and wetland complexes for foraging (Stewart 1975, Kantrud and Higgins 1992, Dechant et al. 2001). In both upland and wetland habitats, adults with broods use somewhat taller, denser grass cover than do breeding pairs during nesting (Ryan and Renken 1987). Willets also prefer native grass to tame vegetation (Stewart 1975, Kantrud and Higgins 1992, Dechant et al. 2001) and shallow-water wetlands with short, sparse shoreline vegetation. Suitable wetlands range from fresh to saline and vary widely in size and permanence (Dechant et al. 2001).

A common upland bird to the area is the horned lark. In Colorado, horned lark territories in lightly grazed short-grass pastures ranged between 0.13 and 1.5 hectare and averaged 0.7 hectare (Boyd 1976 referenced in Dinkens et al. 2003). Horned larks have been observed, but most surveys of the area have concentrated on wetland areas. A lack of data on upland birds' use of the refuge hampers upland management decisions.

Though these and other birds have been identified in the area, the Service does not have any data on the effects of current grazing, condition of uplands, or other biological information due to a lack of monitoring. The lack of site-specific biological information on these species' use of refuge lands and personnel dedicated to guide management practices (prescribed fire, grazing, haying, and mowing) needs to be corrected by gathering data and evaluating such management practices for the benefits they offer to wildlife resources. Baseline information on vegetative structure, composition, and quality as well as water quality are imperative to guide proper management decisions.

**Objective 2**

Within 10 years, identify and map invasive plant infestations (other than tamarisk) and initiate control procedures. Determine target percent control following this process.

**Strategy**

- Continue and improve partnership with Albany County Weed and Pest for noxious weed management using all appropriate known strategies such as chemical, biological, cultural, and mechanical controls.
- Use prescribed fire to reduce and control invasive species.

**Rationale and Assumptions**

For native birds to be retained, invasive plants must be controlled (Marzluff and Ewing 2001). Invasive species pose a serious threat to existing fish and wildlife resources. Once invasive plants are present, it is important to maximize efforts to gain control of them. Currently, no large infestations occur. Continued monitoring, improved by hiring a dedicated Service employee for the Laramie Plains refuges, will ensure that any noted invasive plants will be mapped and control procedures will be initiated.

**Visitor Services Goal**

Provide wildlife-dependent recreational opportunities to a diverse audience when the administration of these programs does not adversely affect habitat management objectives.

**Objective 1**

Within 5 years of plan approval, enhance nonconsumptive wildlife-dependent recreation by developing a visitor services plan and supporting facilities to address refuge activities, access, and circulation.

**Strategies**

- Develop visitor services plan.
- Establish a formal parking area with informational kiosks and brochures.
- Provide walk-in access and accessible trails with markers to designate walking trails to the best wildlife viewing areas.
- Close roads where necessary to facilitate implementation of visitor services plan and decrease disturbance to wildlife, discourage illegal hunting, and improve maintenance.
- Update refuge informational brochures and wildlife list to Service standards.

- Construct accessible photography blinds on Lake George and Rush and Hutton lakes.
- Provide educational materials on wildlife photography techniques.
- Provide an annual educational opportunity with experienced wildlife photographers sharing their expertise.

**Rationale and Assumptions**

The lakes provide wildlife viewing and wildlife photography opportunities. The public can observe and enjoy a variety of wildlife including white-tailed prairie dogs, raptors, waterfowl, shorebirds, and other migratory species.

Currently roads consist mainly of two tracks randomly traversing the refuge in an undefined pattern. Vehicles traveling on the two tracks create new roads and trails when conditions are muddy or when pursuing a wildlife viewing opportunity not near a roadway. Conducting a site circulation assessment and closing refuge roads where needed would reduce law enforcement issues and foster a quiet, quality wildlife-dependent recreational opportunity.

**Objective 2**

Within 10 years of plan approval, improve wildlife educational opportunities.

**Strategies**

- In cooperation with University of Wyoming, Wyoming Audubon, and others, offer scheduled environmental education opportunities at Hutton Lake NWR.
- Create programs for students and volunteers to assist in refuge management activities.
- Provide educational opportunities to local youth organizations such as Boy Scouts and Girl Scouts.

**Rationale and Assumptions**

The public should be made aware of the Refuge System in general and this refuge in particular, as well as the benefits refuges provide to wildlife and the community. The refuge's proximity to Laramie makes it accessible for environmental education opportunities from kindergarten through college.

**Draft CCP—Mortenson Lake NWR**

The following goals, objectives, and strategies for Mortenson Lake NWR outline the actions needed to achieve the vision of the Laramie Plains refuges.

## Wetlands Goal

Following considerations for Wyoming toad needs, manage refuge impoundments and other wetlands to create diverse habitat for wetland-dependent wildlife.

### Objective 1

Within 8 years, develop and implement protocols for increased water management and monitoring of water quality on Garber, Soda, and Gibbs lakes for the benefit of migrating waterfowl and for the nesting and feeding benefits of shorebirds and other water-dependent birds.

#### Strategies

- Work with the USFWS region 6, divisions of water resources and ecological services, to resolve water quality issues.
- Develop an infrastructure improvement plan for dikes, water control structures, and ditches.

#### Rationale and Assumptions

Soda, Gibbs, and Garber lakes are known to have alkalinity problems, but no specific data for the lakes is available. The ability to manage these lakes' water levels is minimal because infrastructures are lacking.

The potential for the Wyoming toad to use these lakes is also minimal, due to water quality and surrounding vegetation. Potential high alkalinity and the limited vegetation development of Garber and Soda lakes make them unsuitable for the toad. Gibbs Lake is surrounded by short-grass prairie with very little wetland vegetation, which also limits habitat for the toad. Managing these lakes for the Wyoming toad would be the priority if the limitations stated above could be changed in favor of the toad.

Waterfowl, shorebirds, and other water-dependent birds currently use the three lakes, but increased water management (water-level control, flushing water through them) and quality could improve the lakes for a greater benefit to these birds.

### Objective 2

Within 5 years, investigate the opportunities for acquiring more water rights and initiate the acquisition on any feasible possibility.

#### Strategy

- Work with USFWS region 6, division of water resources, to pursue additional water rights and seek adjudication of existing storage rights.

#### Rationale and Assumptions

Water rights on the refuge are limited, with water sources being runoff from melting snow, natural springs, and water from return flows off land irrigated by the Pioneer ditch. The refuge does not own any A or B shares on the Pioneer ditch (USFWS 1992). A refuge neighbor owns some of these shares and uses them to help the refuge irrigate some lands around Soda Lake. This irrigation water also helps water flow through Soda Lake into Gibbs Lake. The refuge does have storage rights on Soda, Harmon, and Mortenson lakes, but none of the rights are adjudicated. If water rights were available for purchase, the refuge wetlands and irrigation lands would benefit greatly if the Service could acquire them.

## Uplands Goal

Following consideration for Wyoming toad needs, manage shrub- and grass-dominated uplands for the benefit of migratory birds, white-tailed prairie dogs, pronghorn, and other wildlife.

### Objective 1

Within 3 years, initiate baseline data studies to identify flora and fauna species composition and distribution, as well as habitat types and their distribution on the refuge. Conduct adaptive management over the life of the plan.

#### Strategies

Same strategies as Hutton Lake NWR Uplands objective 1.

#### Rationale and Assumptions

Same rationale and assumptions as Hutton Lake NWR Uplands objective 1.

### Objective 2

Within 5 years, identify and map invasive plant infestations and initiate control procedures. Determine target percent control following this process.

#### Strategies

Same strategies as Hutton Lake NWR Uplands objective 2.

#### Rationale and Assumptions

Same rationale and assumptions as Hutton Lake NWR Uplands objective 2.

## Wyoming Toad Goal

In conjunction with the Wyoming Toad Recovery Team, manage refuge lands around Mortenson Lake and other areas, on the refuge, as necessary to protect, create, and manage habitat suitable for Wyoming toad recovery from endangered status.

### Objective 1

Maintain 40 percent of the habitat over a 5-year average in the moist margin of Mortenson Lake proper with 35–39 percent horizontal vegetative cover (dominant species: American bulrush and creeping spike, or species with similar morphology) and 20 percent open areas in mosaic conditions for metamorphs and juvenile (<2 year olds) Wyoming toads.

#### Strategies

- Graze cattle to stimulate or maintain habitat conditions.
- Use prescribed fire to stimulate or maintain habitat conditions.
- Use mechanical manipulation to stimulate or maintain habitat conditions.
- Manipulate water to stimulate habitat conditions.
- Develop vegetative monitoring protocol.

#### Rationale and Assumptions

Two master's theses (Withers 1992 and Parker 2000), background information, and the Wyoming Toad Recovery Team indicate that the habitat conditions detailed above are beneficial to the growth and survival of the Wyoming toad. Vegetative type and percent cover for metamorphs and juveniles are based on Withers's study, with the lower percentage used more by the metamorphs and the higher percentage used more by the juveniles. The vegetative percentage cover for adults is based on Parker's study. The vegetative cover percentages are based on the habitat as a whole, with each cover fulfilling a part of the habitat for a total of 100 percent. The lake's moist margin is defined as the area of ample soil moisture favored by the Wyoming toad at Mortenson Lake. On a 4-point moisture scale (1 = dry, 2 = moist, 3 = saturated, 4 = standing water), Wyoming toads use moist 2.0 to supersaturated 3.6 soils (Withers 1992).

One report questions Parker's habitat-use data because none of the toads in his study were wild: "The determination of habitat use and preference is fraught with difficulties such as spatial and serial autocorrelation, nonindependence of proportions, and definitions of habitat availability" (Drietz 2006). Parker also questions Withers's claim of habitat cover needs for adult Wyoming toads in an article

in the *Journal of Wildlife Management*. He states that adult toads used habitat with more vegetation cover than was documented in the past (Parker and Anderson 2003).

The objectives for the Wyoming toad are based on the best available science. As new research becomes available, the objectives will change to reflect new data and knowledge.

### Objective 2

Maintain 40 percent of the habitat over a 5-year average in the moist margin of Mortenson Lake proper with a mean of 55 percent horizontal vegetative cover (dominant species: American bulrush and creeping spike, or species with similar morphology) and 20 percent open areas in mosaic conditions for adult Wyoming toads.

#### Strategies

Same as objective 1.

#### Rationale and Assumptions

Same as objective 1.

### Objective 3

Manage water levels on Mortenson Lake to mimic conditions prior to refuge establishment with drawdowns starting in early May. Maintain water levels in late May or early June for egg masses. Prior to initiating another drawdown, conduct surveys for egg masses to determine if hatching has occurred. Once hatching is completed, begin another drawdown and continue to draw down until about mid-July to provide basking areas for adults and shallow warm water for tadpoles.

#### Strategies

- Conduct egg mass surveys.
- Conduct breeding calling surveys.
- Develop monitoring protocols.
- Monitor water quality.
- Staff gauge for Mortenson Lake.

#### Rationale and Assumptions

Two master's theses (Withers 1992 and Parker 2000), background information, and the Wyoming Toad Recovery Team indicate that the water level manipulation described above should enhance Wyoming toad habitat. This drawdown effort is an attempt to mimic prerefuge management of Mortenson Lake. The Recovery Team believes that the management practice over the past 15 of years of keeping the lake full throughout the spring and into the summer may be a factor in the perceived decline of Wyoming toads at Mortenson Lake. Prerefuge

water manipulations would create shallow stable water 3.5–6.3 cm deep for egg development, warm shallow water for tadpoles, and eventually dry moist areas for adult toads to bask in (Withers 1992). Draw down of Mortenson Lake would be approximately 1.6 feet over the three month time frame.

#### **Objective 4**

Continue to work with the Recovery Team following their recommendations for habitat conditions for the Wyoming toad as new science emerges.

#### **Strategy**

- Continue to have a Service staff member participate as a member of the Recovery Team.

#### **Rationale and Assumptions**

The Recovery Team is on the forefront of all new science concerning the toad. The team's recommendations will reflect the most up-to-date science and on-the-ground experience.

### **6.4 STAFFING AND FUNDING**

Currently, the Arapaho NWR Complex has a staff of five full-time employees. All five employees work in the complex with duties at Arapaho NWR, the three Laramie Plains refuges, and Pathfinder NWR near Casper, Wyoming. Table 5 lists these positions along with one new position (specifically assigned to the Laramie Plains refuges and Pathfinder NWR) that is needed for full implementation of the CCP. Projects required to carry out the CCP are funded through two separate systems, as follows:

- The refuge operations needs system (RONS) is used to document requests to Congress for funding and staffing needed to carry out projects above the existing base budget.
- The Service asset maintenance management system (SAMMS) is used to document the equipment, buildings, and other existing properties that require repair or replacement.

### **Monitoring and Evaluation**

Adaptive management is a flexible approach to long-term management of biotic resources. Adaptive management is directed, over time, by the results of

ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are carried out within a framework of scientifically driven experiments to test the predictions and assumptions outlined with a CCP (figure 18).

