Draft Comprehensive Conservation Plan
and
Environmental Assessment

Kirwin National Wildlife Refuge

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Acronyms, Abbreviations, and Terms Used in this CCP

BCR	bird conservation region
CCP	comprehensive conservation plan
CD	compatibility determination
CFR	Code of Federal Regulations
CRP	Conservation Reserve Program
EA	environmental assessment
EO	executive order
EPA	Environmental Protection Agency
FONSI	Finding of No Significant Impact
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
KDHE	Kansas Department of Health and Environment
KDWP	Kansas Department of Wildlife and Parks
NEPA	National Environmental Policy Act of 1969
Non-wildlife-dependent recreation uses	water and jet skiing, personal water craft, camping, swimming, horseback riding, volleyball, basketball, tournament fishing, power and speed boating
NWR	national wildlife refuge
PEL	probable effect level
PIF	Partners in Flight
Reclamation	Bureau of Reclamation
Refuge System	National Wildlife Refuge System
RMP	resource management plan
SAV	submerged aquatic vegetation
Service	U.S. Fish and Wildlife Service
TEL	threshold effect level
TOC	total organic carbon
URL	uniform resource locators
USACE	U.S. Army Corps of Engineers
Wildlife-dependent recreation uses	hunting, fishing, wildlife observation and photography, and environmental education and interpretation
WPA	Waterfowl Production Area

For definitions of terms used throughout this comprehensive conservation plan, please see the glossary at appendix A.

Summary

Kirwin National Wildlife Refuge (NWR), consisting of 10,778 acres, is located in north-central Kansas. The refuge was established in 1954 as an overlay project on a Bureau of Reclamation irrigation and flood control reservoir. Fee title to the land is held for the United States by the Bureau of Reclamation (Reclamation). Water level control of the reservoir rests with the Kirwin Irrigation District, Reclamation, and the U.S. Army Corps of Engineers.

The refuge supports diverse wildlife habitat including grasslands, wooded riparian areas, open water, and wetlands. Providing quality wildlife habitat and compatible recreation opportunities are key components to managing Kirwin National Wildlife Refuge.

Refuge Purpose

Basic authority for the existence of the refuge stems from the Fish and Wildlife Coordination Act, which authorized the establishment of wildlife areas on federal water projects. The purpose of Kirwin National Wildlife Refuge, "…shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements… and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, …in behalf of the National Migratory Bird Management Program" (Fish and Wildlife Coordination Act).

Comprehensive Conservation Plan

The U.S. Fish and Wildlife Service (Service) has developed this draft comprehensive conservation plan (CCP) and environmental assessment (EA) to provide a foundation for the management and use of the refuge. This CCP is intended to serve as a working guide for management programs and actions over the next 15 years.

This CCP has been prepared by a planning team composed of representatives from various Service programs, other federal agencies, and state agencies. In developing this CCP, the planning team incorporated the input of local citizens and organizations.

Management Alternatives

Alternatives are different approaches to management of the refuge designed to resolve issues, achieve the refuge purpose, and comply with current laws, regulations, and policies. This draft CCP describes two management alternatives for Kirwin NWR: Alternative A (No Action—Current Management) and Alternative B (Wildlife, Habitat, and Public Use—Proposed Action). Each alternative will maintain the core wildlife viewing, fishing, and hunting functions that are central to Kirwin NWR's role in the local economy.

Under alternative A, Kirwin NWR will continue to be managed in accordance with the current Memorandum of Agreement (MOA) between Reclamation and the Service, the Cooperative Agreement between the Kansas Department of Wildlife and Parks (KDWP), and the Kirwin Comprehensive Management Plan (CMP) completed in 1996.

The National Environmental Policy Act (NEPA) describes the no action alternative as continuing the present course of action for the affected environment until the action is changed. This definition allows for evolution of refuge management over time to comply with new laws, regulations and policies.

The Refuge Administration Act of 1966, made some elements of the cooperative agreement between the Service and KDWP obsolete. Under alternative A, the Cooperative Agreement will be updated to comply with current Refuge System laws, regulations, and policies.

The CMP will continue to provide the foundation for management and use of the refuge. The CMP emphasizes public use and recreation, although required compatibility determinations may modify the existing public use program if this alternative is selected for implementation. Managing prairie grasslands to favor native species of flora and fauna will continue under this alternative.

Alternative B strives to fully implement the National Wildlife Refuge System Improvement Act of 1997, which directs that each refuge in the Refuge System will be managed for the benefit of "wildlife first." Under this alternative, management emphasis will shift from public use and recreation to wildlife and habitat management

for migratory birds and species of conservation concern. Non-wildlife-dependent recreational uses will not be allowed. Wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, interpretation and environmental education) are compatible with the purpose of the refuge, and will be promoted.

Environmental Consequences

Under alternative A there would be no change in management of the refuge's habitat. Existing trends in boat traffic disturbance and low quality and quantity of resting and feeding habitat of the reservoir would continue. Continued dramatic fluctuations in water levels would continue to inhibit the establishment of submerged aquatic vegetation (SAV) and associated feeding habitat. Management would continue to focus on waterfowl to the exclusion of other migratory bird species.

Current level of invasive species control is not sufficient to limit the spread of invasive species, resulting in continued decline in quality and quantity of resting, nesting, and feeding habitat for migratory bird species.

Continued decrease in relative abundance of native plants due to competition with invasive plant species.

Existing hunting, fishing, wildlife observation and photography, interpretation, and environmental education programs would remain the same, but no efforts would be made to increase the quality or quantity of opportunities currently offered by these programs. Existing non-wildlife-dependent recreation uses would be reviewed for compliance with current laws, regulations, and policies through a compatibility determination process. The refuge would continue to have areas of degraded wildlife habitat due to camping and other current non-wildlife-dependent recreation.

Socioeconomic change would be minimal.

Alternative B would primarily focus management efforts on improving migratory bird habitat. This alternative emphasizes grassland restoration and management. Management of the grassland will promote expansion of native species and provide appropriate structure and composition of grassland habitat for migratory birds.

Chapter 1. Introduction

The U.S. Fish and Wildlife Service (Service) has developed this Draft Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) to provide a foundation for the management and use of Kirwin National Wildlife Refuge (NWR) located in north-central Kansas. This CCP is intended to serve as a working guide for management programs and actions over the next 15 years.

This CCP was developed in compliance with the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and Part 602 (National Wildlife Refuge System Planning) of the Fish and Wildlife Service Manual. The actions described within this CCP also meet the requirements of the National Environmental Policy Act of 1969 (NEPA). Compliance with NEPA is being achieved through the involvement of the public and the inclusion of an integrated EA.

When fully implemented, this CCP will strive to achieve the program vision and the purpose of the refuge. Fish and wildlife are the first priority in refuge management. Public use (wildlife-dependent recreation) is allowed and encouraged as long as it is compatible with, or does not detract from, the refuge's purpose(s).

This CCP has been prepared by a planning team composed of representatives from various Service programs, including Refuges and Ecological Services; other federal agencies, including U.S. Bureau of Reclamation (Reclamation) and U.S. Army Corps of Engineers (USACE); and state agencies, including the Kansas Department of Wildlife and Parks (KDWP) and the Kansas Biological Survey. In developing this CCP, the planning team has incorporated the input of local citizens and organizations. This public involvement and the planning process itself are described in section 1.5 and also see appendix B.

After reviewing a wide range of public comments and management needs, the planning team developed a proposed alternative. This alternative will attempt to address major issues while determining how best to achieve the intent and purposes of the refuge. The proposed alternative is the Service's recommended course of action for the future management of the refuge, and is embodied in this draft CCP and EA.

Shortly after completion of the CMP in 1996, the Improvement Act was signed into law. This law amends and builds upon the National Wildlife Refuge System Administration Act of 1966 to ensure that the Refuge System is managed as a national system of related lands, waters, and interests for the protection and conservation of our Nation's wildlife resources.

The Improvement Act's main components include: a strong and singular wildlife conservation mission for the Refuge System; a requirement that the Secretary of the Interior maintain the biological integrity, diversity and environmental health of the Refuge System; a new process for determining compatible uses of refuges; a recognition that wildlife-dependent recreational uses, when determined to be compatible, are legitimate and appropriate public uses of the Refuge System; that these compatible wildlife-dependent recreational uses are the priority general public uses of the Refuge System; and a requirement for preparing CCPs for each refuge in the Refuge System.

1.1 Purpose and Need for Plan

The purpose of this CCP is to identify the role that Kirwin NWR will play in support of the mission of the National Wildlife Refuge System (Refuge System), and to provide long-term guidance to management programs and activities. The plan is needed:

- To build relationships and communicate with local landowners, the general public, and other partners in efforts to carry out the mission of the Refuge System;
- To provide a clear statement of direction for the future management of the refuge;
- To provide neighbors, visitors, and government officials with an understanding of the Service's management actions on this refuge;

- To ensure that the Service's management actions are consistent with the mandates of the Improvement Act;
- To ensure that the management of this refuge is consistent with federal, state, and county plans; and
- To provide a basis for the development of budget requests for the programs operational, maintenance, and capital improvement needs.

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

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

The U.S. Fish and Wildlife Service

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

Over a hundred years ago, America's fish and wildlife resources were declining at an alarming rate. Concerned citizens, scientists, and hunting and angling groups joined together to restore and sustain our national wildlife heritage. This was the genesis of the U.S. Fish and Wildlife Service.

Today, the Service enforces federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores vital wildlife habitat, protects and recovers endangered species, and helps other governments with conservation efforts. It also administers a Federal Aid program that distributes hundreds of millions of dollars to states for fish and wildlife restoration, boating access, hunter education, and related projects across America.

The Service is the managing agency of the Refuge System, thousands of Waterfowl Production Areas, and other special management areas. It also operates 66 national fish hatcheries and 78 ecological services field stations.

Service Activities in Kansas

Service activities in Kansas contribute to the state's economy, ecosystems, and education programs. The following lists activities (from 2000 unless otherwise noted) (USFWS 2001).

- The Service employs 46 people in Kansas.
- Kansas has 4 National Wildlife Refuges, encompassing 58,714 acres (.011 percent of the state).
- More than 350,000 people annually visit refuges in Kansas, and of these:
  - 124,000 people visit refuges to view wildlife;
  - 33,500 people hunt on refuges;
  - 27,400 people fish on refuges; and
  - over 2,800 school children participated in Service education programs.
- Over 2,206 hours were donated by 155 volunteers to help with Service Projects.
- The Service distributed $3.7 million to KDWP for sport fish restoration and $3.5 million for wildlife restoration and hunter education.
- Since 1990, the Service partnered with over 510 landowners to enhance wildlife habitat which included:
  - Restoring 125,773 upland acres;
  - Protecting 64 miles of riparian habitat; and
  - Restoring 21,244 wetland acres.
- The Service paid Kansas counties more than $40,683 under the Refuge Revenue Sharing Act; funds may be used for any governmental purpose.