To apply adaptive management, specific survey, inventory, and monitoring protocols would be adopted for the Laramie Plains refuges. The habitat management strategies would be systematically evaluated to determine management effects on wildlife populations. This information would be used to refine approaches and determine how effectively the objectives are being accomplished. If monitoring and evaluation indicate undesirable effects for target and nontarget species or communities, the management projects would be altered accordingly. Subsequently, the CCP would be revised.

Specific monitoring and evaluation activities will be described in the step-down management plans (table 6).

### **Plan Amendment and Revision**

The final CCP will be reviewed annually to determine the need for revision. A revision would occur if and when significant information becomes available. The final CCP will be supported by detailed step-down management plans to address the completion of specific strategies in support of the Laramie Plains refuges' goals and objectives. Revisions to the CCP and the step-down management plans will be subject to public review and NEPA compliance.

At a minimum, the final CCP will be evaluated every 5 years and revised after 15 years.

### **6.5 STEP-DOWN MANAGEMENT PLANS**

The CCP for the Laramie Plains refuges is intended to be a broad umbrella plan that (1) outlines general concepts and objectives for habitat, wildlife, visitor services, cultural resources, and partnerships; and (2) guides refuge management for the next 15 years. Step-down management plans provide greater detail for carrying out specific actions authorized by the CCP. Table 5 presents step-down management plans for the refuges that are anticipated to be needed, along with their current status and next revision date.

<b>Table 5. Current and proposed staff for the Arapaho NWR Complex, including Arapaho NWR, Colorado, and Bamforth NWR, Hutton Lake NWR, Mortenson Lake NWR, and Pathfinder NWR, Wyoming.</b>		
	<i>Current Positions</i> <i>GS=General Schedule Positions</i> <i>WG=Wage Grade Positions</i>	<i>Additional Proposed Positions</i> <i>(Unfunded staffing)</i>
Management Staff	Refuge project leader, GS-12* Refuge operations specialist, GS-11*	Refuge operations specialist, GS-9
Biological Staff	Wildlife biologist, GS-9*	<i>No additional positions</i>
Visitor Service Staff	<i>None</i>	<i>None</i>
Administrative Staff	Administrative assistant, GS-8*	<i>No additional positions</i>
Maintenance Staff	Maintenance worker, WG-8*	<i>No additional positions</i>
Law Enforcement Staff	<i>None</i>	<i>None</i>
Fire Management Staff	<i>None</i>	<i>None</i>

\*This position supports the Laramie Plains refuges but is assigned to the Arapaho NWR Complex and works at all five stations.

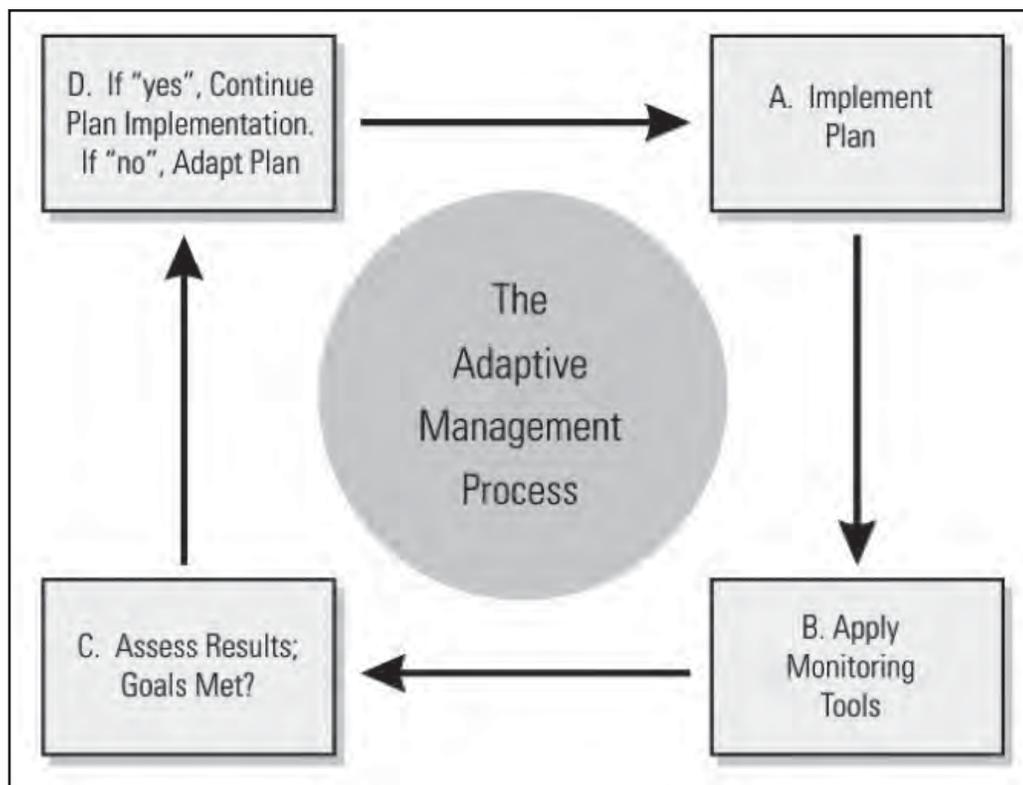


Figure 18. The adaptive management process.

<i>Step-down Management Plan</i>	<i>Completed Plan, Year Approved</i>	<i>New or Revised Plan, Completion Year</i>
Fire management plan	2001	2009
Habitat management plan	—	2012
Habitat management plan (annual)	—	2009
Integrated pest management plan	2007	N/A
Law enforcement plan	—	2017
Safety plan	Under plan for Arapaho NWR Complex	2008
Visitor services plan (applies to Hutton Lake NWR)	—	2010
Water management plan	2007	N/A



# Glossary of Terms

**accessible**—Pertaining to physical access to areas and activities for people of different abilities, especially those with physical impairments.

**adaptive resource management**—The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities; a process that uses feedback from research, monitoring, and evaluation of management actions to support or modify objectives and strategies at all planning levels; a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plan. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

**Administration Act**—National Wildlife Refuge System Administration Act of 1966.

**alternative**—A reasonable way to solve an identified problem or satisfy the stated need (40 CFR 1500.2); one of several different means of accomplishing refuge purposes and goals and contributing to the Refuge System mission (Draft Service Manual 602 FW 1.5).

**amphibian**—A class of cold-blooded vertebrates including frogs, toads or salamanders.

**animal unit month (AUM)**—Measure of the quantity of livestock forage. Equivalent to the amount of forage needed to support a 1,000-pound animal (or one cow/calf pair) for 1 month.

**annual**—A plant that flowers and dies within 1 year of germination.

**ATV**—All-terrain vehicle.

**AUM**—*See* animal unit month.s

**baseline**—A set of critical observations, data, or information used for comparison or a control.

**biological control**—The use of organisms or viruses to control invasive plants or other pests.

**biological diversity, also biodiversity**—The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Service Manual 052 FW 1.12B). The National Wildlife Refuge System's focus is on indigenous

species, biotic communities, and ecological processes.

**biotic**—Pertaining to life or living organisms; caused, produced by, or comprising living organisms.

**canopy**—A layer of foliage, generally the uppermost layer, in a vegetative stand; midlevel or understory vegetation in multilayered stands. Canopy closure (*also* canopy cover) is an estimate of the amount of overhead vegetative cover.

**CCC**—*See* Civilian Conservation Corps.

**CCP**—*See* comprehensive conservation plan.

**CFR**—*See* Code of Federal Regulations.

**cfs**—Cubic feet per second.

**Civilian Conservation Corps (CCC)**—Peacetime civilian “army” established by President Franklin D. Roosevelt to perform conservation activities from 1933–42. Activities included erosion control; firefighting; tree planting; habitat protection; stream improvement; and building of fire towers, roads, recreation facilities, and drainage systems.

**Code of Federal Regulations (CFR)**—The codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government. Each volume of the CFR is updated once each calendar year.

**compatibility determination**—*See* compatible use.

**compatible use**—A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the director of the U.S. Fish and Wildlife Service, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge (Draft Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identified stipulations or limits necessary to ensure compatibility.

**comprehensive conservation plan (CCP)**—A document that describes the desired future conditions of the refuge and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the Refuge System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

**concern**—*See* issue.

**cool-season grasses**—Grasses that begin growth earlier in the season and often become dormant in the summer. These grasses will germinate at lower temperatures. Examples of cool-season grasses are western wheatgrass, needle and thread, and green needlegrass.

**cover, also cover type, canopy cover**—Present vegetation of an area.

**cultural resources**—The remains of sites, structures, or objects used by people in the past.

**dense nesting cover (DNC)**—A composition of grasses and forbs that allows for a dense stand of vegetation that protects nesting birds from the view of predators, usually consisting of one to two species of wheatgrass, alfalfa, and sweetclover.

**depredation**—Destruction or consumption of eggs, broods, or individual wildlife due to a predatory animal; damage inflicted on agricultural crops or ornamental plants by wildlife.

**DNC**—*See* dense nesting cover.

**drawdown**—The act of manipulating water levels in an impoundment to allow for the natural drying-out cycle of a wetland.

**EA**—*See* environmental assessment.

**ecosystem**—A dynamic and interrelating complex of plant and animal communities and their associated nonliving environment; a biological community, together with its environment, functioning as a unit. For administrative purposes, the Service has designated 53 ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries and their sizes and ecological complexity vary.

**EIS**—Environmental impact statement.

**emergent**—A plant rooted in shallow water and having most of the vegetative growth above water such as cattail and hardstem bulrush.

**endangered species, federal**—A plant or animal species listed under the Endangered Species Act of 1973, as amended, that is in danger of extinction throughout all or a significant portion of its range.

**endangered species, state**—A plant or animal species in danger of becoming extinct or extirpated in a particular state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

**endemic species**—Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

**environmental assessment (EA)**—A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action and alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

**EPA**—Environmental Protection Agency.

**extinction**—The complete disappearance of a species from the earth; no longer existing.

**extirpation**—The extinction of a population; complete eradication of a species within a specified area.

**fauna**—All the vertebrate and invertebrate animals of an area.

**federal trust resource**—A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States of America as a result of federal acts and treaties. Examples are species listed under the Endangered Species Act, migratory birds protected by international treaties, and native plant or wildlife species found on a national wildlife refuge.

**federal trust species**—All species where the federal government has primary jurisdiction including federally endangered or threatened species, migratory birds, anadromous fish, and certain marine mammals.

**flora**—All the plant species of an area.

**FMP**—fire management plan.

**forb**—A broad-leaved, herbaceous plant; a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue but dies down at the end of the growing season.

**fragmentation**—The alteration of a large block of habitat that creates isolated patches of the original habitat that are interspersed with a variety of other habitat types; the process of reducing the size and connectivity of habitat patches, making movement of individuals or genetic information between parcels difficult or impossible.

**“friends” group**—Any formal organization whose mission is to support the goals and purposes of its associated refuge and the National Wildlife Refuge Association overall; “friends” organizations and cooperative and interpretive associations.

**FWS**—*See* U.S. Fish and Wildlife Service.

**geographic information system (GIS)**—A computer system capable of storing and manipulating spatial data; a set of computer hardware and software

for analyzing and displaying spatially referenced features (such as points, lines and polygons) with nongeographic attributes such as species and age.

**GIS**—*See* geographic information system.

**goal**—Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

**grassland tract**—A contiguous area of grassland without fragmentation.

**GS**—general schedule (pay rate schedule for certain federal positions).

**habitat**—Suite of existing environmental conditions required by an organism for survival and reproduction; the place where an organism typically lives and grows.

**habitat disturbance**—Significant alteration of habitat structure or composition; may be natural (for example, wildland fire) or human-caused events (for example, timber harvest and disking).

**habitat type, also vegetation type, cover type**—A land classification system based on the concept of distinct plant associations.

**HMP**—Habitat management plan.

**impoundment**—A body of water created by collection and confinement within a series of levees or dikes, creating separate management units although not always independent of one another.

**Improvement Act**—National Wildlife Refuge System Improvement Act of 1997.

**indigenous**—Originating or occurring naturally in a particular place.

**integrated pest management (IPM)**—Methods of managing undesirable species such as invasive plants; education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods.

**introduced species**—A species present in an area due to intentional or unintentional escape, release, dissemination, or placement into an ecosystem as a result of human activity.

**invasive plant, also noxious weed**—A species that is nonnative to the ecosystem under consideration and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

**IPM**—*See* integrated pest management.

**issue**—Any unsettled matter that requires a management decision; for example, a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (Draft Service Manual 602 FW 1.5).

**management alternative**—*See* alternative.

**migration**—Regular extensive, seasonal movements of birds between their breeding regions and their wintering regions; to pass usually periodically from one region or climate to another for feeding or breeding.

**migratory birds**—Birds which follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

**mission**—Succinct statement of purpose and/or reason for being.

**mitigation**—Measure designed to counteract an environmental impact or to make an impact less severe.

**monitoring**—The process of collecting information to track changes of selected parameters over time.

**national wildlife refuge**—A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include coordination areas; a complete listing of all units of the Refuge System is in the current “Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service.”