The National Wildlife Refuge System

In 1903, President Theodore Roosevelt designated the 5.5-acre Pelican Island in Florida as the nation's first wildlife refuge for the protection of brown pelicans and other native nesting birds. This was the first time the federal government set aside land for the sake of wildlife. This small but significant designation was the beginning of the National Wildlife Refuge System. One hundred years later, the Refuge System has become the largest collection of lands in the world specifically managed for wildlife, encompassing over 96 million acres within 544 refuges and over 3,000 small areas for waterfowl breeding and nesting. Today, there is at least one refuge in every state in the nation including Puerto Rico and the U.S. Virgin Islands.

In 1997 a clear mission was established for the Refuge System through the passage of the National Wildlife Refuge System Improvement Act (Improvement Act). That mission is:

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

The Improvement Act further states that each refuge shall be managed:

- To fulfill the mission of the Refuge System;
- To fulfill the individual purposes of each refuge;
- To consider the needs of fish and wildlife first;
- To fulfill the requirement of developing a comprehensive conservation plan for each unit of the Refuge System, and fully involve the public in the preparation of these plans;
- To maintain the biological integrity, diversity, and environmental health of the Refuge System;
- To recognize that wildlife-dependent recreation activities are legitimate and priority public uses; and
- To retain the authority of refuge managers to determine compatible public uses.

In addition to the overall mission for the Refuge System, the wildlife and habitat vision for each National Wildlife Refuge stresses the following principles:

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

Following passage of the Improvement Act, the Service immediately began efforts to carry out the direction of the new legislation, including the preparation of CCPs for all refuges. The development of these plans is now ongoing nationally. Consistent with the Improvement Act, all refuge CCPs are being prepared in conjunction with public involvement, and each refuge is required to complete its own plan within the 15-year schedule (by 2012).

People and the National Wildlife Refuge System

Our fish and wildlife heritage contributes to the quality of our lives and is an integral part of our Nation's greatness. People and nature are linked through spiritual, recreational, and cultural ties. Wildlife and wild places have always given people special opportunities to have fun, relax, and appreciate our natural world.

Whether through birdwatching, fishing, hunting, photography, or other wildlife pursuits, wildlife recreation also contributes millions of dollars to local economies. In 2002, approximately 35.5 million people visited a National Wildlife Refuge, mostly to observe wildlife in their natural habitats. Visitors are most often accommodated through nature trails, auto tours, interpretive programs and hunting and fishing opportunities. Significant economic benefits are being generated to the local communities that surround the refuges. Economists have reported that National Wildlife Refuge visitors contribute more than $792 million annually to the local economies.

Compatibility Policy

With the passage of the Improvement Act, a new process for determining compatibility of refuge uses was established. The Service Compatibility Policy and Regulations finalized in October 2000 describes the current standard for determining compatible uses of a refuge. A copy of the Compatibility Policy and Regulations may be obtained on-line at (http://policy.fws.gov/library/00fr62457.pdf).

Lands within the Refuge System are different from federal multiple-use public lands, such as National Forest System lands, in that they are closed to all public uses unless specifically and legally opened. The Improvement Act clearly establishes that wildlife conservation is the single Refuge System mission. To ensure the primacy of the Refuge System wildlife conservation mission, a compatibility policy was developed and placed into effect in 2000 (65 Fed. Reg.62458 (October 18, 2000)). The compatibility policy states that the Service will not initiate or permit a new use of a National Wildlife Refuge or expand, renew, or extend an existing use of a National Wildlife Refuge, unless the Service has determined that the use is a compatible use and that use is not inconsistent with public safety.

A refuge use is defined as any activity on a refuge, except administrative or law enforcement activity, carried out by or under the direction of an authorized Service employee. Recreational uses, including all actions associated with a recreational use, refuge management economic activities, or other use by the public are considered to be refuge

uses. Facilities and activities associated with recreational public uses, or where there is an economic benefit associated with a use, require compatibility determinations (CDs). Refuge management activities such as invasive species control, prescribed fire, scientific monitoring, and facilities for managing a refuge do not require CDs.

Some recreational activities, while wholesome and enjoyable, are not dependent on the presence of fish and wildlife, nor dependent on the expectation of encountering fish and wildlife. Many of these non-wildlife-dependent recreational activities are often disruptive or harmful to fish, wildlife or plants, or may interfere with the use and enjoyment of a refuge by others engaged in wildlife-dependent recreation. These non-wildlife-dependent uses may more appropriately be conducted on private land, or other public lands not specifically dedicated for wildlife conservation.

A compatible use is a proposed or existing wildlife-dependent recreational use or any other use of a National Wildlife Refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the National Wildlife Refuge. Sound professional judgment is further defined as a decision that is consistent with principles of fish and wildlife management and administration, available science and resources and adherence with law. The Service will secure public input throughout the CCP and CD process.

CDs are written determinations signed and dated by the refuge manager and the refuge supervisor stating that a proposed or existing use of a National Wildlife Refuge is or is not a compatible use. CDs are typically completed as part of the CCP or step-down management plan process. Draft CDs are open to public input and comment. Once a final CD is made by the refuge manager, it is not subject to administrative appeal.

The Service requires that CDs be reevaluated for existing wildlife-dependent recreational uses when conditions under which the use is permitted change significantly, or if there is significant new information regarding the effects of the use, or concurrently with the preparation or revision of a CCP, or at least every 15 years, whichever is earlier. In addition, a refuge manager always may reevaluate the compatibility of a use at any time.

Except for uses specifically authorized for a period longer than 10 years (such as rights-of-way), the Service requires CDs be reevaluated for all existing uses other than wildlife-dependent recreational uses when conditions under which the use is permitted change significantly, or if there is significant new information regarding the effects of the use, or at least every 10 years, whichever is earlier. In addition, a refuge manager always may reevaluate the compatibility of a use at any time.

1.3 Ecosystem Descriptions and Threats

Platte/Kansas Rivers Ecosystem

Kirwin NWR is located within the Platte/Kansas Rivers Ecosystem. The Platte/Kansas Rivers Ecosystem unit encompasses approximately 182,000 square miles of the central Great Plains of the United States (figure 1). The Platte/Kansas Rivers Ecosystem includes the states of Colorado, Kansas, Nebraska and Wyoming. The area is diverse, beginning at the headwaters of the North and South Platte river systems high in the Rocky Mountains, moving into sage brush uplands of north-central Colorado and southeastern Wyoming, traversing across the short-grass prairie regions of eastern Colorado, and the mixed-grass prairie regions of Nebraska and Kansas. The primary ecological processes affecting this system are climate, cultivation, grazing, and fire. The ecosystem is considered arid with an average annual precipitation between 8 and 16 inches per year. Approximately 85 percent of the Platte/Kansas Rivers Ecosystem is privately owned. The remainder is primarily owned and managed by state and federal agencies.

Three primary geographic sub-units exist within this ecosystem: mixed-grass prairie, mountain, and short-grass prairie. Kirwin NWR is located within the mixed-grass prairie sub-unit of the Platte/Kansas Rivers Ecosystem. The mixed-grass prairie encompasses the eastern two-thirds of the north one-half of the state of Kansas and the eastern two-thirds of the state of Nebraska (figure 1). Elevation varies from 3,000 to 5,500 feet above mean sea level. The area is largely under private ownership and consists primarily of prairie grassland or prairie grassland converted to cropland.

Prairie grasslands are considered to be one of the most imperiled ecosystem types in North America and worldwide (TNC 1998). Bison and other native herbivores have been extirpated or greatly reduced throughout the ecoregion. Prairie grassland birds, such as the mountain plover and lesser prairie

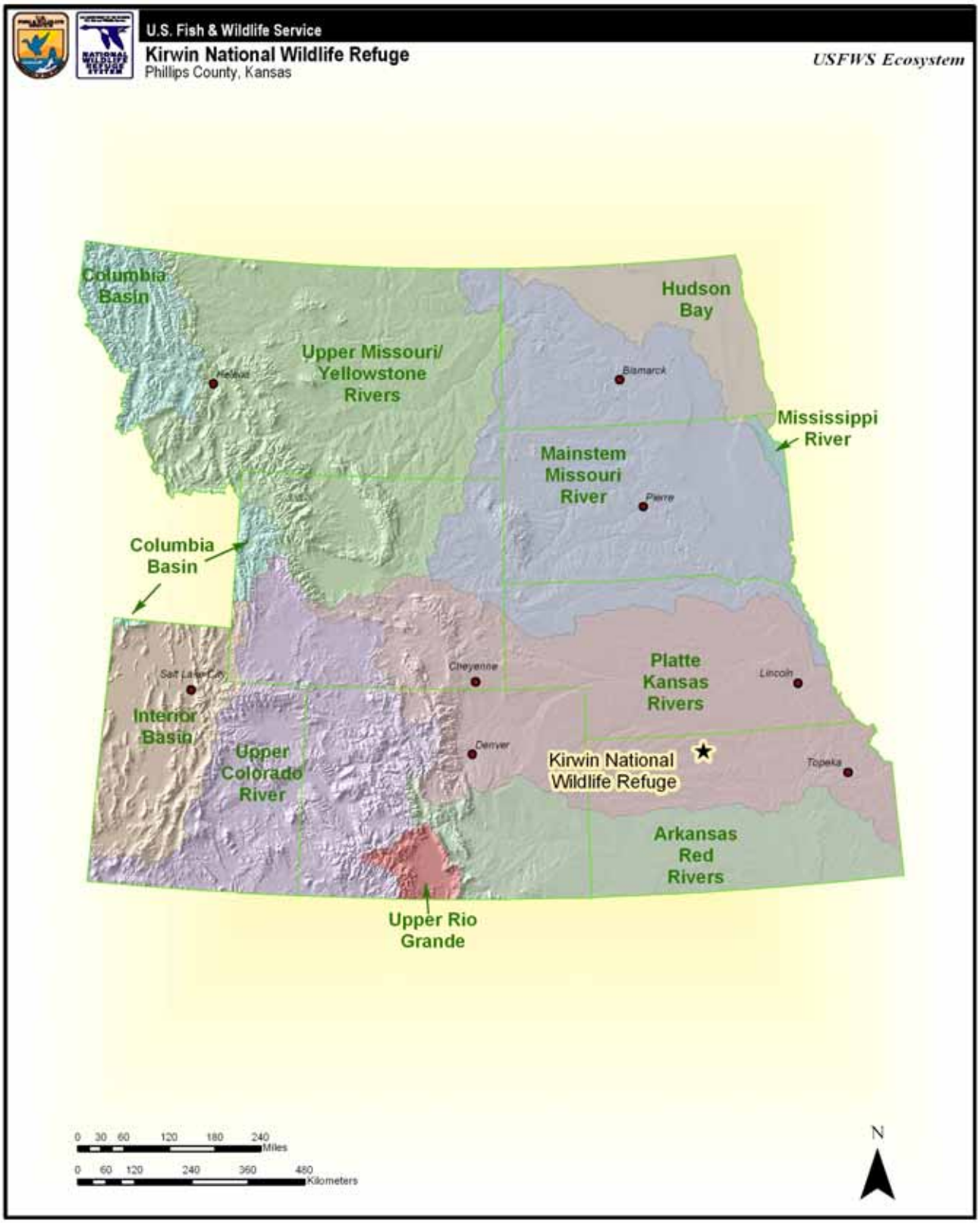


Figure 1. USFWS Region 6 Ecosystem Map

> ***In the larger context of conserving biological diversity in agricultural and natural ecosystems in North America, prairies are a priority, perhaps the highest priority. It is time to bring a measure of prairie conservation to the forefront.***
> (Samson and Knopf 1994)

The short-grass and tall-grass prairies intergrade just east of an irregular line that runs from northern Texas through Oklahoma, Kansas, and Nebraska, northwestward into west-central North Dakota and South Dakota. The perimeter is not well defined because of the array of short-stature, intermediate, and tall grass species that make up an ecotone between the short-grass and tall-grass prairies (Bragg and Steuter 1996). In general, the mixed-grass prairie is characterized by the warm-season grasses of the short-grass prairie to the west and the cool- and warm-season grasses, which grow much taller, to the east. Because of this ecotonal mixing, the number of plant species found in mixed-grass prairies exceeds that in other prairie types. Estimated declines in area of native mixed-grass prairie, although less than those of the tall-grass, range from 30.5 percent in Texas to over 99.9 percent in Manitoba.