**National Wildlife Refuge System (Refuge System)**—Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife including species threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas.

**National Wildlife Refuge System Improvement Act of 1997 (Improvement Act)**—Sets the mission and the administrative policy for all refuges in the National Wildlife Refuge System; defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation); establishes a formal process for determining appropriateness and compatibility; establish the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; requires a comprehensive conservation plan

for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

**native species**—A species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

**neotropical migrant**—A bird species that breeds north of the United States and Mexican border and winters primarily south of this border.

**NEPA**—National Environmental Policy Act.

**nest success**—The percentage of nests that successfully hatch one or more eggs of the total number of nests initiated in an area.

**NOA**—Notice of availability.

**nongovernmental organization**—Any group that is not composed of federal, state, tribal, county, city, town, local, or other governmental entities.

**noxious weed, also invasive plant**—Any living stage (including seeds and reproductive parts) of a parasitic or other plant of a kind that is of foreign origin (new to or not widely prevalent in the U.S.) and can directly or indirectly injure crops, other useful plants, livestock, poultry, other interests of agriculture, including irrigation, navigation, fish and wildlife resources, or public health. According to the Federal Noxious Weed Act (PL 93-639), a noxious weed (such as invasive plant) is one that causes disease or has adverse effects on humans or the human environment and, therefore, is detrimental to the agriculture and commerce of the U.S. and to public health.

**NRCS**—Natural Resources Conservation Service of the U.S. Department of Agriculture.

**NWR**—national wildlife refuge.

**objective**—An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work; derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific and should be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively (Draft Service Manual 602 FW 1.5).

**overwater species**—nesting species such as diving ducks and many colonial-nesting birds that build nests within dense stands of water-dependent plants, primarily cattail, or that build floating nests of vegetation that rest on the water.

**patch**—An area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

**perennial**—Lasting or active through the year or through many years; a plant species that has a life span of more than 2 years.

**plant community**—An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soil, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community, such as ponderosa pine or bunchgrass.

**playa**—A nearly level area at the bottom of an undrained desert basin, sometimes temporarily covered with water.

**prescribed fire**—The skillful application of fire to natural fuels under conditions such as weather, fuel moisture, and soil moisture that allow confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

**priority public use**—One of six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority if found to be compatible with a refuge's purposes. This includes hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

**proposed action**—The alternative proposed to best achieve the purpose, vision, and goals of a refuge (contributes to the Refuge System mission, addresses the significant issues, and is consistent with principles of sound fish and wildlife management).

**public**—Individuals, organizations, and groups; officials of federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

**public involvement**—A process that offers affected and interested individuals and organizations an opportunity to become informed about, and to express their opinions on, Service actions and policies. In the process, these views are studied thoroughly and thoughtful consideration of public views is given in shaping decisions for refuge management.

**purpose of the refuge**—The purpose of a refuge is specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing authorization or expanding a refuge, refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

**raptor**—A carnivorous bird such as a hawk, a falcon, or a vulture that feeds wholly or chiefly on meat taken by hunting or on carrion (dead carcasses).

**Reclamation**—Bureau of Reclamation of the U.S. Department of the Interior.

**refuge operations needs system (RONS)**—A national database that contains the unfunded operational needs of each refuge. Projects included are those required to implement approved plans and meet goals, objectives, and legal mandates.

**refuge purpose**—*See* purpose of the refuge.

**Refuge System**—*See* National Wildlife Refuge System.

**refuge use**—Any activity on a refuge, except administrative or law enforcement activity, carried out by or under the direction of an authorized Service employee.

**resident species**—A species inhabiting a given locality throughout the year; nonmigratory species.

**rest**—Free from biological, mechanical, or chemical manipulation, in reference to refuge lands.

**restoration**—Management emphasis designed to move ecosystems to desired conditions and processes, such as healthy upland habitats and aquatic systems.

**riparian area or riparian zone**—An area or habitat that is transitional from terrestrial to aquatic ecosystems including streams, lakes, wet areas, and adjacent plant communities and their associated soils that have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, “riparian” describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes all plant life growing on the land adjoining a stream and directly influenced by the stream.

**RONS**—*See* refuge operations needs system.

**SAMMS**—*See* Service Asset Maintenance Management System.

**scoping**—The process of obtaining information from the public for input into the planning process.

**seasonally flooded**—Surface water is present for extended periods in the growing season, but is absent by the end of the season in most years.

**sediment**—Material deposited by water, wind, and glaciers.

**Service**—*See* U.S. Fish and Wildlife Service.

### **Service Asset Maintenance Management System**

**(SAMMS)**—A national database which contains the unfunded maintenance needs of each refuge; projects include those required to maintain existing equipment and buildings, correct safety deficiencies for the implementation of approved plans, and meet goals, objectives, and legal mandates.

**shelterbelt**—Single to multiple rows of trees and shrubs planted around cropland or buildings to block or slow down the wind.

**shorebird**—Any of a suborder (*Charadrii*) of birds such as a plover or a snipe that frequent the seashore or mud flat areas.

**spatial**—Relating to, occupying, or having the character of space.

**special status species**—Plants or animals that have been identified through federal law, state law, or agency policy as requiring special protection of monitoring. Examples include federally listed endangered, threatened, proposed, or candidate species; state-listed endangered, threatened, candidate, or monitor species; Service’s species of management concern; species identified by the Partners in Flight program as being of extreme or moderately high conservation concern.

**special use permit**—A permit for special authorization from the refuge manager required for any refuge service, facility, privilege, or product of the soil provided at refuge expense and not usually available to the general public through authorizations in Title 50 CFR or other public regulations (“Refuge Manual” 5 RM 17.6).

**species of concern**—Those plant and animal species, while not falling under the definition of special status species, that are of management interest by virtue of being federal trust species such as migratory birds, important game species, or significant keystone species; species that have documented or apparent populations declines, small or restricted populations, or dependence on restricted or vulnerable habitats.

**spoil piles**—Spoil piles (also known as stock piles or storage piles) are excavated materials consisting of topsoil or subsoils that have been removed and temporarily stored during construction activity. Proper placement and stabilization of spoil piles helps reduce soil erosion.

**step-down management plan**—A plan that provides the details necessary to implement management strategies identified in the comprehensive conservation plan (“Draft Service Manual” 602 FW 1.5).

**strategy**—A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (“Draft Service Manual” 602 FW 1.5).

**submergent**—A vascular or nonvascular hydrophyte, either rooted or nonrooted, that lies entirely beneath the water surface, except for flowering parts in some species.

**threatened species, federal**—Species listed under the Endangered Species Act of 1973, as amended, that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

**threatened species, state**—A plant or animal species likely to become endangered in a particular state within the near future if factors contributing to population decline or habitat degradation or loss continue.

**travel corridor**—A landscape feature that facilitates the biologically effective transport of animals between larger patches of habitat dedicated to conservation functions. Such corridors may facilitate several kinds of traffic including frequent foraging movement, seasonal migration, or the once in a lifetime dispersal of juvenile animals. These are transition habitats and need not contain all the habitat elements required for long-term survival or reproduction of its migrants.

**trust resource**—*See* federal trust resource.

**trust species**—*See* federal trust species.

**U.S. Fish and Wildlife Service (Service, USFWS, FWS)**—The principal federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. The Service manages the 93-million-acre National Wildlife Refuge System comprised of more than 530 national wildlife refuges and thousands of waterfowl production areas. It also operates 65 national fish hatcheries and 78 ecological service field stations, the agency enforces federal wildlife laws, manages migratory bird populations, restores national significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the federal aid program that distributes millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

**USFWS**—*See* U.S. Fish and Wildlife Service.

**U.S. Geological Survey (USGS)**—A federal agency whose mission is to provide reliable scientific information to describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

**USGS**—*See* U.S. Geological Survey.

**vision statement**—A concise statement of the desired future condition of the planning unit, based primarily on the Refuge System mission, specific refuge purposes, and other relevant mandates (“Draft Service Manual” 602 FW 1.5).

**visual obstruction**—Pertaining to the density of a plant community; the height of vegetation that blocks the view of predators and conspecifics to a nest.

**visual obstruction reading (VOR)**—A method of visually quantifying vegetative structure and composition.

**VOR**—*See* visual obstruction reading.

**wading birds**—Birds having long legs that enable them to wade in shallow water including egrets, great blue herons, black-crowned night-herons, and bitterns.

**waterfowl**—A category of birds that includes ducks, geese, and swans.

**watershed**—The region draining into a river, a river system, or a body of water.

**wetland management district (WMD)**—Land that the Refuge System acquires with Federal Duck Stamp funds for restoration and management primarily as prairie wetland habitat critical to waterfowl and other wetland birds.

**WG**—wage grade schedule (pay rate schedule for certain federal positions).

**wildland fire**—A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (“Service Manual” 621 FW 1.7).

**wildlife-dependent recreational use**—Use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, environmental education, or interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the Refuge System.

**WMD**—*See* wetland management district.

**woodland**—Open stands of trees with crowns not usually touching, generally forming 25–60 percent cover.

**WUI**—wildland–urban interface.

# Appendix A

## Key Legislation and Policies

This appendix briefly describes the guidance for the National Wildlife Refuge System and other policies and key legislation that guide the management of the Laramie Plains National Wildlife Refuges.

### NATIONAL WILDLIFE REFUGE SYSTEM

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

*National Wildlife Refuge System Improvement Act of 1997.*

### Goals

- Fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.
- Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.
- Perpetuate migratory bird, interjurisdictional fish, and marine mammal populations.
- Conserve a diversity of fish, wildlife, and plants.
- Conserve and restore, where appropriate, representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.
- Foster understanding and instill appreciation of fish, wildlife, and plants, and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

### Guiding Principles

There are four guiding principles for management and general public use of the Refuge System established by Executive Order 12996 (1996):

- **Public Use**—The Refuge System provides important opportunities for compatible wildlife-dependent recreational activities involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation.
- **Habitat**—Fish and wildlife will not prosper without high-quality habitat, and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges.
- **Partnerships**—America’s sportsmen and women were the first partners who insisted on protecting valuable wildlife habitat within wildlife refuges. Conservation partnerships with other federal agencies, state agencies, tribes, organizations, industry, and the general public can make significant contributions to the growth and management of the Refuge System.
- **Public Involvement**—The public should be given a full and open opportunity to participate in decisions regarding acquisition and management of our national wildlife refuges.

### LEGAL AND POLICY GUIDANCE

Management actions on national wildlife refuges are circumscribed by many mandates including laws and executive orders, the latest of which is the Volunteer and Community Partnership Enhancement Act of 1998. Regulations that affect refuge management the most are listed below.

**American Indian Religious Freedom Act (1978)**—Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

**Americans with Disabilities Act (1992)—**

Prohibits discrimination in public accommodations and services.

**Antiquities Act (1906)**—Authorizes the scientific investigation of antiquities on federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

**Archaeological and Historic Preservation Act (1974)**—Directs the preservation of historic and archaeological data in federal construction projects.

**Archaeological Resources Protection Act (1979), as amended**—Protects materials of archaeological interest from unauthorized removal or destruction and requires federal managers to develop plans and schedules to locate archaeological resources.

**Architectural Barriers Act (1968)**—Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

**Clean Water Act (1977)**—Requires consultation with the U.S. Army Corps of Engineers (40 permits) for major wetland modifications.

**Endangered Species Act (1973)**—Requires all federal agencies to carry out programs for the conservation of endangered and threatened species.

**Executive Order No. 7168 (1935)**—Establishes Arrowwood Migratory Waterfowl Refuge “as a refuge and breeding ground for migratory birds and other wild life... to effectuate further the purposes of the Migratory Bird Conservation Act....”

**Executive Order 11988 (1977)**—Requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

**Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)**—Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the Refuge System.

**Executive Order 13007, Indian Sacred Sites (1996)**—Directs federal land management agencies to accommodate access to and ceremonial uses of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

**Federal Noxious Weed Act (1990)**—Requires the use of integrated management systems to control or contain undesirable plant species and an interdisciplinary approach with the cooperation of other federal and state agencies.

**Federal Records Act (1950)**—Requires the preservation of evidence of the government’s organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

**Fish and Wildlife Coordination Act (1958)**—Allows the U.S. Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

**Migratory Bird Conservation Act (1929)**—Establishes procedures for acquisition by purchase, rental, or gifts of areas approved by the Migratory Bird Conservation Commission.

**Migratory Bird Hunting and Conservation Stamp Act (1934)**—Authorizes the opening of part of a refuge to waterfowl hunting.

**Migratory Bird Treaty Act (1918)**—Designates the protection of migratory birds as a federal responsibility; and enables the setting of seasons and other regulations, including the closing of areas, federal or nonfederal, to the hunting of migratory birds.

**National Environmental Policy Act (1969)**—Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate this Act with other planning requirements, and prepare appropriate documents to facilitate better environmental decision making. [From the “Code of Federal Regulations” (CFR), 40 CFR 1500]

**National Historic Preservation Act (1966), as amended**—Establishes as policy that the federal government is to provide leadership in the preservation of the Nation’s prehistoric and historical resources.