Dominant grasses in the mixed-grass prairie of the central Great Plains are blue grama, little bluestem, sand dropseed, tall dropseed, western wheatgrass, buffalograss, and side-oats grama. Other important grasses include big bluestem, switchgrass, and Indiangrass. Native prairie also supports numerous ecologically important forbs such as scarlet globemallow, western ragweed, resindot skullcap, prairie coneflower, heath aster, black Samson, prairie phlox, prairie clover, dotted gayfeather, slim-flowered scurfpea, and Missouri goldenrod.

Due to its ecological and vegetative diversity, this ecosystem supports at least 234 species of migratory birds. It provides breeding and migration habitat for significant populations of waterfowl plus a variety of other water birds. The ecosystem supports several species of candidate and federally listed threatened and endangered species including the least tern, piping plover, Topeka shiner, Meads milkweed, western prairie fringed orchid, pallid sturgeon, bald eagle, American burying beetle, tiger beetle, Eskimo curlew, whooping crane, blowout penstemon, and black-footed ferret.

1.4 National and Regional Mandates

This section presents, from the national level to the local level, highlights of legal mandates, Service policy, and existing resource plans that directly influenced development of this CCP.

Refuges are managed to achieve the mission and goals of the Refuge System and the designated purpose of the refuge unit as described in establishing legislation or executive orders, or other establishing documents. Key concepts and guidance of the Refuge System are provided in the Refuge System Administration Act of 1966, Title 50 of the Code of Federal Regulations, the Fish and Wildlife Service Manual and, most recently, through the National Wildlife Refuge System Improvement Act of 1997. A list of other laws and executive orders that may affect the CCP for Kirwin NWR or the Service's implementation of the CCP is provided in appendix C.

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

Service policies providing guidance on planning and the day-to-day management of a refuge are contained within the Refuge System Manual and the Service Manual.

Refuge Contributions to National and Regional Plans

Fulfilling the Promise

A 1999 report titled "Fulfilling the Promise, The National Wildlife Refuge System: Visions for Wildlife, Habitat, People and Leadership" (Service 1999) is the culmination of a year-long process by teams of Service employees to evaluate the Refuge System nationwide.

This report was the focus of the first National Refuge System Conference, held in October 1998, and attended by refuge managers, other Service employees, and representatives from leading conservation organizations. The report contains 42

recommendations packaged with three vision statements dealing with wildlife and habitat, people, and leadership.

This CCP deals with all three of these major topics, and the Service looked to the recommendations in the document for guidance throughout the plan.

Published in June 2004, the Region 6 Picnicking and Camping Policy establishes new guidance for picnicking and camping on Refuge System lands in region 6. According to the policy, "Generally, the act of coming to a National Wildlife Refuge for the sole purpose of picnicking and/or camping at that site is an inappropriate use of Refuge System lands."

Partners In Flight, Conservation of the Land Birds of the United States: Central Mixed-grass Prairie

Partners in Flight began in 1990 with the recognition of the decline of many migratory bird species. The challenge, according to the Partners in Flight Program, is managing human population growth while maintaining functional natural ecosystems. To meet his challenge, Partners in Flight began working to identify priority land bird species and habitat types. Partners in Flight activity has resulted in production of 52 Bird Conservation Plans covering all of the continental United States.

The primary goal of Partners in Flight is to provide for the long-term health of the avifauna of this continent. The first priority is to prevent the rarest species from going extinct. The second is to prevent uncommon species from descending into threatened status. The third goal is to "keep common birds common."

The spatial unit chosen by Partners in Flight for planning purposes has been the physiographic area. There are 58 physiographic areas (i.e., areas defined by similar physical geographic features) wholly or partially contained within the contiguous United States and several others wholly or partially in Alaska. Kirwin NWR lies within the Central Mixed-grass Prairie, which is physiographic area 34 (see figure 2).

The majority of the Central Mixed-grass Prairie occurs in central Kansas and Nebraska, with a small portion in southern South Dakota. The northern and western portions are covered by the Nebraska Sandhills, an area of rolling, irregular dunes interspersed with gently sloping valleys and numerous small wetlands. The remainder of the physiographic area is a dissected loess plain drained by several major rivers. Whereas all of the uplands are naturally mixed- and tall-grass prairie communities, the larger river valleys support northern flood plain forests.

Priority bird species and habitats of the Central Mixed-grass Prairie include:

- Prairie grasslands
  - Swainson's hawk
  - Greater prairie-chicken (highest percent population of any physiographic area)
  - Lesser prairie-chicken
  - Long-billed curlew
  - Bell's vireo (requires shrubby conditions within prairie grasslands)
  - Smith's longspur (winter only)
  - Dickcissel
- Big River Sandbars
  - Piping plover
- Wetlands
  - American white pelican
  - Black rail

North American Waterfowl Management Plan

The North American Waterfowl Management Plan was originally written in 1986. The plan envisioned a 15-year effort to achieve landscape conditions that could sustain waterfowl populations. In 1985, waterfowl populations had plummeted to record lows. The habitat that waterfowl depend on for survival was disappearing at a rate of 60 acres per hour. Recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation to help in the recovery of a shared resource, the U.S. and Canadian governments developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. With Plan update in 1994, Mexico became a signatory to the Plan.

The Plan is innovative because its perspective is international in scope, but its implementation functions at the regional level. Its success is dependent upon the strength of partnerships, called "joint ventures," involving federal, state, provincial, tribal, and local governments, businesses, conservation organizations, and individual citizens. Joint ventures are regionally based, self-directed partnerships that carry out science-based conservation through a wide array of community participation. Joint ventures develop implementation plans focusing on areas of concern identified in the Plan. As of the end of 2003, Plan partners have invested more than $3.2 billion to protect, restore, and/or enhance more than 13.1

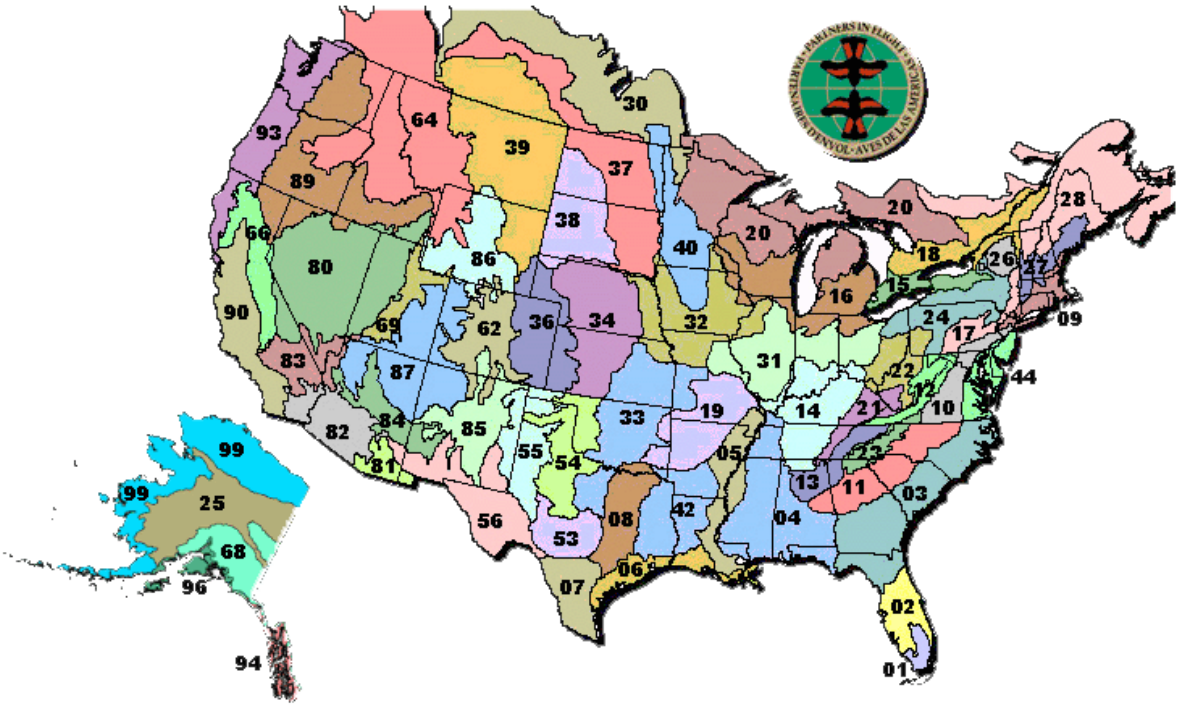


Figure 2. Partners in Flight Physiographic Areas

million acres of habitat. Kirwin NWR lies within the Playa Lakes Joint Venture.

Playa Lakes Joint Venture

The Playa Lakes Joint Venture (PLJV) takes in more than 50,000 wetlands known as "playas" across the southern High Plains of the U.S. Most of these 10 to 100 acre shallow, circular basins are found in eastern Colorado and New Mexico, western Nebraska, Kansas and Oklahoma and the Texas Panhandle.

Depending on the season, these basins can be concave discs of clay or shimmering pools of water, providing habitat for waterfowl, shorebirds, cranes and other migratory birds. Most playas are privately owned and landowner participation in the joint venture is crucial to protecting the playas.

Playa Lakes Joint Venture Area Implementation Plan for Bird Conservation Region (BCR) 19-KS

The BCR 19 part of Kansas contains 27,012,337 acres dominated by cropland (67 percent) principally corn, wheat and soybeans. These areas, intermingled with wetland or other types, support large numbers of Swainson's hawk and ring-necked pheasant. Large amounts of mid-grass prairies remain (18 percent) supporting grasshopper sparrow, dickcissel, and eastern meadowlark. Within this type are small brushy ravines critical for northern bobwhite and Bell's vireo.

Tall-grass prairies, which represent only a small fraction of total grasslands in the Joint Venture (JV), are found here and support populations of upland sandpiper and Henslow's sparrow when in large (> 200 acre) blocks. Large rivers include the Arkansas and support riparian species such as Mississippi kite, red-headed woodpecker and Baltimore oriole. Where large rivers create wide flood plains and unvegetated sandbars within the stream channel, least tern may find breeding habitat. Other wetlands in this portion of Kansas, especially emergent marsh and saline wetland complexes, support continentally important populations of migrant shorebirds and waterfowl, including mallard, northern pintail, geese, sandhill cranes, and migrating whooping cranes.

Habitat assessments and modeling suggest that waterfowl population objectives (foraging use-days) can be supported on the available wetland habitats, but that only about 7 percent of shorebird population objectives (also foraging use-days) can be supported. This assessment assumed that the greater prairie-chicken population needed to be doubled from the currently modeled population.

To reach an average of a projected 100 percent of population objective for priority bird species PLJV recommends:

1. Increasing the amount of protected habitats especially wetlands, mixed-grass and tall-grass prairie.

2. Emphasizing protection and enhancement of existing waterfowl habitat conservation efforts as a hedge against future habitat declines, including protecting and restoring emergent and saline wetlands, and restoring and enhancing river flows.

3. Directing shorebird habitat conservation efforts toward providing habitat to support about 23 million additional foraging use-days, which is the current shortfall. This could be done by converting 31,962 acres of playas to moist-soil units, and managing for optimum shorebird foraging suitability (mud flats and very shallow water with minimal emergent cover). Because only a small portion of existing wetland habitat is suitable for foraging shorebirds (too deep, too densely vegetated, etc.), alternative conservation strategies could involve improving suitability of existing wetlands for foraging shorebirds through management actions such as grazing, brush removal, and water level management. However, this strategy requires management of more acres than the strategy described above.

4. Restoring and protecting 20,000 acres of tall-grass prairie targeting areas adjacent to current patches in far eastern BCR 19; and ensuring that approximately 2,500 acres (in approximate 75-acre patches) are burned on a rotational basis with no patch being burned more frequently than about every 4–5 years to maintain appropriate tall-grass conditions for Henslow's sparrow.

5. Managing a minimum of 1,400,000 acres of mixed-grass prairie and CRP, by regular patch burning to control eastern red cedar but consider on a much larger scale.

6. Protecting and restoring saline and other wetlands wherever they occur.

7. When possible, protecting and maintaining habitat (primarily by burning) for black-capped vireo where it was present historically.

8. Encouraging signup for CRP adding 1,000,000 acres targeting areas adjacent to native mixed-grass to create large blocks of habitat; in western BCR 19, adjacent to sand sage prairie; in eastern BCR 19, adjacent to tall grass prairie.

9. Ensuring all CRP is planted to native and area appropriate grasses; and including shrubs and native forbs in the mixture where appropriate.

10. Maintaining all existing prairie-dog colony acres in western BCR 19.

11. Maintaining wetland habitats around reservoirs and ponds and improving riparian conditions along streams including the eradication of nonnative plants.

12. Planning for the creation and "maintenance" of wide, braided, stream channels; and restoring more regular streamflow in large rivers and tributaries and protect water quality throughout the BCR. Doubling the current amount of unvegetated sandbar acreage. Protecting all known least tern colonies. Increasing the percentage of riparian canopy forest but rather than focusing on creation of large contiguous tracts of habitat concentrate on creating smaller groves of forest spreadout across the BCR. Considering also the maintenance or creation of wet meadows in drainages or along riparian corridors.

13. Encouraging maximum enrollment in Farm Bill programs that help recommendations above and are positioned to increase block size of native grasslands.

14. Protecting known colonial water bird colonies and areas where marsh birds breed. Consider especially black and king rail habitat in central BCR 19.

Recovery Plans for Federally Listed Threatened or Endangered Species

Where the following list of federally listed threatened or endangered species occur on Kirwin NWR, the Service will follow the management goals and strategies laid out in their respective recovery plans: whooping crane (endangered), Eskimo curlew (endangered), bald eagle (threatened), piping plover (threatened), least tern (endangered), Meads milkweed (threatened), and western prairie fringed orchid (threatened). This list of threatened or endangered species will change as new species are listed, delisted, or discovered on refuge lands.

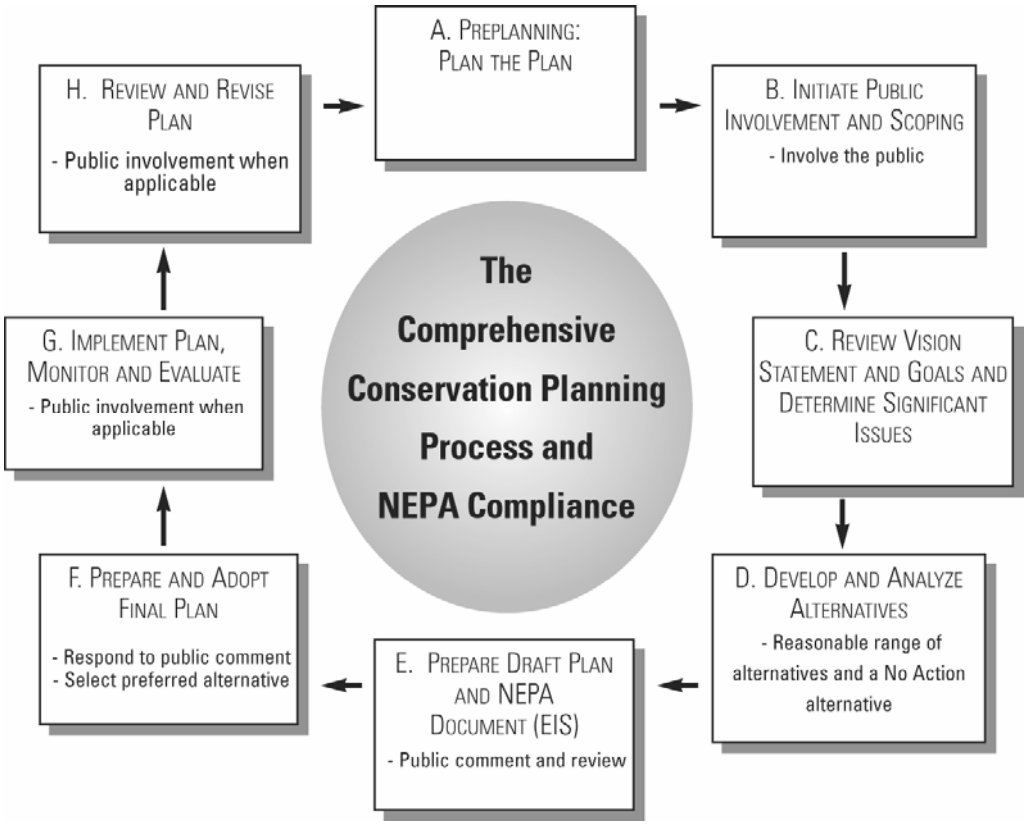


Figure 3. The Steps in the Comprehensive Conservation Planning Process

Existing Refuge Plans

Kirwin National Wildlife Refuge Comprehensive Management Plan

Kirwin National Wildlife Refuge currently operates under the guidance of the Kirwin National Wildlife Refuge Comprehensive Management Plan (CMP) completed in 1996 (Service 1996). The CMP establishes a vision for the refuge that includes management for the conservation, preservation and management of fish, wildlife and wildlife habitats, with emphasis on migratory birds.

Although the refuge currently operates under the guidance of the CMP, with the passage of the Improvement Act, additional responsibilities of the Refuge System were defined.

The Improvement Act requires a CCP for each refuge be completed by the year 2012. Above all, the law directs that wildlife comes first in the Refuge System. The Improvement Act accomplishes this by: establishing that wildlife conservation is the principal mission of the Refuge System; requiring that the biological integrity, diversity, and environmental health of each refuge and the Refuge System be maintained; and mandating that the Service monitor the status and trends of fish, wildlife, and plants on each refuge.

When complete, the CCP will supersede the CMP of 1996.

1.5 The Planning Process

This Draft CCP and EA for Kirwin NWR is intended to comply with the Improvement Act, NEPA, and their implementing regulations. The Service issued a final refuge planning policy in 2000 that established requirements and guidance for Refuge System planning, including CCPs and step-down management plans, ensuring that planning efforts comply with the provisions of the Improvement Act. The planning policy identified several steps of the CCP and EA process (see figure 3):

- Form a planning team and conduct preplanning

- Initiate public involvement and scoping
- Draft Vision Statement and Goals
- Develop and analyze alternatives, including a Proposed Action
- Prepare Draft EA and CCP
- Prepare and adopt Final CCP and EA and issue a Finding of No Significant Impact (FONSI) or determine an Environmental Impact Statement is needed.
- Implement plan, monitor and evaluate
- Review (every 5 years) and revise (every 15 years) plan

This dynamic process may require revisiting various steps. Nevertheless, the first step to beginning this project was to determine the planning area and establish a planning team.

The Service began the planning process in October 2002. A planning team comprising Service personnel, other federal agencies, and state agencies was developed shortly after this initial kickoff meeting. Draft issues and qualities lists were developed and updated over a course of several meetings. During preplanning, several items were addressed including developing a mailing list and planning schedule.

A draft vision statement and goals were developed during a workshop in February 2003, and a Notice of Intent to develop a comprehensive conservation plan for Kirwin NWR was published in the Federal Register March 21, 2003. Several communication tools were used to engage the public including newsletters and postage-paid comment forms. In addition, notifications of open houses were distributed through media press releases (for a summary of public scoping see appendix B).

Public scoping began in May 2003 with open houses in Kirwin, Phillipsburg, and Hays, Kansas. The draft vision statement and goals were shared with the public in a planning update and at the open houses.

Over the course of preplanning and public scoping, the planning team collected available information about the resources and the surrounding areas. This information is summarized in chapter 4.

This CCP provides long-term guidance for management decisions; sets forth goals, objectives, and strategies needed to accomplish refuge purposes; and identifies the Service's best estimate of future needs. This CCP details program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. This CCP does not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Coordination with the Public

The planning team began the public scoping process by contacting people that participated in the development of the CMP for Kirwin NWR in June 1996. A mailing list of over 388 names served as the starting point for engaging the public.

In May 2003, the first in a series of planning updates was sent to each person on the mailing list. The planning update introduced the CCP process, provided history on the Refuge System and a schedule of upcoming public scoping meetings. Each person was invited to participate in the process, attend public meetings and to offer comments. Postage-paid comment forms were included in the planning update. Public scoping meetings also were announced in several local newspapers.

Three open houses were held during the period from May 20 to 22, 2003, in Kirwin, Phillipsburg, and Hays, Kansas. During each open house, the CCP planner and refuge personnel were available to answer questions on the history of the Refuge System, and the CCP and NEPA processes. Attendees were given a two-page comment form and invited to submit comments to Service personnel orally or in writing. The turnout was mixed, from no attendees at the open house in Hays to more than 20 individuals at the open house in Kirwin. Seventy-three written comments were received.