**National Wildlife Refuge System Administration Act (1966)**—Defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge, provided such use is compatible with the major purposes for which the refuge was established.

**National Wildlife Refuge System Improvement Act of 1997**—Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System; mandates comprehensive conservation planning for all units of the Refuge System.

**Native American Graves Protection and Repatriation Act (1990)**—Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

**Refuge Recreation Act (1962)**—Allows the use of refuges for recreation when such uses are compatible with the refuge’s primary purposes and when sufficient funds are available to manage the uses.

**Rehabilitation Act (1973)**—Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the federal government to ensure that any person can participate in any program.

**Rivers and Harbors Act (1899)**—Section 10 of this Act requires the authorization of U.S. Army Corps of Engineers prior to any work in, on, over, or under navigable waters of the United States.

**Volunteer and Community Partnership Enhancement Act (1998)**—Encourages the use of volunteers to assist in the management of refuges within the Refuge System; facilitates partnerships between the Refuge System and nonfederal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.



# Appendix B

## *List of Preparers, Consultation, and Coordination*

This document is the result of the extensive, collaborative, and enthusiastic efforts by the seven members of the Laramie Plains refuges planning team below. Many others contributed insight and support.

### Planning Team

<i>Team Member</i>	<i>Position</i>	<i>Work Unit</i>
Andrea Cerovski	Wildlife biologist	Wyoming Game and Fish Department; Lander, WY
Mark Ely	Geographic information system (GIS) specialist	USFWS, Region 6; Lakewood, CO
Toni Griffin	Planning team leader	USFWS, Region 6; Lakewood, CO
Pam Johnson	Wildlife biologist	Arapaho NWR; Walden, CO
Mark Lanier	<i>Former</i> assistant refuge manager	Arapaho NWR; Walden, CO
Larry Roberts	Wildlife biologist	Wyoming Game and Fish Department; Casper, WY
Ann Timberman	Project leader	Arapaho NWR; Walden, CO

### Contributors

The Service would like to acknowledge the efforts of the following individuals and organizations toward the completion of this draft CCP and EA. The diversity, talents, and knowledge they contributed dramatically improved the vision and completeness of this document.

<i>Name</i>	<i>Position</i>	<i>Work Unit</i>
BBC Research & Consulting	Socioeconomic impact studies	Contractor
Rick Coleman	Assistant regional director, refuge system	USFWS
Megan Estep	Chief hydrologist	USFWS
Sheri Fetherman	Chief, division of education and visitor services	USFWS
Wayne King	Biologist, refuge system	USFWS
Deb Parker	Writer-editor	USFWS
Dean Rundle	Refuge supervisor	USFWS
Richard Schroeder	Wildlife biologist	USGS

Shapins Associates	Writer-editor; layout	Contractor
Michael Spratt	Chief, division of refuge planning	USFWS
Richard Sterry	Regional fire planner	USFWS
Meg VanNess	Regional archaeologist	USFWS
Dave Wiseman	Refuge supervisor, <i>retired</i>	USFWS
Wyoming Toad Recovery Team	Wyoming toad recovery	USFWS

---

# Appendix C

## *Public Involvement*

---

Public scoping was initiated for the Laramie Plains refuges in a notice of intent (NOI) dated June 16, 2006. The NOI announced intent to prepare a comprehensive conservation plan and environmental assessment for the refuges and to obtain suggestions and information on the scope of issues to be considered in the planning process.

A public meeting was held in Laramie, Wyoming, on May 25, 2006. Approximately 31 people attended the meeting. Numerous written comments were received during the open comment period. Comments received identified biological, social, and economic concerns regarding refuge management. The mailing list for the CCP and EA follows.

### **Federal Officials**

U.S. Representative Barbara Cubin, Washington DC

Rep. Cubin's Area Director, Cheyenne, WY

U.S. Senator Craig Thomas, Washington DC

Sen. Thomas's Area Director, Casper, WY

U.S. Senator Michael Enzi, Washington DC

Sen. Enzi's Area Director, Cheyenne, WY

### **Federal Agencies**

Bureau of Land Management; Cheyenne, WY; Rawlins, WY

National Park Service, Omaha, NE

USFWS, Ecological Services, Cheyenne, WY

USFWS, National Wildlife Refuge System; Albuquerque, NM; Anchorage, AK; Arlington, VA; Atlanta, GA; Fort Snelling, MN; Hadley, MA; Portland, OR; Rawlins, WY; Sacramento, CA; Shepherdstown, WV; Washington DC

USGS-Fort Collins Science Center, Ft. Collins, CO

### **Tribal Officials**

Arapaho Business Committee, Fort Washakie, Wyoming

Crow Tribal Council, Crow Agency, Montana

Northern Cheyenne Tribal Council, Lame Deer, Montana

Oglala Sioux Tribal Council, Pine Ridge, South Dakota

Shoshone Business Council, Fort Washakie, Wyoming

### **State Officials**

Governor Dave Freudenthal, Cheyenne, WY

Representative Kermit Brown, Laramie, WY

Representative Kurt S. Bucholz, Saratoga, WY

Representative Jim Slater, Laramie, WY

Representative Jane Warren, Laramie, WY

Representative Kevin White, Laramie, WY

Senator Mike Massie, Laramie, WY

Senator Phil Nicholas, Laramie, WY

### **State Agencies**

Wyoming Department of Agriculture, Cheyenne, WY

Wyoming Game and Fish Department; Casper, WY; Lander, WY; Laramie, WY

Wyoming Game Fish Commission, Cheyenne, WY

Wyoming Office of State Lands and Investments, Cheyenne, WY

Wyoming State Historic Preservation Office, Cheyenne, WY

### **Local Government**

Albany County Commissioners, Laramie, WY

Laramie Rivers Conservation District, Safe Harbor Liaison, Laramie, WY

Mayor, Laramie, WY

### **Organizations**

American Bird Conservancy, Plains, VA

American Rivers, Washington DC

Audubon Wyoming, Casper, WY; Laramie, WY; Tie Siding, WY

Biodiversity Conservation Alliance, Laramie, WY  
Defenders of Wildlife, Washington DC  
Ducks Unlimited, Memphis, TN  
Izaak Walton League, Gaithersburg, MD  
League of Women Voters of Wyoming, Laramie, WY  
Murie Audubon Society, Casper, WY  
National Audubon Society; Washington DC; New York, NY  
National Trappers Association, New Martinsville, WV  
National Wildlife Federation, Reston, VA  
National Wildlife Refuge Association, Washington DC  
Sierra Club; San Francisco, CA; Sheridan, WY  
The Nature Conservancy, Boulder, CO  
The U.S. Humane Society, Washington, DC  
The Wilderness Society, Washington DC  
Union Pacific Railroad, Omaha, NE  
Wildlife Management Institute; Fort Collins, CO; Corvallis, OR; Washington DC  
Wyoming Natural diversity Database, Laramie, WY  
Wyoming Outdoor Council, Logan, UT

## **Universities, Colleges, and Schools**

University of Wyoming, Real Estate Operations, Laramie, WY  
University of Wyoming, School of Environment and Natural Resources, Laramie, WY

## **Media**

Casper Star Tribune, Casper, WY  
Daily Boomerang, Laramie, WY  
KCGY, Laramie, WY  
KIMX, Laramie, WY  
KISS, Casper, WY  
KKTY, Douglas, WY  
Rawlins Daily Times, Rawlins, WY  
Wyoming Public Radio, Laramie, WY

## **Individuals**

71 individuals

# Appendix D

## *Divestiture Analysis*

---

### Introduction

During the Comprehensive Conservation Plan (CCP) process, Bamforth National Wildlife Refuge was identified as a candidate for divestiture from the National Wildlife Refuge System (Refuge System). The refuge was analyzed by the planning team to determine whether or not it warranted status as a national wildlife refuge.

The divestiture model represents a set of criteria for measuring the value of a refuge. Designed as a preplanning tool, the model allows planners and refuge managers to determine whether or not a refuge or easement refuge should be considered for divestiture. If the model indicates that a refuge should be considered for divestiture, the process and consequences of divestiture will be studied further during the CCP process.

In the case of Bamforth NWR, the planning team did not have enough knowledge of the refuge resources to answer the model questions with a high degree of confidence. Following the analysis, the planning team decided to retain Bamforth NWR in the Refuge System due to the lack of knowledge and understanding of the refuge's resources and the role the refuge serves in supporting the mission of the Refuge System.

### The Divestiture Model

Region 6's divestiture model was developed during a two-day workshop held December 14–15, 2004, at the regional office in Denver, Colorado. The purpose of the workshop was to develop a standard policy in region 6 for identifying which refuges to consider for divestiture. The model consists of a set of nine questions that must be addressed when considering a refuge for divestiture.

Since its development, the model has been used to evaluate a number of refuges for divestiture consideration with analysis resulting in the recommendation of some refuges for divestiture and others to be retained in the Refuge System.

### Divestiture Model Applied to Bamforth NWR

#### 1. Does the refuge achieve one or more of the Refuge System goals?

Yes, but none clearly so.

To fulfill our statutory duty to achieve refuge purpose(s) and further the System Mission: Refuge is a breeding ground for birds, but not necessarily due to refuge management, since none has occurred, or is it any better than /different from surrounding lands.

Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered: *A memo dated March 31, 2005, shows the potential threatened and endangered species for Bamforth NWR as bald eagle, black-footed ferret, and Ute ladies'-tresses. Records indicate that no surveys have been conducted for these species on the refuge. Prairie dog numbers are not known, but the paved state highway running through the refuge and I-80 immediately south would seem to preclude the area as a likely ferret recovery area. Alkaline soils of the refuge would likely preclude Ute ladies'-tresses from use of the refuge.*

Perpetuate migratory bird, interjurisdictional fish, and marine mammal populations: *In good water years, some colonial nesting bird use.*

Conserve a diversity of fish, wildlife, and plants: *Management options are limited in trying to increase existing diversity. Unknown what diversity is there currently due to lack of knowledge of existing refuge resources.*

Conserve and restore as appropriate representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems: *No. Too small an area to affect ecological processes characteristics.*

To foster understanding and instill appreciation of native fish, wildlife, and plants, and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation: *Refuge is currently closed to all public use.*

#### 2. Does the refuge meet its purpose (fulfilling the refuge's intent and statutory purpose)?

Yes.

#### 3. Does the refuge provide substantial support for migratory bird species, provide important sheltering, feeding, and breeding habitat for threatened and endangered species, or support species identified in authorizing legislation?

No, but more research is needed. Early 1990s annual narrative discusses 200 white pelicans produced. The importance of Bamforth NWR to area pelican nesting should be known to answer this question with a degree of confidence.

**4. Does the refuge have biological integrity; if not, is it feasible to restore the biological integrity of the converted or degraded habitat?**

Unknown. The refuge is located in a basin in a low-precipitation zone, with poor soils and low vegetative potential. Most vegetation on the refuge is native, but it is unknown whether the area has been farmed or degraded by other management actions (development of irrigation ditches, water control structures, overgrazing, and so forth).

**5. Does the refuge contribute to landscape conservation, provide a stepping stone for migratory birds, or serve a unique habitat patch important to the conservation of a trust species?**

The refuge may serve as a stepping stone for migratory birds as there are several lakes and mud flats in the Laramie Plains refuges, but specific migratory bird use is unknown at this time due to lack of information. Refuge habitat types are

plentiful in the region and similar to adjacent lands; the refuge does not serve as a unique habitat patch important to the conservation of a trust species.

**6. Is there such significant community interest support for the refuge that divestiture would result in unacceptable long-term public relations?**

No.

**7. Do we have or can we acquire the jurisdiction to meet the refuge purpose, NWRS mission and goals, and prevent incompatible uses?**

Yes. Refuge lands are owned in fee title by the Service.

**8. Can someone else achieve most or all of the purposes of the refuge without the Service having to incur costs?**

Unknown.

**9. Cost/liability**

Costs are limited to staff time and fuel for 1–4 trips to the refuge annually. No known liability issues exist.

# Appendix E

## *Fire Management Program*

The Service has management and administrative responsibility, including fire management, for the Laramie Plains refuges, which covers approximately 4,860 acres in south-central Wyoming.

### THE ROLE OF FIRE

In ecosystems of the Great Plains, vegetation has evolved under periodic disturbance and defoliation from grazing, fire, drought, and floods. This periodic disturbance is what kept the ecosystem diverse and healthy while maintaining significant biodiversity for thousands of years.

Historically, natural fire and Native American ignitions have played an important disturbance role in many ecosystems by removing fuel accumulations, decreasing the impacts of insects and diseases, stimulating regeneration, cycling nutrients, and providing a diversity of habitats for plants and wildlife.

When fire and/or grazing are excluded from prairie landscapes, fuel loadings increase due to a build-up of thatch and invasion of woody vegetation. This increase in fuel loadings leads to an increase in a fire's resistance to control which threatens firefighter and public safety as well as federal and private facilities.