In November 2003, a second planning update was distributed to each person on the mailing list. This planning update offered a discussion of the ongoing public involvement efforts in support of the CCP, and a summary of the public comments received. An additional 19 comment forms were received as a result of the distribution of the second planning update. Input obtained from all meetings and correspondence was considered in developing this draft CCP.

Coordination with Other Federal Agencies

In January 2003, an invitation letter to participate in the CCP process was sent by the Service's region 6 director to the director of the Great Plains Region of the U.S. Bureau of Reclamation. Local representatives from Grand Island, Nebraska were tasked with representing Reclamation on the core CCP planning team. The local representatives and

the refuge staff maintain excellent and ongoing working relations, which precedes the start of the CCP process. Reclamation representatives have participated in all of the planning workshops and attended the public open houses, providing invaluable input to the planning process.

In January 2003, an invitation letter to participate in the CCP process was sent by the Service's region 6 director to the Kansas City District, USACE. Although the USACE declined the invitation to participate in the planning process as a member of the core team, the USACE did agree to provide support for the planning process by reviewing pertinent planning documents and providing comments to the planning team. In addition, the local USACE representatives attended the biological workshop held in support of the CCP in December 2003.

State Coordination

The KDWP is charged with protecting Kansas wildlife resources for future generations through conservation and enhancement. Their mission is to, "Conserve and enhance Kansas natural heritage, its wildlife and its habitats to assure future generations the benefits of the state's diverse, living resources; provide the public with opportunities for the use and appreciation of the natural resources of Kansas, consistent with the conservation of those resources; and inform the public of the status of the natural resources of Kansas to promote understanding and gain assistance in achieving this mission." KDWP currently manages four museum/nature centers, four fish hatcheries, 24 state parks and 63 wildlife areas in support of wildlife, recreation, and fisheries.

In January 2003, an invitation letter to participate in the CCP process was sent by the Service's region 6 director to the director of the KDWP. Local KDWP representatives were tasked with representing the KDWP on the core CCP planning team. The local KDWP representatives and the refuge staff maintain excellent and ongoing working relations, which precedes the start of the CCP process. KDWP representatives have participated in all of the planning workshops and attended the public open houses.

In June 2004, an invitation letter to participate in the CCP process was sent by the Service's region 6 director to the director of the Kansas Biological Survey. A positive response was received and a representative of the Kansas Biological Survey was assigned to the core planning team. The Kansas Biological Survey has attended subsequent planning team meetings and provided valuable input regarding migratory birds in Kansas.

Offices of Senators Pat Roberts and Sam Brownback and Representative Jerry Moran were initially contacted in January 2003. The refuge manager and the assistant manager visited staffs at the appropriate district offices to inform them about this upcoming project.

State Senator Janice Lee and State Representative Clay Aurand were visited by the refuge manager and assistant manager in May 2003.

The representatives were contacted again through two planning update newsletters, which provided them with updated information.

Tribal Coordination

On June 19, and July 10, 2003, the Pawnee Tribe of Oklahoma and Prairie Band Potawatomi Nation respectively, were contacted through a letter signed by the Service region 6 director. The tribes were provided information about the CCP project and were invited to serve on the core planning team.

One inquiry from a representative of the Pawnee Tribe of Oklahoma was received. After receiving clarification on the project, the Pawnee Tribe of Oklahoma wished to continue receiving correspondence, but felt the planning area would not be of major interest to tribal members.

Initial inquires from Prairie Band Potawatomi Nation Department of Planning and Environmental Protection were received by the planning team leader. Upon receiving further information about the project, the Prairie Band Potawatomi Nation indicated they wished to continue receiving correspondence, but felt the planning area would not be of major interest to tribal members.

Results of Scoping

Comments collected from scoping meetings and correspondence were used in the development of a list of key issues that needed to be addressed in the CCP. The planning team determined which alternatives could best address these issues.

The proposed alternative formed the basis for the draft objectives and strategies to achieve the goals developed by the planning team. This process ensures that key issues are resolved or given priority over the life of this CCP. A summary of these issues along with some discussion of their impacts to the resource is discussed in chapter 2.

Decision to be Made

The decision to be made by the Mountain–Prairie regional director of the Service is the selection of an alternative that will be implemented as the Kirwin NWR CCP. This decision will be made in recognition of the environmental effects of each alternative considered. The decision will be disclosed in a FONSI included in the final CCP. Implementation of the CCP will begin upon signature and publication of the final CCP.

Table 1. Kirwin National Wildlife Refuge Comprehensive Conservation Planning Process Summary

Date	*Event*	*Outcome*
October 2002	Preplanning meeting.	Kirwin NWR CMP reviewed by Service personnel. Decision made to write a CCP, in lieu of revising the CMP.
December 2002	CCP kick-off meeting.	Established planning team; identified refuge purpose, history and establishing authority; developed planning schedule; internal scoping of issues; developed public involvement plan.
February 2003	Vision and goals workshop.	Developed draft vision statement and goals for Kirwin NWR.
March 2003	Publication of Notice of Intent (to prepare the CCP) in the Federal Register.	Notified public of the upcoming preparation of the CCP.
March 2003	Site visit to Kirwin NWR by USGS, Northern Prairie Wildlife Research Center.	Collected data for Biological Assessment of Kirwin NWR.
May 2003	News releases for public meetings sent to 10 local newspapers.	Notified public of opportunities for involvement in the CCP process.
May 2003	Public open house in Kirwin, Kansas.	Opportunity for public to provide input and identify issues.
May 2003	Public open house in Hays, Kansas.	Opportunity for public to provide input and identify issues.
May 2003	Public open house in Phillipsburg, Kansas.	Opportunity for public to provide input and identify issues.
December 2003	Biological workshop.	Reviewed report: A Biological Assessment of Kirwin NWR (USGS, Northern Prairie Wildlife Research Center, March 2003).
February 2004	Interagency meeting at Kirwin NWR.	CCP postponed while EA to divest the refuge under consideration.
May 2004	CCP re-initiation meeting.	Updated planning schedule and resumed CCP process.
July 2004	Alternatives and objectives development workshop.	Developed a range of management alternatives for the refuge.
January 2005	Selection of the proposed alternative.	Selected alternative B as the Service's proposed alternative.
August 2005	Release of draft CCP and EA for internal review.	Received comments about the draft CCP and EA.
March 2006	Release of draft CCP and EA for public review.	Received public comments about the draft CCP and EA.
March 2006	Public open house in Phillipsburg, Kansas.	Increased public understanding of the draft CCP and EA, and receipt of public comments about the draft CCP and EA.

Chapter 2. The Refuge

2.1 Establishment, Acquisition, and Management History

Authorized under a General Plan approved by the Secretary of the Interior on June 17, 1954, Kirwin National Wildlife Refuge was established to provide habitat for and facilitate the management of the Nation's migratory bird resources.

Basic authority for the existence of the refuge stems from the Fish and Wildlife Coordination Act, which authorized the establishment of wildlife areas on federal water projects. The refuge is an overlay on Reclamation's Kirwin Reservoir project, fed by the North Fork Solomon River and Bow Creek. Fee title to the land is held for the United States by Reclamation. Water level control of the reservoir rests with the Kirwin Irrigation District, Reclamation and USACE. The watershed of the two water sources extends into western Kansas and covers approximately 800,000 acres. The 10,778-acre refuge is located west of the town of Kirwin in Phillips County in north-central Kansas (see figure 4).

The primary purpose of the reservoir is to provide for flood control and provide irrigation water for the Kirwin Irrigation District. The Kirwin Irrigation District irrigates up to 11,500 acres of cropland downstream of the reservoir. When the dam was completed in 1955, the reservoir filled to conservation level in just a few years.

The reservoir remained full, with seasonal fluctuations, until 1970 when a series of events caused a lowering of the lake level. From 1970 on, the combined effects of irrigation releases and reduced stream flow, resulting from underground water pumping, conservation farming practices, and the construction of hundreds of stock water ponds, caused a steady decrease in the average lake level. In 1992–1993, above-normal precipitation was recorded in the watershed and the reservoir refilled, reaching a record high level of 5.8 feet above conservation pool elevation. In 1995, runoff from a rain event raised the lake level to 7.8 feet above conservation pool, setting a new record level. Current data indicates Kirwin Reservoir is entering a period of low water levels due to the natural drought cycle for the next 20 to 40 years.

2.2 Purpose

Refuge System lands have been acquired under a variety of legislative acts and administrative orders. The transfer and acquisition authorities, used to obtain the lands, usually have one or more purposes for which land can be transferred or acquired. Over time, an individual refuge may contain lands that have been acquired under a variety of transfer and acquisition authorities with different purposes.

The purpose of Kirwin NWR, "… shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements… and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, …in behalf of the National Migratory Bird Management Program" (Fish and Wildlife Coordination Act).

2.3 Vision and Goals

During the early stages of the planning process, the planning team developed a vision for the refuge. The vision describes what the refuge will be, or what the Service hopes to do, and is based primarily upon the Refuge System mission and specific refuge purposes.

The vision was presented to the public during public open houses, and is a future-oriented statement designed to be achieved through refuge management by the end of the 15-year CCP planning horizon. The vision for Kirwin NWR is:

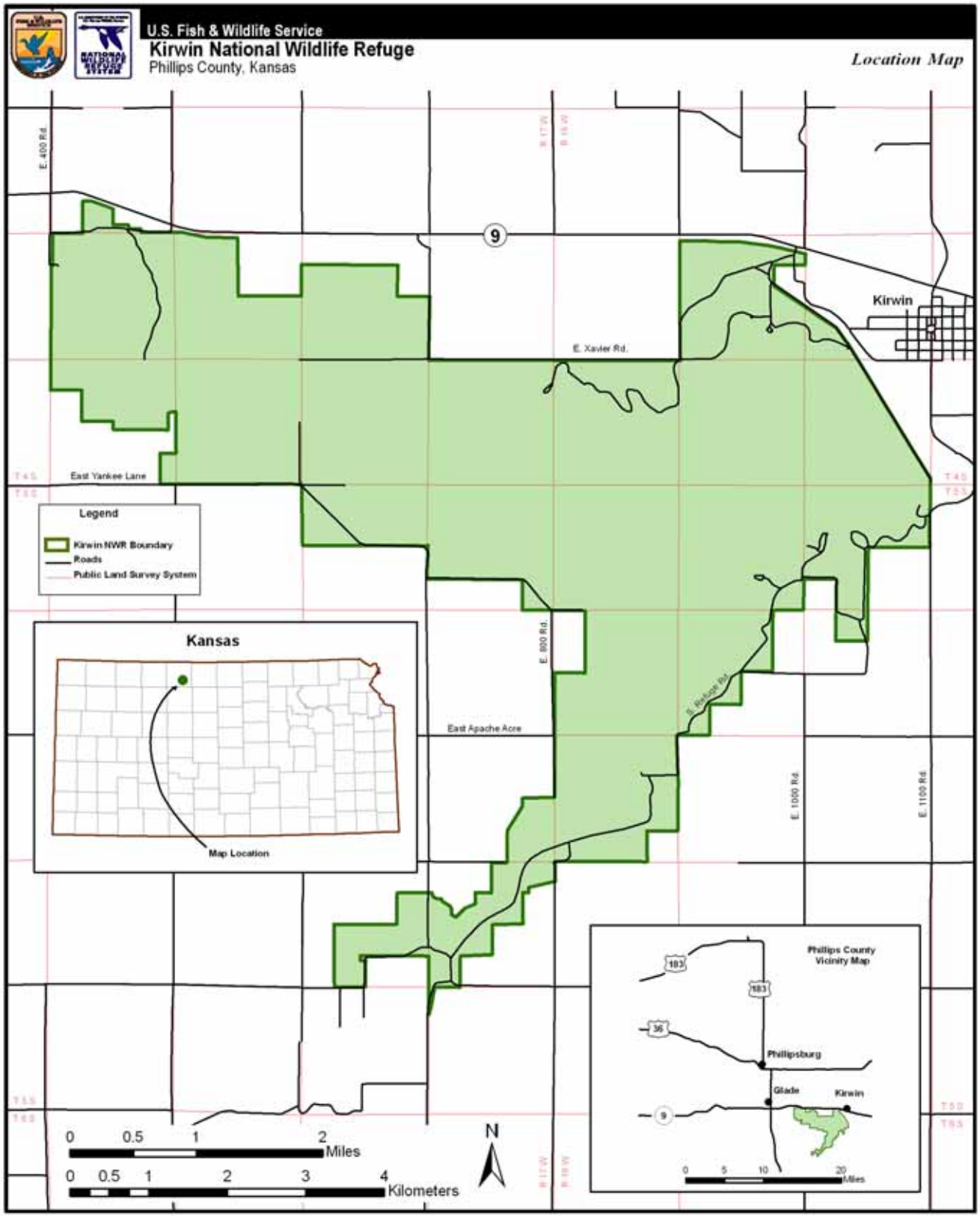


Figure 4. Kirwin National Wildlife Refuge Location Map

Along the seam where the tall and short grasses of the rolling prairie embrace and dance in the Kansas wind, two valleys join and beckon abundant wildlife and visitors alike. Visitors to the refuge will find themselves charmed by the melody of the meadowlark, captivated by the expansive vistas from limestone outcrops, and delighted by the bountiful resources of its land and waters. Wildlife-dependent recreation amid the solitude of the refuge will provide present and future generations with an experience to remember for a lifetime.

The planning team also developed a set of goals for the refuge based on the Improvement Act and information developed during project planning. The goals direct work toward achieving the vision and purpose of the refuge, and outline approaches for managing the refuge's resources. Seven goals for Kirwin NWR were identified:

Goal 1. Ecology. The refuse will restore the native mixed-grass prairie ecosystem (e.g., prairie grasslands, wooded draws, and limestone outcrops) and riparian areas above flood levels to emulate natural processes. When water levels are low, diversify wildlife habitats within the dry reservoir basin.

Goal 2. Water Resources. In coordination with Reclamation, the Kirwin Irrigation District will strive to maintain greater water level management and storage specifically for the benefit of fish and wildlife and wildlife-dependent recreation.

Goal 3. Research and Science. The refuse will utilize a scientific approach with the best available information will guide the restoration, protection, and enhancement of the refuge's water resources and fish and wildlife habitat for the prosperity of native flora and fauna.

Goal 4. Cultural Resources. The refuge will protect significant prehistoric, Native American, and other cultural resources.

Goal 5. Refuge Operations. The refuge will prioritize for "wildlife first" and emphasize the protection of trust resources in the utilization of staff, funding, partnerships, and volunteer programs.

Goal 6. Public Use. All public uses will be compatible with the purpose of the Kirwin NWR and the mission of the Refuge System. Wildlife-dependent public uses will be prioritized as follows: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. In association with compatible uses, the refuge will strive to provide a diversity of outreach, research, education, and interpretation.

Goal 7. Partnership. The refuge will work to complement habitat on the refuge and surrounding landscape by developing partnerships regarding land and water habitat restoration, environmental education, wildlife-dependent public use, research, and infrastructure.

2.4 Special Values of the Refuge

During the vision and goals workshop, the planning team identified the outstanding qualities of Kirwin NWR. Qualities are the characteristics and features of the refuge that make it special and worthy of refuge status.

- Kirwin NWR sits amidst the rolling hills and limestone outcrops of the mixed-grass prairie and is located within the transition zone of the tall-grass prairie and short-grass plains.
- The refuge lies within the heart of the Central Flyway and plays an important role as a nesting and foraging area for migratory birds.
- On December 26, 1996 the refuge was identified as being significant for world bird conservation and officially designated a "Globally Important Bird Area" by the American Bird Conservancy.
- Two valleys (North Fork Solomon River and Bow Creek) meet at Kirwin Reservoir to create a permanent water body in a semiarid environment, which attracts a large diversity of wildlife.
- The refuge is dynamic in nature with great changes year-to-year as a result of fluctuating water levels in the reservoir basin.
- A significant presence of native wildflowers exists in native undisturbed prairie on the refuge.
- Fremont clematis, sometimes called Fremont leather plant because of the texture of the leaves, was named in honor of General John C. Fremont, U.S. Army, who made five expeditions westward across the United States, discovering many new species of plants (Stevens 1948). This plant is one of the rarest in Kansas due to its limited range. This plant is only found in north-central Kansas, with Kirwin NWR being the only NWR to have a population of this rare species.

- Kirwin Reservoir contains a tremendous fishery during periods of high water.
- There is a sense of remoteness at Kirwin NWR; it is not crowded.

2.5 Planning Issues

Several key issues were identified following the analysis of all comments collected through the various public scoping activities and a review of the requirements of the Improvement Act and NEPA. These issues were considered during the formulation of alternatives for future management. The following issues were selected to be reviewed during the CCP process.

Declining Populations of Nongame Wildlife Species

On-the-ground management of nongame species, such as prairie grassland dependent migratory birds, has received less attention and active management than game species. Over the past 10 to 15 years game species have garnered more support and active management in the United States than nongame species.

Invasive Plant Species

Canada thistle has been documented on the refuge as far back as the 1970s. However, conditions were not right for a major expansion of Canada thistle until the high water of the mid 1990s began to recede. As the water receded, the moist soil left behind was prime habitat to germinate the Canada thistle seeds, which facilitated the rapid expansion of this plant species on the refuge.

Smooth brome grass is an invasive plant native to the steppes of Asia, which has been introduced to North America. If North American prairie grasslands are not burned or grazed at the correct time of year, smooth brome may increase in many prairie grassland sites to the point of becoming the dominant species in these areas. Prairie grasslands dominated by smooth brome grass do not include the diversity of plants required by many wildlife species to meet their life cycle needs. Therefore, areas dominated by smooth brome grass generally provide less benefit for nesting and feeding birds than prairie grasslands that are dominated by native plants.

Invasive trees introduce several detrimental items — avian predators, land-based predators, and nest parasites — to the mixed-grass prairie ecosystem and prairie grassland-dependent migratory bird species. Trees that invade prairies provide corridors for hunting red fox, raccoon, opossum, and skunks; and perches for avian predators and nest parasites such as red-tailed hawks and brown-headed cowbirds.

Tamarisk (also called salt cedar) is an invasive tree/shrub that prefers moist soil, such as those near the reservoir. Tamarisk leaves are all elopathic which fall and are absorbed into the soil leaving behind an environment not conducive to growing other native plants; thus, plant diversity is reduced. If allowed to grow, stands of tamarisk will become dense and will raise the summer temperature in the understory, which is not conducive to nesting migratory birds.

Reservoir Water Level Fluctuations

Large fluctuations of the reservoir water levels prevent the development of SAV. SAV is the baseline of the aquatic food chain. Without the presence of SAV, there are few invertebrates for small fish to eat. The timing of the large fluctuations also plays a roll in emergent aquatic vegetation, plants that grow in the mud of the receding waters. Reservoir drawdowns have historically occurred in mid- to late summer. Exposing mud at this time of year provides ideal habitat for invasive plants such as tamarisk. Exposing mud earlier in the season would benefit native wetland plants such as swamp smartweed, which are beneficial to water birds.

Assess the Appropriateness and Compatibility of Current Non-wildlife-dependent Uses on the Refuge

The Improvement Act and subsequent regulations and policies address appropriate recreational uses of a refuge. In conjunction with the Improvement Act, the Service Compatibility Policy states that non-wildlife-dependent recreational uses are generally inappropriate uses of a refuge. Non-wildlife-dependent recreational uses may cause conflicts with other refuge visitors and may degrade or destroy wildlife habitat.

Develop Habitat Management Plan that Allows Refuge Staff to Achieve and Monitor Proposed Habitat Objectives

To be productive areas for wildlife, habitats of the refuge must be actively managed. When habitats in this ecosystem remain idle for long periods of time invasive plants such as smooth brome grass, musk thistle, and locust trees invade habitat and reduce the value of the habitat for migratory birds. Habitat management tools such as prescribed fire, grazing, haying, and farming help the refuge staff manage habitats for wildlife.

Expansion of Environmental Education and Interpretation Programs

The refuge plays an important role in providing environmental education for the surrounding area. People informed about wildlife and wildlife management practices have a greater appreciation for wildlife and their habitat needs. Increasing efforts to work with small groups (e.g., Boy Scouts and school groups) and conducting large events (e.g., Eco-Meet and Eagle Day) will enhance the general public knowledge of wildlife. Expanding and updating wildlife interpretation will also enhance the public knowledge of wildlife and benefit wildlife populations in the future.

Chapter 3. Alternatives

3.1 Introduction

Alternatives are different approaches to management of the refuge designed to resolve issues, achieve the refuge purpose, vision, and goals identified in the CCP, while helping to fulfill the mission of the Refuge System and comply with current laws, regulations, and policies. NEPA requires an equal and full analysis of all alternatives considered for implementation.

This chapter describes two management alternatives for Kirwin NWR: Alternative A (Current Management/No Action) and Alternative B (Wildlife, Habitat, and Public Use—Proposed Action). The following sections describe how the alternatives were developed and how each alternative addresses the substantive issues identified during the scoping process.

3.2 Alternatives Development

In 2003, the Service held several meetings with the public to identify the issues and concerns that were associated with management of Kirwin NWR. The public involvement process is summarized in greater detail in chapter 2. Based on public input, as well as guidelines from NEPA, the Improvement Act, and Service Planning Policy, the planning team selected the substantive issues that will be addressed in the alternatives. The substantive issues identified for Kirwin NWR are as follows:

1. Habitat Management
2. Visitor Services
3. Water Resources
4. Research and Science
5. Cultural Resources
6. Refuge Operations
7. Partnerships

The planning team then discussed alternatives for management that will address the issues of the refuge, and meet the goals of the Refuge System. Each alternative described in the following sections attempts to address the issues outlined above. Degree of emphasis, approach, and tools used to address each of the issues differ between alternatives.

3.3 Alternatives Considered but Eliminated from Detailed Study

Terminate Memorandum of Agreement

One alternative considered by the planning team would have terminated the 1985 Memorandum of Agreement (MOA) between Reclamation and the Service which defines management responsibilities of the two agencies. Reclamation owns the land within the Kirwin Reservoir Project, and retains administrative jurisdiction over those lands designated as operations areas. The Service has administrative jurisdictions over lands designated as wildlife refuge lands and waters. This alternative was considered due to the historical precedent of some recreational uses at Kirwin National Wildlife Refuge that conflicts with the purpose of the refuge and mission of the Refuge System as defined in the Improvement Act.

During public scoping, a significant issue identified by the public was the desire to continue using the area for recreational purposes including camping, picnicking, and water sports (e.g., jet skiing and water skiing). These non-wildlife-dependent public uses are generally considered inappropriate and incompatible uses of a National Wildlife Refuge.

If the Service remains in its role as the land management agency for the Kirwin Reservoir area, the area would be managed to fulfill the purpose of the refuge and mission of the Refuge System. Termination of the MOA would result in management responsibilities reverting back to Reclamation, and was considered to be an option that would allow the continuation of existing recreational uses of the Kirwin Reservoir area.

In addition to the recreational uses occurring at the refuge, there was a perception by some within the Service that Kirwin NWR possessed minimal natural resource and biological value. Each refuge must meet the purpose for which it was established and contribute to the goals and mission of the Refuge System. Refuges that cannot meet this standard should be considered for divestiture.

Due to a lack of documented biological information, the planning team was uncertain of the biological resources of the area and the contribution of Kirwin NWR to the Refuge System. The planning team made a recommendation to obtain a biological assessment of the refuge.

In January 2003, the Service entered into a contract with the Northern Prairie Wildlife Research Center of the U.S. Geological Survey (USGS) to perform a biological assessment of Kirwin NWR. An ecologist from the center visited the refuge in March of 2003. Based on the site visit, discussions with refuge staff, and relevant literature reviews, a report titled "A Biological Assessment of Kirwin National Wildlife Refuge" was provided to the planning team in November of 2003 (Laubhan 2004).

The section on evaluation of community types discusses in more detail the attributes of various communities that occur within the refuge boundary.

In December 2003 the planning team met for a biological workshop at the refuge. The purpose of the workshop was to review the information presented in the USGS report. Four broad communities were delineated: reservoir pool; shoreline; riparian; and upland. The report identified 234 bird species known to occur on Kirwin NWR, and documented the population status of these species based on various regional and national plans. Of the species known to occur on the refuge, 43 are considered to be species of conservation concern. A copy of the Biological Assessment of Kirwin National Wildlife Refuge may be obtained by contacting the Service: Division of Refuge Planning, 134 Union Boulevard, Suite 300, Lakewood, Colorado 80228-1807.

Region 6's 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 should be considered for divestiture. The model consists of a set of eight questions that must be addressed when considering a refuge for divestiture. Although the model is still being tested and has not been finalized, it was used to analyze the value of Kirwin NWR and its contribution to the Refuge System. The results of the analysis indicate that Kirwin NWR meets at least one goal of the Refuge System, meets the purpose of the refuge, and provides substantial support for migratory bird species. According to the model, any refuge that answers yes to the above three criteria does not warrant further consideration for divestiture.

A complete summary of the development of the divestiture model and its application to Kirwin NWR is included in appendix D.

Based on the biological assessment, divestiture analysis, and sound professional judgment, a decision was made by the regional office to retain Kirwin NWR in the Refuge System. Therefore, this alternative was eliminated from detailed study by the planning team.

3.4 Elements Common to all Alternatives

This section identifies some of the key elements included in this CCP regardless of the alternative selected for implementation. Each alternative will accomplish the following:

- The United States will maintain ownership of the land, which will be managed by the Service and Reclamation according to their jurisdictional responsibilities, and in accordance with existing agreements between the two agencies.
- The Kansas Department of Health and Environment will continue to monitor water quality of the reservoir.
- Cultural resources will continue to be protected in accordance with federal and state laws, policies and guidelines.

3.5 Description of Alternatives

Alternative A (No Action—Current Management)

Under alternative A, Kirwin NWR will continue to be managed in accordance with the current Memorandum of Agreement (MOA) between Reclamation and the Service, and the Cooperative Agreement between the Kansas Department of Wildlife and Parks (KDWP).

In addition, this alternative will continue implementation of the 1996 CMP described in chapter 1. The CMP heavily emphasizes public use and recreation. This management approach is not consistent with the direction provided to National Wildlife Refuges in the 1997 Improvement Act. Continuing to manage the refuge in accordance with the CMP limits the staff's ability to accomplish the mission of the Refuge System.

A Cooperative Agreement between the Service and the Kansas Forestry, Fish and Game Commission (later renamed the Kansas Department of Wildlife and Parks) was signed in

June of 1954. This agreement articulates a cooperative partnership between the two agencies for management of the fishery on the Kirwin National Wildlife Refuge. The Refuge Administration Act of 1966, made some elements of the cooperative agreement obsolete. Under this alternative, the Cooperative Agreement will be updated to comply with current Refuge System laws, regulations, and policies.

Implementation of the CMP began in 1996 and continues to present day. The goals of the CMP are as follows:

- Enhance and maintain migratory bird populations, emphasizing resting and feeding habitat for waterfowl and other water birds, while providing nesting and breeding habitat for prairie grassland nesting species, and habitat for migrant raptors and Neotropical migrants.
- Enhance and maintain habitat for threatened and endangered species, emphasizing species known to use the refuge, including bald eagle, least tern, piping plover, whooping crane, peregrine falcon, and any state-listed or federal candidate species.
- Enhance and maintain native mixed-grass prairie habitat, emphasizing structural diversity in the plant community, and providing habitat for wildlife representing the mixed-grass prairie.
- Enhance and maintain riparian areas in Bow Creek and North Fork Solomon River corridors, emphasizing structural diversity in the native shrub/tree community for wildlife.
- Enhance and maintain diverse wetlands by providing reliable water supplies to stabilize water levels for fish and wildlife, and create moist-soil management areas for wetland-dependent wildlife.
- Provide natural and domestic food crops for waterfowl and resident wildlife for population maintenance and to prevent depredation on surrounding private lands. Food crops will be grown using minimal chemical applications.
- Maintain plant and animal diversity by providing habitat for resident and migratory species representative of the mixed-grass prairie.
- Provide effective wildlife and ecosystem based education by fostering partnerships, expanding outreach, demonstrating best management practices, developing site-specific curriculum and providing interpretive materials.
- Provide wildlife-oriented recreation emphasizing compatible hunting, fishing, wildlife viewing, camping and picnicking opportunities, while minimizing impacts from compatible non-wildlife-oriented recreation.

The CMP places a heavy emphasis on providing public use and recreation opportunities at Kirwin NWR.

To support the recreational program identified in the CMP, the Kirwin refuge manager performed a CD for the purpose of the continuation of boating on Kirwin National Wildlife Refuge. This CD takes precedence over all other previous planning documents of the same purpose. The CD, signed in September 1996, declares boating on Kirwin NWR to be consistent with federal and state laws, supports the fishing program, and provides opportunities for wildlife viewing. To ensure compatibility with the purpose of the refuge, the CD includes the following stipulations:

- All special refuge regulations, laws, and Service policies will be adhered to by boaters using Kirwin Reservoir.
- Refuge waters may be closed to all flotation devices without notice when emergencies arise, or if boaters using the area will constitute a disturbance to an endangered species or other refuge wildlife.
- If the reservoir level drops below elevation 1,703.6 feet (1,500 surface acres) boating will be stopped to ensure sufficient habitat and protection is provided to water dependent wildlife.

Or

- If the reservoir level drops below elevation 1,703.6 feet (1,500 surface acres) the buoy line will be moved east to a line between Railroad Flats and Beer Can Bottoms.

Refuge staff began working to implement the CMP when it was complete. The CMP included 14 objectives under four goals. Over the life of the CMP several objectives have been accomplished, some in whole and some in part. In alignment with the emphasis of the CMP, a majority of the refuge's discretionary budget and staff time was directed toward accomplishing the public use and recreation goals and objectives. Due to the small staff and discretionary budget, little time or money remains to address the additional goals and objectives of the CMP. Objectives presented

in the CMP that have been accomplished to date include the following:

- Provide nonconsumptive wildlife-oriented recreation opportunities for public enjoyment while limiting disturbance to wildlife and wildlife habitat, on selected areas of the refuge.
- Provide biologically sustainable consumptive recreational opportunities, such as hunting and fishing, for public enjoyment on selected areas of the refuge.
- Manage prairie grasslands that favor native species of flora and fauna and emphasize habitat diversity on 3,750 acres of mixed-grass prairie—represented by big bluestem, little bluestem, western wheatgrass, switchgrass, Indiangrass, sideoats grama, and blue grama—and that maintain a healthy state of height/density, ground cover, seedlings, and mature plants, with 15 percent to 25 percent mix of native forbs.
- Manage the riparian habitat along Bow Creek and the Solomon River to: 1) retain and enhance a mix of cottonwood, willow, hardwoods, and shrubs represented by bur oak, green ash, black walnut, hackberry, silver maple, plum, and choke cherry; and 2) benefit migrating and nesting songbirds, deer, turkey, and small mammals.
- Provide food for spring and fall migrating waterfowl and wintering resident species by planting 1,300 to 1,600 acres of domestic crops.
- Prevent a dense growth of volunteer willow, cottonwood and tamarisk trees below the conservation pool when the reservoir levels decrease.
- Provide areas with minimal wildlife disturbance at critical times of the year, to allow for nesting, feeding and resting.
- Maintain the fisheries resource to provide quality recreational fishing and food sources for birds dependent on a fish diet.
- Provide a high-quality environmental education and interpretation program for refuge visitors and local K–12 students.

Public Use

With the advent of the Improvement Act and the Region 6 Picnicking and Camping Policy, some of the existing public uses at Kirwin NWR do not comply with current Service laws, regulations and policies. One reason to prepare a CCP for Kirwin NWR is because the CCP process provides an opportunity for refuge staff to reevaluate existing refuge uses, and take the appropriate action to obtain compliance with current Service laws, regulations, and policies.

If this alternative is selected for implementation, all existing refuge uses will be reevaluated under the new compatibility process. It is anticipated that the non-wildlife-dependent uses will be modified or discontinued as a result of updated CDs. Refuge uses that are determined to be incompatible with the purpose of the refuge will be discontinued during the life of this CCP.

Although the visitor services program may be modified as a result of the reevaluation of existing CDs, this program will continue to be one of the highest management priorities in this alternative. A large portion of the discretionary budget and staff time will continue to be allocated to the visitor services program. In this alternative, the greatest staffing need is for an outdoor recreation planner.