However, fire when properly utilized, can:

- reduce hazardous fuels build-up in both wildland-urban interface (WUI) and non-WUI areas;
- improve wildlife habitats by reducing density of vegetation and/or changing plant species composition;
- sustain and/or increase biological diversity;
- improve woodlands and shrublands by reducing plant density;
- reduce susceptibility of plants to insect and disease outbreaks;
- improve quality and quantity of livestock forage;
- improve the quantity of water available for municipalities and activities dependent on wildlands for their water supply.

### WILDLAND FIRE MANAGEMENT POLICY AND GUIDANCE

In 2001, an update of the 1995 "Federal Fire Policy" was completed and approved by the Secretaries of Interior and Agriculture. The 2001 "Federal Wildland Fire Management Policy" directs federal agencies to achieve a balance between fire suppression to protect life, property, and resources and fire use to regulate fuels and maintain healthy ecosystems. In addition, it directs agencies to use the appropriate management response for all wildland fire regardless of the ignition source. This policy provides eight guiding principles that are fundamental to the success of the fire management program:

- Firefighter and public safety is the first priority in every fire management activity.
- The role of wildland fires as an ecological process and natural change agent will be incorporated into the planning process.
- Fire management plans (FMPs), programs, and activities support land and resource management plans and their implementation.
- Sound risk management is a foundation for all fire management activities.
- Fire management programs and activities are economically viable, based on values to be protected, costs, and land and resource management objectives.
- FMPs and activities are based on the best available science.
- FMPs and activities incorporate public health and environmental quality consideration.
- Federal, state, tribal, local, interagency, and international coordination and cooperation are essential.
- Standardization of policies and procedures among federal agencies is an ongoing objective.

The fire management considerations, guidance, and direction should be addressed in the land use resource plans (for example, the CCP). FMPs are step-down processes from the land use plans and

habitat plans, with more detail on fire suppression, fire use, and fire management activities.

## MANAGEMENT DIRECTION

The Laramie Plains refuges will protect life, property, and other resources from wildland fire by safely suppressing all wildfires. Prescribed fire as well as manual and mechanical fuel treatments will be used in an ecosystem context to protect both federal and private property and for habitat management purposes. Fuel reduction activities will be applied in collaboration with federal, state, private and NGO partners. In addition, fuel treatments will be prioritized based on the guidance for prioritization established in the goals and strategies outlined in the U.S. Fish and Wildlife Service's National Wildlife Refuge System Wildland Fire Management Program Strategic Plan 2003–2010 and the R6 Refuges Regional Priorities FY07–11. For WUI treatments, areas with community wildfire protection plans (CWPPs) and communities at risk (CARs) will be the primary focus.

All aspects of the fire management program will be conducted in a manner consistent with applicable laws, policies, and regulations. The Laramie Plains refuge stations will maintain an FMP to accomplish the fire management goals described below. Prescribed fire, manual, and mechanical fuel treatments will be applied in a scientific way under selected weather and environmental conditions.

## Fire Management Goals

The goals and strategies of the U.S. Fish and Wildlife Service's National Wildlife Refuge System Wildland Fire Management Program Strategic Plan are consistent with Department and Service policies, National Fire Plan direction, President Bush's Healthy Forest Initiative, the 10-Year Comprehensive Strategy and Implementation Plan, National Wildfire Coordinating Group (NWCG) Guidelines, initiatives of the Wildland Fire Leadership Council, and Interagency Standards for Fire and Aviation Operations.

The R6 Refuges Regional Priorities FY07–11 are consistent with the refuges' vision statement for region 6: "to maintain and improve the biological integrity of the region, ensure the ecological condition of the region's public and private lands are better understood, and endorse sustainable use of habitats that support native wildlife and people's livelihoods." The fire management goals for the Laramie Plains refuges are to use prescribed fire, manual, and mechanical treatments to: (1) reduce the threat to life and property through hazardous fuels reduction treatments, (2) meet the habitat goals and objectives identified in this CCP, and (3)

reintroduce fire to ecosystems that evolved with fire as a disturbance factor.

## Fire Management Objective

The objective of the fire management program is to utilize prescribed fire, manual, and mechanical treatment methods to treat between 10 and 500 acres over the life of the plan.

## Strategies

Strategies and tactics that consider public and firefighter safety as well as resource values at risk will be used. Wildland fire suppression, prescribed fire methods, manual and mechanical means, timing, and monitoring are described in more detail within the step-down FMP(s).

All management actions would use prescribed fire, manual and/or mechanical means to reduce hazardous fuels, restore and maintain desired habitat conditions, control non-native vegetation, and control the spread of woody vegetation within the diverse ecosystem habitats. The fuels treatment program will be outlined in the FMP for the refuges. Prescribed fire burn plans will be developed site specific following the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide (2006) template.

Prescribed fire temporarily reduces air quality by reducing visibility and releasing components through combustion. The refuges will meet the Clean Air Act emission standards by adhering to the "Wyoming State Implementation Plan" requirements during all prescribed fire activities.

## FIRE MANAGEMENT ORGANIZATION, CONTACTS, AND COOPERATION

Qualified fire management technical oversight for the refuges will be established by region 6 of the Service, using the fire management district approach. Under this approach, fire management staff will be determined by established modeling systems based on the fire management workload of a group of refuges, and possibly that of interagency partners. The fire management workload consists of historical wildland fire suppression activities as well as historical and planned fuels treatments.

Depending on budgets, fire management staffing and support equipment may be located at the administrative station or at other refuges within the district and shared between all units. Fire management activities will be conducted in a coordinated and collaborative manner with federal and nonfederal partners.

On approval of this CCP, new FMP(s) will be developed for the Laramie Plains refuges. The FMP(s) may be done as: (1) an FMP that covers each individual refuge, (2) an FMP that covers the refuges within this CCP, (3) an FMP that covers the administrative district, or (4) an interagency FMP.



# Appendix F

## List of Plant Species

The following plant species that occur at the Laramie Plains refuges are listed in alphabetic order of their scientific names. Species may be found on one or more of the three refuges.

Scientific Name	Common Name
<i>Achillea millefolium</i>	Common yarrow
<i>Achnatherum hymenoides</i>	Indian ricegrass
<i>Agoseris glauca</i>	Mountain dandelion
<i>Agropyron cristatum</i>	Crested wheatgrass
<i>Agrostis stolonifera</i>	Creeping bentgrass
<i>Alopecurus arundinaceus</i>	Creeping meadow foxtail
<i>Antennaria microphylla</i>	Littleleaf pussytoes
<i>Argentina anserina</i>	Silverweed cinquefoil
<i>Artemisia frigida</i>	Fringed sage
<i>Artemisia tridentata wyomingensis</i>	Wyoming big sagebrush
<i>Artemisia tridentata vaseyana</i>	Mountain big sagebrush
<i>Aster ascendens</i>	Western aster
<i>Aster falcatum</i>	White prairie aster
<i>Astragalus agrestis</i>	Field milkvetch
<i>Astragalus bodinii</i>	Bodin's milkvetch
<i>Astragalus</i> spp.	Milkvetch
<i>Atriplex gardneri</i>	Gardner's saltbush
<i>Bouteloua gracilis</i>	Blue grama
<i>Brassicaceae</i> spp.	Mustard
<i>Bromus tectorum</i>	Cheatgrass
<i>Calamagrostis stricta</i>	Reedgrass
<i>Camelina microcarpa</i>	Littlepod false flax
<i>Carex nebrascensis</i>	Nebraska sedge
<i>Carex praegracilis</i>	Clustered field sedge
<i>Chenopodium rubrum</i>	Red goosefoot
<i>Chrysothamnus</i> spp.	Rabbitbrush
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium canescens</i>	Prairie thistle
<i>Cleome serrulata</i>	Rocky mountain bee plant
<i>Conyza canadensis</i>	Canadian horseweed
<i>Crepis runcinata</i>	Hawk's beard
<i>Cryptantha</i> spp.	Cryptantha
<i>Cryptantha thyrsoiflora</i>	Calcareous cryptantha
<i>Delphinium geyeri</i>	Geyer's larkspur
<i>Deschampsia caespitosa</i>	Tufted hairgrass
<i>Descurainia sophia</i>	Flixweed

Scientific Name	Common Name
<i>Distichlis spicata</i>	Saltgrass
<i>Elymus triticoides</i>	Alkali wildrye
<i>Eleocharis fallax</i>	Creeping spikerush
<i>Eleocharis</i> spp.	Spikerush
<i>Elymus lanceolatus</i>	Thickspike wheatgrass
<i>Elymus</i> spp.	Wheatgrass
<i>Elymus trachycaulus</i>	Slender wheatgrass
<i>Epilobium ciliatum</i>	Fringed willowherb
<i>Equisetum laevigatum</i>	Smooth horsetail
<i>Erigeron</i> spp.	Fleabane
<i>Eriogonum brevicaule</i>	Shortstem buckwheat
<i>Eriogonum flavum</i>	Alpine golden buckwheat
<i>Eriogonum ovalifolium</i>	Cushion buckwheat
<i>Eriogonum</i> spp.	Buckwheat
<i>Erysimum capitatum</i>	Sanddune wallflower
<i>Erysimum</i> spp.	Wallflower
<i>Festuca</i> spp.	Fescue
<i>Gentianella amarella</i>	Autumn dwarf gentian
<i>Glaux maritima</i>	Sea milkwort
<i>Grindelia squarrosa</i>	Curlycup gumweed
<i>Gutierrezia sarothrae</i>	Broom snakeweed
<i>Hesperostipa comata</i>	Needleandthread
<i>Heterotheca subaxillaris</i>	Camphorweed
<i>Hippuris vulgaris</i>	Common mare's-tail
<i>Hordeum jubatum</i>	Foxtail barley
<i>Iris missouriensis</i>	Rocky Mountain iris
<i>Juncus balticus</i>	Baltic rush
<i>Juncus bufonius</i>	Toad rush
<i>Juncus compressus</i>	Roundfruit rush
<i>Juncus longistylis</i>	Longstyle rush
<i>Juncus nevadensis</i>	Sierra rush
<i>Juncus torreyi</i>	Torrey's rush
<i>Koeleria macrantha</i>	Prairie Junegrass
<i>Krascheninnikovia lanata</i>	Winterfat
<i>Lappula</i> spp.	Stickseed
<i>Lepidium densiflorum</i>	Common pepperweed
<i>Lepidium perfoliatum</i>	Clasping pepperweed
<i>Lepidium</i> spp.	Pepperweed
<i>Linanthus pungens</i>	Granite prickly phlox
<i>Lesquerella ludoviciana</i>	Foothill bladderpod

Scientific Name	Common Name
<i>Lesquerella</i> spp.	Bladderpod
<i>Lygodesmia juncea</i>	Rush skeletonplant
<i>Melilotus officinalis</i>	Yellow sweetclover
<i>Melilotus</i> spp.	Sweetclover
<i>Mentha arvensis</i>	Wild mint
<i>Mertensia</i> spp.	Bluebells
<i>Mimulus glabratus</i>	Roundleaf monkeyflower
<i>Mirabilis linearis</i>	Narrowleaf four o'clock
<i>Muhlenbergia filiformis</i>	Pullup muhly
<i>Oenothera coronopifolia</i>	Crownleaf evening-primrose
<i>Opuntia</i> spp.	Pricklypear
<i>Orobanche fasciculata</i>	Clustered broomrape
<i>Orobanche ludoviciana</i>	Louisiana broomrape
<i>Oxytropis deflexa</i>	Nodding locoweed
<i>Oxytropis</i> spp.	Locoweed
<i>Parnassia palustris</i>	Marsh grass of Parnassus
<i>Paronychia sessiliflora</i>	Creeping nailwort
<i>Pascopyrum smithii</i>	Western wheatgrass
<i>Phleum pratense</i>	Timothy
<i>Phlox hoodii</i>	Hood's phlox
<i>Physaria</i> spp.	Twinpod
<i>Plantago eriopoda</i>	Redwool plantain
<i>Poa juncifolia</i>	Sandberg bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Poa</i> spp.	Bluegrass
<i>Poa trivialis</i>	rough bluegrass
<i>Polygonum aviculare</i>	Prostrate knotweed
<i>Polygonum ramosissimum</i>	Bushy knotweed
<i>Potentilla bipinnatifida</i>	Tansy cinquefoil
<i>Potentilla</i> spp.	Cinquefoil
<i>Primula incana</i>	Silvery primrose
<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass
<i>Puccinellia nuttalliana</i>	Nuttall's alkaligrass
<i>Pyrrocoma lanceolata</i>	Lanceleaf goldenweed
<i>Ranunculus cymbalaria</i>	Alkali buttercup
<i>Rumex crispus</i>	Curly dock
<i>Rumex maritimus</i>	Golden dock
<i>Salix plantifolia</i>	Planeleaf willow
<i>Salsola kali</i>	Russian thistle
<i>Salsola collina</i>	Slender Russian thistle

Scientific Name	Common Name
<i>Salsola</i> spp.	Russian thistle
<i>Sarcobatus vermiculatus</i>	Greasewood
<i>Scirpus americanus</i>	American bulrush
<i>Scirpus nevadensis</i>	Nevada bulrush
<i>Schoenoplectus tabernaemontani</i>	Softstem bulrush
<i>Scutellaria galericulata</i>	Marsh skullcap
<i>Senecio hydrophiloides</i>	Tall groundsel
<i>Sisyrinchium implicatum</i>	Blueeyed grass
<i>Sisyrinchium pallidum</i>	pale blue-eyed grass
<i>Sium suave</i>	Hemlock waterparsnip
<i>Sonchus palustris</i>	Marsh sowthistle
<i>Sparganium</i> spp.	Bur-reed
<i>Sphaeralcea coccinea</i>	Scarlet globemallow
<i>Sporobolus cryptandrus</i>	Sand dropseed
<i>Stuckenia filiformis</i>	Fineleaf pondweed
<i>Stuckenia pectinata</i>	Sago pondweed
<i>Tetradymia canescens</i>	Spineless horsebrush
<i>Townsendia hookeri</i>	Hooker's townsendia
<i>Tragopogon dubius</i>	Yellow salsify
<i>Trifolium hybridum</i>	Alsike clover
<i>Trifolium repens</i>	White clover
<i>Triglochin maritima</i>	Seaside arrowgrass
<i>Triglochin palustris</i>	Marsh arrowgrass
<i>Valeriana edulis</i>	Tobacco root

# Appendix G

## List of Potentially Occurring Bird Species

The following bird species potentially occur at the Laramie Plains refuges. Species may be found on one or all three refuges.

Scientific Name	Common Name
<i>Accipiter cooperii</i>	Cooper's hawk
<i>Accipiter gentilis</i>	Northern goshawk*
<i>Accipiter striatus</i>	Sharp-shinned hawk*
<i>Actitis macularia</i>	Spotted sandpiper
<i>Aechmophorus clarkii</i>	Clark's grebe
<i>Aechmophorus occidentalis</i>	Western grebe
<i>Agelaius phoeniceus</i>	Red-winged blackbird
<i>Aix sponsa</i>	Wood duck
<i>Anas acuta</i>	Northern pintail
<i>Anas americana</i>	American wigeon
<i>Anas carolinensis</i>	Green-winged teal
<i>Anas clypeata</i>	Northern shoveler
<i>Anas cyanoptera</i>	Cinnamon teal
<i>Anas discors</i>	Blue-winged teal
<i>Anas platyrhynchos</i>	Mallard
<i>Anas strepera</i>	Gadwall
<i>Anthus rubescens</i>	American pipit
<i>Aquila chrysaetos</i>	Golden eagle
<i>Ardea herodias</i>	Great blue heron
<i>Asio flammeus</i>	Short-eared owl*
<i>Athene cunicularia</i>	Burrowing owl*
<i>Aythya affinis</i>	Lesser scaup
<i>Aythya americana</i>	Redhead
<i>Aythya collaris</i>	Ring-necked duck
<i>Aythya marila</i>	Greater scaup*
<i>Aythya valisineria</i>	Canvasback
<i>Bombycilla cedrorum</i>	Cedar waxwing*
<i>Bombycilla garrulus</i>	Bohemian waxwing*
<i>Botaurus lentiginosus</i>	American bittern
<i>Branta canadensis</i>	Canada goose
<i>Bubo virginianus</i>	Great horned owl*
<i>Bubulcus ibis</i>	Cattle egret
<i>Bucephala albeola</i>	Bufflehead
<i>Bucephala clangula</i>	Common goldeneye
<i>Bucephala islandica</i>	Barrow's goldeneye*

Scientific Name	Common Name
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Buteo lagopus</i>	Rough-legged hawk
<i>Buteo regalis</i>	Ferruginous hawk
<i>Buteo swainsoni</i>	Swainson's hawk
<i>Butorides virescens</i>	Green heron*
<i>Calamospiza melanocorys</i>	Lark bunting
<i>Calcarius ornatus</i>	Chestnut-collared longspur
<i>Calcarius sandwichensis</i>	McGown's longspur
<i>Calidris alba</i>	Sanderling*
<i>Carduelis pinus</i>	Pine siskin
<i>Carduelis tristis</i>	American goldfinch
<i>Cathartes aura</i>	Turkey vulture
<i>Catharus guttatus</i>	Hermit thrush*
<i>Charadrius montanus</i>	Mountain plover*
<i>Charadrius vociferus</i>	Killdeer
<i>Chen caerulescens</i>	Snow goose*
<i>Chen rossii</i>	Ross's goose*
<i>Chlidonias niger</i>	Black tern
<i>Chondestes grammacus</i>	Lark sparrow
<i>Chordeiles minor</i>	Common nighthawk
<i>Circus cyaneus</i>	Northern harrier
<i>Cistothorus palustris</i>	Marsh wren
<i>Coccothraustes vespertinus</i>	Evening grosbeak*
<i>Colaptes auratus</i>	Northern flicker
<i>Corvus brachyrhynchos</i>	American crow
<i>Corvus corax</i>	Common raven
<i>Cygnus columbianus</i>	Tundra swan
<i>Dendroica coronata</i>	Yellow rumped warbler
<i>Dendroica nigrescens</i>	Black-throated gray warbler*
<i>Dendroica petechia</i>	Yellow warbler
<i>Egretta thula</i>	Snowy egret
<i>Eremophila alpestris</i>	Horned lark
<i>Erolia alpina</i>	Dunlin*
<i>Erolia bairdii</i>	Baird's sandpiper
<i>Erolia mauri</i>	Western sandpiper
<i>Erolia minutilla</i>	Least sandpiper
<i>Euphagus carolinus</i>	Rusty blackbird*
<i>Euphagus cyanocephalus</i>	Brewer's blackbird
<i>Falco mexicanus</i>	Prairie falcon
<i>Falco peregrinus</i>	Peregrine falcon
<i>Fulica americana</i>	American coot

Scientific Name	Common Name
<i>Gallinago delicata</i>	Wilson's snipe
<i>Gavia immer</i>	Common loon
<i>Geothlypis trichas</i>	Common yellowthroat
<i>Grus canadensis tabida</i>	Sandhill crane
<i>Haliaeetus leucocephalus</i>	Bald eagle
<i>Himantopus mexicanus</i>	Black-necked stilt*
<i>Hirundo rustica</i>	Barn swallow
<i>Hydroprogne caspia</i>	Caspian tern*
<i>Larus argentatus</i>	Herring gull*
<i>Larus californicus</i>	California gull
<i>Larus delawarensis</i>	Ring-billed gull*
<i>Larus philadelphia</i>	Bonaparte's gull
<i>Larus pipixcan</i>	Franklin's gull
<i>Lanius ludovicianus</i>	Loggerhead shrike
<i>Leucosticte atrata</i>	Black rosy finch
<i>Leucosticte australis</i>	Brown-capped rosy finch*
<i>Leucosticte tephrocotis</i>	Gray-crowned rosy finch*
<i>Limnodromus scolopaceus</i>	Long-billed dowitcher
<i>Limosa fedoa</i>	Marbled godwit
<i>Lophodytes cucullatus</i>	Hooded merganser*
<i>Melanitta deglandi</i>	White-winged scoter*
<i>Melospiza melodia</i>	Song sparrow
<i>Mergus merganser</i>	Common merganser
<i>Micropalmata himantopus</i>	Stilt sandpiper*
<i>Molothrus ater</i>	Brown-headed cowbird
<i>Numenius americanus</i>	Long-billed curlew*
<i>Numenius phaeopus</i>	Whimbrel*
<i>Nycticorax nycticorax</i>	Black-crowned night-heron
<i>Oreoscoptes montanus</i>	Sage thrasher
<i>Oxyura jamaicensis</i>	Ruddy duck
<i>Passer domesticus</i>	House sparrow
<i>Passerculus sandwichensis</i>	Savannah sparrow
<i>Pelecanus erythrorhynchos</i>	American white pelican
<i>Petrochelidon pyrrhonota</i>	Cliff swallow
<i>Phalacrocorax auritus</i>	Double-crested cormorant
<i>Phalaropus lobatus</i>	Red-necked phalarope
<i>Phalaropus tricolor</i>	Wilson's phalarope
<i>Pica hudsonia</i>	Black-billed magpie
<i>Pipilo chlorurus</i>	Green-tailed towhee
<i>Piranga ludoviciana</i>	Western tanager
<i>Plectrophenax nivalis</i>	Snow bunting*

Scientific Name	Common Name
<i>Plegadis chihi</i>	White-faced ibis
<i>Podiceps auritus</i>	Horned grebe*
<i>Podiceps grisegena</i>	Red-necked grebe*
<i>Podiceps nigricollis</i>	Eared grebe
<i>Podilymbus podiceps</i>	Pied-billed grebe
<i>Poecile atricapilla</i>	Black-capped chickadee
<i>Pooecetes gramineus</i>	Vesper sparrow
<i>Porzana carolina</i>	Sora
<i>Quiscalus quiscula</i>	Common grackle
<i>Rallus limicola</i>	Virginia rail
<i>Recurvirostra americana</i>	American avocet
<i>Riparia riparia</i>	Bank swallow
<i>Salpinctes obsoletus</i>	Rock wren*
<i>Sayornis saya</i>	Say's phoebe
<i>Selasphorus platycercus</i>	Broad-tailed hummingbird
<i>Selasphorus rufus</i>	Rufous hummingbird
<i>Sialia currucoides</i>	Mountain bluebird
<i>Spizella breweri</i>	Brewer's sparrow
<i>Spizella passerina</i>	Chipping sparrow
<i>Stelgidopteryx serripennis</i>	Northern rough-winged swallow
<i>Sterna forsteri</i>	Forster's tern
<i>Sterna hirundo</i>	Common tern*
<i>Sturnus vulgaris</i>	European starling
<i>Sturnella magna</i>	Eastern meadowlark*
<i>Sturnella neglecta</i>	Western meadowlark
<i>Tachycineta bicolor</i>	Tree swallow
<i>Tachycineta thalassina</i>	Violet-green swallow
<i>Toxostoma rufum</i>	Brown thrasher
<i>Tringa flavipes</i>	Lesser yellowlegs
<i>Tringa melanoleuca</i>	Greater yellowlegs
<i>Tringa semipalmata</i>	Willet
<i>Tringa solitaria</i>	Solitary sandpiper
<i>Troglodytes aedon</i>	House wren*
<i>Turdus migratorius</i>	American robin
<i>Tyrannus tyrannus</i>	Eastern kingbird
<i>Tyrannus verticalis</i>	Western kingbird
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed blackbird
<i>Zenaida macroura</i>	Mourning dove*
<i>Zonotrichia leucophrys</i>	White-crowned sparrow

\*Signifies rare sighting

# Appendix H

## *List of Potentially Occurring Amphibian and Reptile Species*

---

The following amphibian and reptile species potentially occur at the Laramie Plains refuges. Species may be found on one or more of the three refuges.

<b>Scientific Name</b>	<b>Common Name</b>
<b>Amphibians</b>	
<i>Ambystoma tigrinum</i>	Tiger salamander
<i>Bufo baxteri</i>	Wyoming toad
<i>Phrynosoma platyrhinos</i>	Horned lizard
<i>Pseudacris triseriata maculata</i>	Boreal chorus frog
<b>Reptiles</b>	
<i>Crotalus viridis</i>	Prairie rattlesnake
<i>Pituophis catenifer</i>	Bull snake



# Appendix I

## *List of Potentially Occurring Mammal Species*

---

The following mammals potentially occur at the Laramie Plains refuges. Species may be found on one or more of the three refuges.

<b>Scientific Name</b>	<b>Common Name</b>
<i>Antilocapra americana</i>	Pronghorn
<i>Canis latrans</i>	Coyote
<i>Cervus canadensis</i>	Elk
<i>Chaetodipus hispidus</i>	Hispid pocket mouse
<i>Cynomys leucurus</i>	White-tailed prairie dog
<i>Lepus townsendii</i>	White-tailed jack rabbit
<i>Mephitis mephitis</i>	Striped skunk
<i>Microtus pennsylvanicus</i>	Meadow vole
<i>Mustela frenata</i>	Long-tailed weasel
<i>Mustela vison</i>	Mink
<i>Myotis lucifugus</i>	Little brown myotis
<i>Odocoileus hemionus</i>	Mule deer
<i>Ondatra zibethicus</i>	Muskrat
<i>Perognathus fasciatus</i>	Wyoming pocket mouse
<i>Peromyscus maniculatus</i>	Deer mouse
<i>Procyon lotor</i>	Common raccoon
<i>Reithrodontomys megalotis</i>	Western harvest mouse
<i>Sorex cinereus</i>	Masked shrew
<i>Spermophilus elegans</i>	Wyoming ground squirrel
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined ground squirrel
<i>Sylvilagus audubonii</i>	Desert cottontail
<i>Tamias minimus</i>	Least chipmunk
<i>Taxidea taxus</i>	American badger
<i>Thomomys talpoides</i>	Northern pocket gopher
<i>Vulpes vulpes</i>	Red fox
<i>Zapus hudsonius preblei</i>	Preble's meadow jumping mouse



# Appendix J

## *Draft Compatibility Determination for Wildlife Observation and Wildlife Photography*

---

**Uses:** Wildlife observation and wildlife photography

**Refuge Name:** Hutton Lake NWR

**County:** Albany County, Wyoming

**Establishing and Acquisition Authorities:**

Migratory Bird Conservation Act, Executive Order 5782

**Refuge Purposes:**

- “As a refuge and breeding ground for migratory birds and other wild animals.” (Executive Order 5782, dated January 28, 1932)
- “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d [Migratory Bird Conservation Act])

**National Wildlife Refuge System Mission**

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

**Description of Uses**

Provide opportunities that support wildlife-dependent recreation.

Wildlife observation and wildlife photography would be allowed year-round. This CCP proposes to continue the above uses and add the following to improve wildlife observation and wildlife photography:

- Update and improve refuge signs.
- Develop visitor services plan.
- Establish a formal parking area with informational kiosks and brochures.
- Provide walk-in access and accessible trails with markers to designate walking trails to the best wildlife viewing areas.

- Close roads where necessary to facilitate implementation of visitor services plan and decrease disturbance to wildlife, discourage illegal hunting, and improve maintenance.
- Update existing refuge informational brochures and wildlife list to Service standards.
- Construct accessible photography blinds on Lake George and Rush and Hutton lakes.
- Provide educational materials on wildlife photography techniques.
- Provide an annual educational opportunity with experienced wildlife photographers sharing their expertise.

The refuge would be open for wildlife observation and wildlife photography. Their supporting use (access) would be controlled and regulated through the publication of refuge “tear sheets” and brochures, and through information posted at the kiosks.

Wildlife observation and wildlife photography are two of the six wildlife-dependent, priority public uses specified in the Improvement Act. These uses and their supporting access-related uses can be allowed at the refuge without interfering with the migratory bird resource.

**Availability of Resources**

Currently, the programs for wildlife observation and wildlife photography are administered using available resources. Implementing new programs, activities, and facilities outlined in this CCP is tied to funding requests in the form of RONS and SAMMS projects.

**Anticipated Impacts of the Uses**

*Short-term impacts:* Temporary disturbance may exist to wildlife near the activity. Direct, short-term impacts may include minor damage from traffic to refuge roads and trails when wet and muddy, minor damage to vegetation, littering, increased maintenance activity, and potential conflicts with other visitors. These activities would have only minor impacts on wildlife and would not detract from the primary purposes of the refuge.

Long-term impacts: None.

*Cumulative impacts:* There would be no direct or indirect cumulative impacts anticipated with these uses.

### Public Review and Comment

This compatibility determination was prepared concurrently with the draft CCP and EA for the refuge. Public review and comment will be achieved concurrently with the public review and comment period for the draft CCP and EA.

### Determination

Wildlife observation and wildlife photography, along with their supporting uses, are compatible uses at Hutton Lake NWR.

### Stipulations Necessary to Ensure Compatibility

Stipulations regarding the public use program would be made available in published refuge brochures. Dates, closed areas, and other information would be specified:

- Restrict vehicles to designated roads and trails.
- Monitor vehicle use for wildlife disturbance, law enforcement violations, and so forth.
- Monitor use, regulate access, and maintain necessary facilities to prevent habitat degradation and minimize wildlife disturbance.

### Justification

Based on the anticipated biological impacts above and in the EA, wildlife observation and wildlife photography on the Hutton Lake NWR would not interfere with the habitat goals and objectives or purposes for which the refuge was established.

Wildlife observation and wildlife photography are priority wildlife-dependent public uses acknowledged in the Improvement Act. These uses promote an appreciation for the natural resources at the refuge. Increased public stewardship will support and complement the Service’s actions in achieving the purposes of the refuge and the mission of the National Wildlife Refuge System.

### Signature

\_\_\_\_\_  
Ann Timberman  
Project Leader, Arapaho NWR  
USFWS, Region 6

\_\_\_\_\_  
Date

### Review

\_\_\_\_\_  
Dean Rundle  
Refuge Supervisor  
USFWS, Region 6

\_\_\_\_\_  
Date

### Concurrence

\_\_\_\_\_  
Richard A. Coleman, PhD  
Assistant Regional Director  
National Wildlife Refuge System  
USFWS, Region 6

\_\_\_\_\_  
Date

**Mandatory 15-Year Reevaluation Date:** 2022



# Appendix K

## *Draft Compatibility Determination for Environmental Education and Interpretation*

---

**Use:** Environmental education and interpretation

**Refuge Name:** Hutton Lake NWR

**County:** Albany County, Wyoming

### **Establishing and Acquisition Authorities:**

Migratory Bird Conservation Act, Executive Order 5782

### **Refuge Purposes:**

- “As a refuge and breeding ground for migratory birds and other wild animals.” (Executive Order 5782, dated January 28, 1932)
- “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d [Migratory Bird Conservation Act])

### **National Wildlife Refuge System Mission**

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

### **Description of Uses**

The uses would be continuation of interpretative and environmental education programs at enhanced and expanded levels. Environmental education consists of activities conducted by refuge staff and partnerships. Interpretation occurs in less formal activities through exhibits, signs, and brochures. Visiting school and nonprofit groups would use the refuge as an outdoor classroom and tour site.

This CCP proposes to continue with the above uses and add the following to improve environmental education and interpretation activities for visitors:

- Update and improve refuge signs.
- Update existing brochures to the Service’s graphic standards.
- In cooperation with University of Wyoming, Wyoming Audubon, and others,

offer scheduled environmental education opportunities at Hutton Lake NWR.

- Create programs for students and volunteers to assist in refuge management activities.
- Provide educational opportunities to local youth organizations such as Boy Scouts and Girl Scouts.

These activities would be held during the daytime, most frequently while school is in session (September–May). Less frequently, nonprofit groups would be hosted during the summer months.

Refuge staff would provide the instruction and host classroom tours in most cases. When someone other than refuge personnel leads activities, a special use permit may be issued.

Interpretation and environmental education are two of the six wildlife-dependent, priority public uses specified in the Improvement Act. These uses can be allowed at the refuge without interfering with the migratory bird resource.

### **Availability of Resources**

Currently, environmental education and interpretation programs are conducted using available resources. Implementing new programs, activities, and facilities outlined in this CCP is tied to funding requests in the form of RONS and SAMMS projects.

### **Anticipated Impacts of the Uses**

*Short-term impacts:* Minimal disturbance to wildlife and wildlife habitat will result from these uses at the current and proposed levels. Adverse impacts are minimized through careful timing and placement of activities. Wildlife near the activities may experience temporary disturbances. Minor damage to vegetation, littering, and increased maintenance may occur. These activities will have only minor impacts on wildlife and will not detract from the primary purposes of the refuge.

*Long-term impacts:* These activities would increase local support of the refuge and increase knowledge of stewardship of natural resources to students young and old.

*Cumulative impacts:* There would be no direct or indirect cumulative impacts anticipated with the continuation of these uses.

### Public Review and Comment

This compatibility determination was prepared concurrently with the draft CCP and EA for the refuge. Public review and comment will be achieved concurrently with the public review and comment period for the draft CCP and EA.

### Determination

Interpretation and environmental education are compatible uses at Hutton Lake NWR.

### Stipulations Necessary to Ensure Compatibility

Allow environmental education and interpretation only in designated areas or under the guidance of refuge staff, partnerships, a volunteer, or a trained teacher to ensure minimal disturbance to wildlife, minimal damage to vegetation, and minimal conflicts between user groups.

Disturbance is almost an unavoidable impact of the interpretive and environmental education programs. However, it is through these activities that visitors would receive an understanding of proper etiquette and the impact people have on habitat and wildlife. This information and refuge-specific regulations would be available through visitor contacts, brochures, and kiosks. Periodic law enforcement would ensure compliance with regulations and area closures.

### Justification

Based on the anticipated biological impacts above and in the EA, it is determined that environmental education and interpretation on the Hutton Lake NWR will not interfere with the habitat goals and objectives or purposes for which it was established.

Environmental education and interpretation are priority wildlife-dependent public uses acknowledged in the Improvement Act. These uses promote an appreciation for the natural resources at the refuge. Increased public stewardship will support and complement the Service's actions in achieving the purposes of the refuge and the mission of the National Wildlife Refuge System.

### Signature

\_\_\_\_\_  
Ann Timberman  
Project Leader, Arapaho NWR  
USFWS, Region 6

\_\_\_\_\_  
Date

### Review

\_\_\_\_\_  
Dean Rundle  
Refuge Supervisor  
USFWS, Region 6

\_\_\_\_\_  
Date

### Concurrence

\_\_\_\_\_  
Richard A. Coleman, PhD  
Assistant Regional Director  
National Wildlife Refuge System  
USFWS, Region 6

\_\_\_\_\_  
Date

**Mandatory 15-Year Reevaluation Date: 2022**



# Appendix L

## *Draft Compatibility Determination for Grazing*

**Use:** Prescribed grazing

**Refuge Name:** Hutton Lake NWR

**County:** Albany County, Wyoming

**Establishing and Acquisition Authorities:**  
Migratory Bird Conservation Act, Executive Order 5782

### **Refuge Purposes:**

- “As a refuge and breeding ground for migratory birds and other wild animals.” (Executive Order 5782, dated January 28, 1932)
- “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d [Migratory Bird Conservation Act])

### **National Wildlife Refuge System Mission**

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

### **Description of Uses**

Prescribed grazing is the use of livestock, usually cattle, to remove standing vegetation, reduce vegetative litter, suppress woody vegetation or noxious weeds, open up vegetation-choked wetlands, or open up areas to sunlight and encourage native grass seedlings and growth. Prescribed grazing is carefully timed, and usually of short duration (usually 2–4 weeks), to target certain species for grazing impacts in order to benefit other species for growth after the competing vegetation has been removed.

Due to the arid climate, when it is determined refuge grasslands will benefit from prescribed grazing, this treatment will occur in the fall of the year (July–October). Grazing will be offered on a bid system to interested landowners with stipulations for eligibility. Mid-season grazing (July) removes litter and encourages some fall regrowth. Grazing later in the season (August–October) removes litter and encourages spring vegetation growth. Late-season grazing also concentrates livestock in heavier

vegetation (rushes) in the refuge ponds due to the upland grasse’s curing and becoming less palatable, which can facilitate providing water openings in the vegetation.

Fence construction and maintenance (often a temporary electric fence) and control and rotation of the livestock are the responsibility of the cooperating private party. Market rate grazing fees are determined by the regional office, but may include standard deductions for fence construction and maintenance, frequent livestock rotations, construction of water gaps, or hauling/providing additional water in dry pasture.

The frequency and duration of prescribed grazing on the refuge will be based on site-specific evaluations of the grassland being managed.

This CCP proposes to continue with the above use and add the following to improve management of refuge upland habitats:

- Conduct upland vegetation surveys.
- Evaluate grazing program to determine appropriate stocking rates, duration, and so forth of grazing program.
- Install and maintain fencing to appropriately manage grazing program.

### **Availability of Resources**

Developing grazing plans and special use permits (SUPs) and monitoring compliance and biological effects require some Service resources. Most grazing management costs (fencing labor, monitoring and moving livestock, hauling water) are provided by the cooperator or permittee. Evaluating the grasslands for grazing prescriptions and grassland response is already a part of the refuge grassland management responsibilities. Some alternative form of grassland management, prescribed burning or haying, may be used if the areas are not treated with prescribed grazing. Managing grasslands through permitted haying has comparable costs to managing a prescribed grazing program. Managed mowing would be more expensive, since all labor costs would be assumed by the Service. Prescribed fire can be an effective grassland management tool, but there are personnel and weather limitations on a burning program, as well the fact that some tracts are not suited to burning management. In addition, there is an ecological benefit to rotating grassland management techniques, such as grazing, burning, and haying, at different seasons, rather than just relying on one technique.

### Anticipated Impacts of the Uses

*Short-term impacts:* Grazing by domestic livestock has the short-term effect of removing some or much of the standing vegetation from a tract of grassland. Properly prescribed, the effect of this removal of vegetation increases the vigor of the grassland, stimulates the growth of desired species of grass and forbs, and reduces the abundance of targeted species such as cool-season exotics, woody species, noxious weeds or invasive species, or cattails. Grazing in the spring may cause the loss of some bird nests due to trampling, and may cause some birds not to nest in areas being grazed. Grazing on public wildlife lands can create an aesthetic issue of concern for some people or visitors who do not understand grassland management. Prescribed grazing is usually of short duration and enhanced, most diverse and vigorous grassland habitats are the end result. Grazing livestock may create a minor and temporary disturbance to wildlife, but generally do no harm. There is a slight potential for conflict between the visiting public and the livestock or the permittee.

### Public Review and Comment

This compatibility determination was prepared concurrently with the draft CCP and EA for the refuge. Public review and comment will be achieved concurrently with the public review and comment period for the draft CCP and EA.

### Determination

As this activity is an economic use, it must meet the compatibility threshold of “contributing to the Mission and Purposes” of the Refuge System and refuge area. Prescribed grazing is used to improve and manage grassland habitats on refuges and benefit the migratory birds and other wildlife that use these habitats.

The use of grazing as a habitat management tool is compatible at Hutton Lake NWR with the following stipulations.

### Stipulations Necessary to Ensure Compatibility

- SUPs will specify the stocking rates, dates of use, and timing for each unit or grazing cell on the refuge.
- The standard grazing fee, as determined for each state by the regional office, and any standard deductions for any labor or work done on Service lands will be included on the SUP.
- Grazing permittees must comply with all applicable State Livestock Health Laws.

- No supplemental feeding will be allowed without authorization from the project leader/refuge manager.
- Control and confinement of livestock will be the responsibility of the permittee.
- The permit is issued subject to the revocation and appeals procedure contained in Title 50, Part 25 of the Code of Federal Regulations.

### Justification

Controlled grazing by domestic livestock will not materially interfere or detract from the purposes for which the refuge was established. Prescribed livestock grazing creates temporary disturbances to vegetation. Many of these disturbances are desirable for grassland management. Grazing produces an undesirable, but short-term impact to grassland nesting birds and site aesthetics. In the long term, prescribed grazing increases grassland vigor, species diversity, and habitat quality. Prescribed grazing is an alternative management tool that can be used to replace or complement prescribed fire, mowing, or haying of Service grasslands. Without periodic disturbance caused by grazing the health of the grassland community would decline.

---

### Signature

\_\_\_\_\_  
 Ann Timberman  
 Project Leader, Arapaho NWR  
 USFWS, Region 6

\_\_\_\_\_  
 Date

### Review

\_\_\_\_\_  
 Dean Rundle  
 Refuge Supervisor  
 USFWS, Region 6

\_\_\_\_\_  
 Date

### Concurrence

\_\_\_\_\_  
 Richard A. Coleman, PhD  
 Assistant Regional Director  
 National Wildlife Refuge System  
 USFWS, Region 6

\_\_\_\_\_  
 Date

**Mandatory 10-Year Reevaluation Date:** 2017

# Bibliography

---

- Allen, A.W. 1986. Habitat suitability index models: lesser scaup (breeding). Fort Collins, CO: U.S. Fish and Wildlife Service, Biological Report 82(10.117). 16 p.
- Audubon Wyoming. 2006. Wyoming's Important Bird Areas Program. <<http://iba.audubon.org/iba/viewState.do?state=US-WY>> accessed 24 July 2007.
- Bureau of Labor Statistics. October 2006. Employment situation summary. Washington DC: U.S. Department of Labor. 25 p.
- Bureau of Land Management (BLM), Partners in Flight. [No date]. Wyoming Basin Executive Summary. <[http://www.blm.gov/wildlife/pl\\_86sum.htm](http://www.blm.gov/wildlife/pl_86sum.htm)> accessed 24 July 2007.
- Crozier, Michelle L. 2001. Waterbird habitat selection in the Laramie Basin, Wyoming [master's thesis]. Laramie, WY: University of Wyoming. 80 p.
- Dai, X.; Boutton, T.W.; Hailemichael, M.; Ansley, R.J.; Jessup, K.E. 2006. Soil carbon and nitrogen storage in response to fire in a temperate mixed-grass savanna. *Journal of Environmental Quality* 35:1620–1628.
- Dark-Smiley, D.; Keinath, D.A. 2003. Species assessment for white-faced ibis (*Plegadis chihi*) in Wyoming. Prepared for United States Department of the Interior by the Wyoming Natural Diversity Database. Laramie, WY: University of Wyoming. [Pages unknown].
- Dechant, J.A.; Johnson, D.H.; Igl, L.D.; Goldade, C.M.; Zimmerman, A.L.; Euliss, B.R. 2003. Effects of management practices on grassland birds: Wilson's phalarope. Jamestown, ND: Northern Prairie Wildlife Research Center. Northern Prairie Wildlife Research Center Online (Version 12DEC2003). <<http://www.npwr.usgs.gov/resource/literatr/grasbird/wiph/wiph.htm>> accessed 24 July 2007.
- Dickerson, K.; Ramirez, P. Jr. 1993. An investigation of trace element contamination at Bamforth National Wildlife Refuge. Cheyenne, WY: U.S. Fish and Wildlife Service Contaminant Report R6/707C/93. 29 p.
- Dickerson, K.K.; Hooper, M.; Huang, T; Allen, M. 2003. Determination of pesticide aerial drift and associated effects to the endangered Wyoming toad (*Bufo baxteri*) at Mortenson and Hutton national wildlife refuges and potential reintroduction sites. Cheyenne, WY: U.S. Fish and Wildlife Contaminant Report R6/717C/00. 72 p.
- Dreitz, Victoria J. 2006. Issues in species recovery: an example based on the Wyoming toad. *BioScience* 56(9):765–771(7).
- Gutzwiller, K.J.; Anderson, S.H. 1987. Habitat suitability index models: marsh wren. Washington DC: U.S. Fish and Wildlife Service Biological Report 82(10.139). 13 p.
- Hart, E. Andrew. 1998. Primary production in saline wetlands of the Laramie Basin [master's thesis]. Laramie, WY: University of Wyoming. 61 p.
- Hart, E. Andrew. 2001. Macroinvertebrate foodwebs in saline wetlands of the Laramie Basin [PhD dissertation]. Laramie, WY: University of Wyoming. 85 p.
- High Plains Regional Climate Center. 2006. <[http://hprec1.unl.edu/cgi-bin/cli\\_perl\\_lib/cliM-AIN.pl?wylarm](http://hprec1.unl.edu/cgi-bin/cli_perl_lib/cliM-AIN.pl?wylarm)> accessed 24 July 2007.
- Kantrud, H.A.; Higgins, K.F. 1992. Nest and nest site characteristics of some ground-nesting, non-passerine birds of northern grasslands. *Prairie Naturalist* 24:67–84.
- Keinath, D.; Heidel, B.; Beauvais, G.P. 2003. Wyoming plant and animal species of concern. Prepared by the Wyoming Natural Diversity Database. Laramie, WY: University of Wyoming. [Pages unknown].
- Keinath, Douglas A. 2006. Wyoming toad monitoring on Buford Foundation Wetland Reserve. Prepared for the Laramie Rivers Conservation District and USFWS by the Wyoming Natural Diversity Database. Laramie, WY: University of Wyoming. [Pages unknown].
- Knight, Dennis H. 1994. Mountains and plains: the ecology of Wyoming landscapes. New Haven, CT: Yale University Press. 338 p.
- Larson, Mary Lou; Letts, Rhonda. 2003. Cultural resource overview of the Laramie Basin and Pathfinder Reservoir, Wyoming, and North Park, Colorado. Laramie, WY: George C. Frinson Institute of Anthropology and Archaeology, University of Wyoming. [Pages unknown].

- Lawrence, Jean M. 1995. Waterbirds of the Laramie Plains Lakes [master's thesis]. Laramie, WY: University of Wyoming. 62 p.
- Little, E.E.; Calfee, R.D.; Dickerson, K. 2002. Determination of impacts on the endangered Wyoming toad (*Bufo baxteri*) at Mortenson National Wildlife Refuge from ammonium nitrate concentrations. Columbia, MO, and Cheyenne, WY: U.S. Fish and Wildlife Service Contamination Report R6/719C/02. 19 p.
- Lovich, J.E. 1996. A brief overview of the impact of tamarisk infestation on native plants and animals. Proceedings of the Saltcedar Management Workshop; 1996 September 17–18; Las Vegas, NV. <<http://www.invasivespeciesinfo.gov/docs/news/workshopSep96/lovich.html>> accessed 24 July 2007.
- Marzluff, J.M.; Ewing, K. 2001. Restoration of fragmented landscapes for the conservation of birds: a general framework and specific recommendations for urbanizing landscapes. *Restoration Ecology* 9(3):280–292.
- Morrison, R.B., editor. 1991. Quaternary nonglacial geology: conterminous U.S., v. K–2. Boulder, CO: Geological Society of America. [Pages unknown].
- Murkin, H.R.; Murkin, E.J.; Ball, J.P. 1997. Avian habitat selection and prairie wetland dynamics: a 10 year experiment. *Ecological Applications* 7:1144–1159.
- Naugle, D.E.; Higgins, K.F.; Bakker, K.K. 2000. A synthesis of the effects of upland management practices on waterfowl and other birds in the northern great plains of the U.S. and Canada. Wildlife Technical Report 1. Stevens Point, WI: University of Wisconsin, College of Natural Resources. 28 p.
- Nicholoff, S. H., compiler. 2003. Wyoming bird conservation plan, version 2.0. Wyoming Partners in Flight. Lander, WY: Wyoming Game and Fish Department. [Pages unknown].
- Parker, Joshua M. 2000. Habitat use and movements of the Wyoming toad (*Bufo baxteri*): a study of wild juvenile, adult, and released captive raised toads [master's thesis]. Laramie, WY: University of Wyoming. 82 p.
- Parker, Joshua M.; Anderson, Stanley H. 2003. Habitat use and movements of repatriated Wyoming toads. *Journal of Wildlife Management* 67(2):439–446.
- Ramirez, P. 1992. Trace elements in water, sediments, and biota from wetlands in the Laramie Basin and their relationship to the recovery of the endangered Wyoming toad (*Bufo hemiophrys baxteri*). Cheyenne, WY: U.S. Fish and Wildlife Service Contaminant Report R6/704C/92. 21 p.
- Ramirez, P. Jr.; Armstrong, J. 1992. Environmental contaminant surveys in three national wildlife refuges in Wyoming. Cheyenne, WY: U.S. Fish and Wildlife Service Contaminant Report R6/2C/92. 35 p.
- Ryan, M.R.; Renken, R.B. 1987. Habitat use by breeding willets in the northern Great Plains. *Wilson Bulletin* 99(2):175–189.
- State of Wyoming, Department of Administration and Information. [No date]. Economic Analysis Division. <<http://eadiv.state.wy.us/>> accessed 24 July 2007.
- Stewart, Robert E. 1975. Breeding birds of North Dakota. Fargo, ND: Tri-College Center for Environmental Studies. [Pages unknown].
- Sudbrock, A. 1993. Tamarisk control. I. Fighting back: An overview of the invasion, and a low-impact way of fighting it. *Restoration & Management Notes* 11(1):31–34.
- U.S. Census Bureau. 2000. Census summary file, American factfinder. <<http://factfinder.census.gov>> accessed 24 July 2007.
- U.S. Department of Agriculture (USDA). 1998. Soil survey of Albany County area, Wyoming. National Resource Conservation Service. SSAID 61. <<http://www.wy.nrcs.usda.gov/technical/wysoils/areatab.html>> accessed 24 July 2007.
- U.S. Department of Energy, Office of Fossil Energy and the Office of Science. 1999. Carbon sequestration research and development. Springfield, VA: National Technical Information Service. <[http://www.fossil.energy.gov/programs/sequestration/publications/1999\\_rdrreport/](http://www.fossil.energy.gov/programs/sequestration/publications/1999_rdrreport/)> accessed 24 July 2007.
- U.S. Environmental Protection Agency (EPA). 2007a. AirData: air quality index summary report (Albany County, Wyoming). <<http://www.epa.gov/air/data/monaqi.html?co~56001~Albany%20Co%2C%20Wyoming>> accessed 24 July 2007.
- . 2007b. AirData: county air quality report—criteria air pollutants (Albany County, Wyoming). <<http://www.epa.gov/air/data/monsum.html?co~56001~Albany%20Co%2C%20Wyoming>> accessed 24 July 2007.

- U.S. Fish and Wildlife Service (USFWS). 1975. Annual report. [Place of publication unknown]: U.S. Fish and Wildlife Service. [Pages unknown].
- . 1980. Arapaho National Wildlife Refuge annual report, section K: feedback. [Place of publication unknown]: U.S. Fish and Wildlife Service. [Pages unknown].
- . 1991. Wyoming Toad Recovery Plan. Denver, CO: U.S. Fish and Wildlife Service. 28 p.
- . 1992. Decision Document Mortenson Lake National Wildlife Refuge. Denver: CO, U.S. Fish and Wildlife Service. [Pages unknown].
- . 2002. Birds of conservation concern 2002. Arlington, VA: U.S. Department of the Interior, U.S. Fish and Wildlife, Division of Migratory Bird Management. 99 p. <<http://migratorybirds.fws.gov/reports/bcc2002.pdf>> accessed 24 July 2007.
- Weller, M.W.; Spatcher, C. E. 1965. Role of habitat in the distribution and abundance of marsh birds. Special Report 43. Ames, IA: Iowa Agricultural and Home Economics Experiment Station. 31 p.
- Withers, David Ian. 1992. The Wyoming toad (*Bufo hemiophrys baxteri*): an analysis of habitat use and life history [master's thesis]. Laramie, WY: University of Wyoming. 233 p.