The existing hunting program will continue with minimal modifications; however, no new actions will be planned to improve hunting quality. The existing fishing program will continue with minimal modifications, but no new actions will be initiated to expand boat fishing opportunities. Interpretive, educational and administrative programs and facilities will be maintained in this alternative (see figure 5).

Wildlife and Habitat Management

This alternative will continue current wildlife and habitat management practices. Habitat management for waterfowl and game species will continue to be a high priority (figure 6).

- Natural and domestic food crops will continue to be planted on the refuge as a supplemental food source for waterfowl and resident wildlife.
- Habitat management for nongame species that have historically received less attention will continue to receive little attention in this alternative.
- The small area of low disturbance for migrating and wintering waterfowl and other water birds will be maintained.

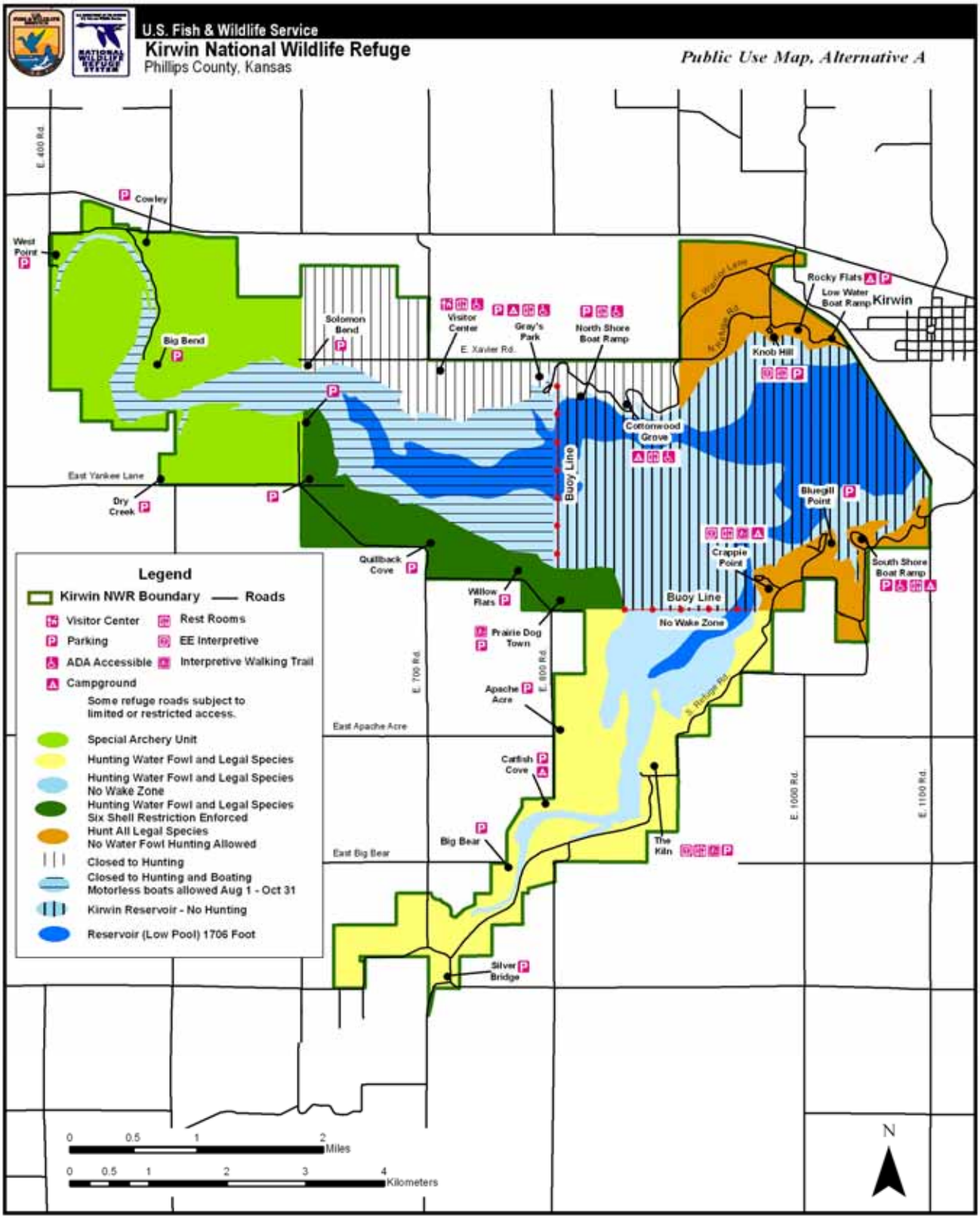


Figure 5. Public Use Map, Alternative A

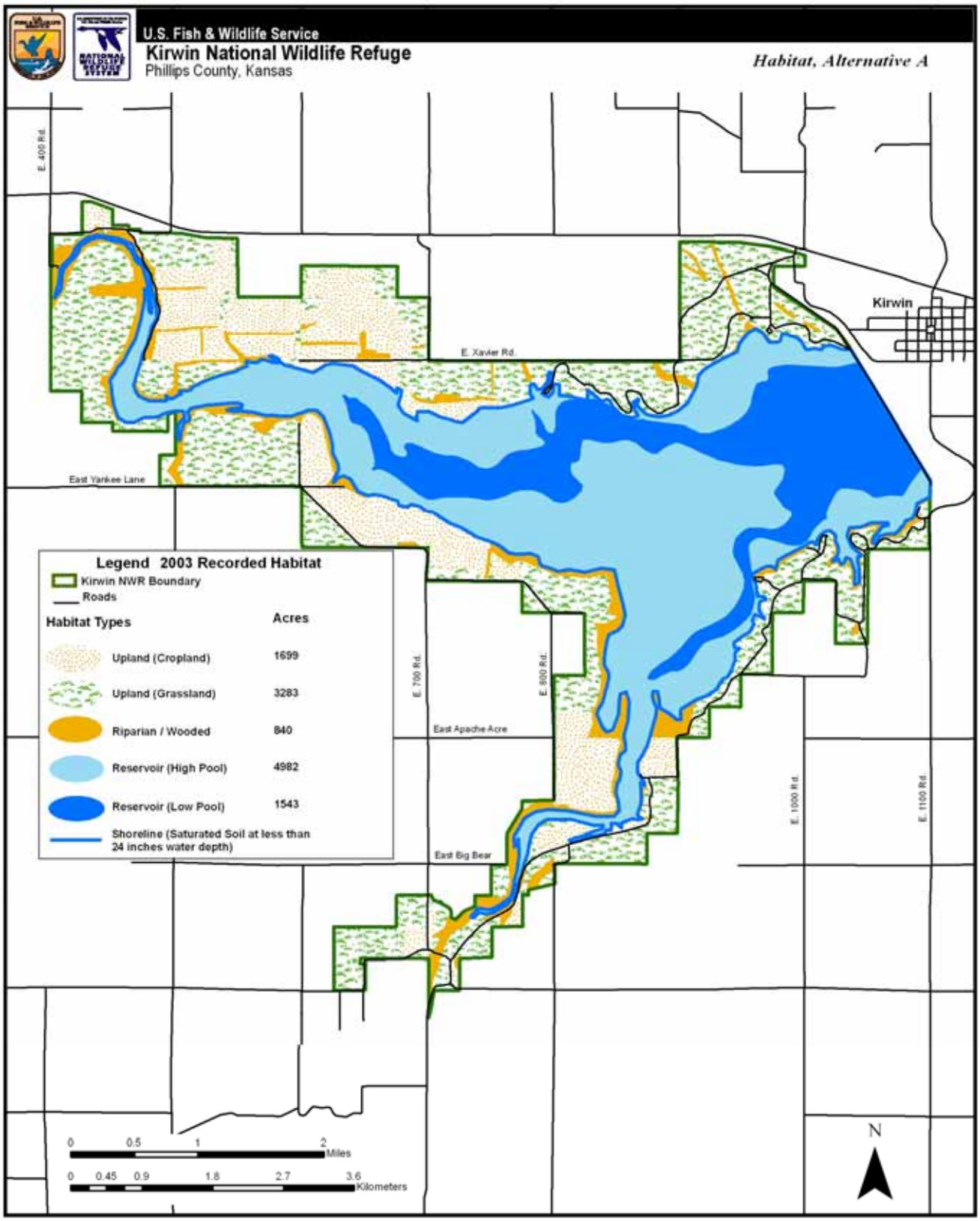


Figure 6. Habitat Map, Alternative A

The motorized boat closure in the Solomon Arm will be maintained from Railroad Flats upstream. There will not be any additional protection for migrating and winter waterfowl.

- Management of invasive species will remain the same. There will not be an expansion or diversification of invasive species management in the shoreline, riparian, upland, or transition zone areas.
- Open habitat for prairie grassland birds will continue to be provided on a small scale by the planting of native grasses and forbs.
- Limited baseline data will continue to be collected for wildlife and habitats.
- There will be no increased efforts in operations and maintenance for natural resources.

Alternative B (Wildlife, Habitat, and Public Use—the Service's Proposed Action)

Alternative B strives to fully implement the Improvement Act, which directs that each refuge in the Refuge System will be managed for the benefit of "wildlife first."

Under this alternative, management will shift from an emphasis on public use and recreation to emphasizing wildlife and habitat management for migratory birds and species of conservation concern. A majority of discretionary spending and staff time will be directed to habitat management for migratory birds. In this alternative the greatest need is to fill the 4.5 vacant staff positions.

Although secondary to wildlife and habitat management, the visitor services program will be a priority in this alternative. Wildlife-dependent recreation will be emphasized and promoted, with hunting, fishing, wildlife observation, photography, environmental education, and interpretation receiving priority attention.

In this alternative, the Service will continue to manage the refuge in accordance with the current MOA between Reclamation and the Service. The current MOA will remain in effect until an updated agreement is signed by both parties.

Public Use

Refuge Planning Policy requires the completion of new CDs or the reevaluation of existing CDs as part of the CCP process for all individual uses, specific use programs, or groups of related uses associated with the Proposed Action. In accordance with Planning Policy, all proposed refuge uses described in this alternative have been evaluated under the new CD process. The CDs are available for public review and comment, and are included in this document as appendix E. The new CDs will supersede previous CDs.

Non-wildlife-dependent uses will not be allowed. Wildlife-dependent recreation uses were found to be compatible with the purpose of the refuge, and will be promoted and emphasized in this alternative.

The existing hunting program will continue with minimal modifications. Increased efforts to improve the quality of the hunting program will be implemented.

Beginning in 2007, the refuge manager will evaluate all refuge roads for criteria including but not limited to wildlife disturbance, law enforcement problems, safety concerns, redundancy of purpose, and maintenance issues. If a road is determined to fail these criteria, it will be seasonally and/or permanently closed. If roads are closed, parking areas would be adjusted to allow pedestrian access (see figure 7).

The existing fishing program will continue with a few modifications. Shore fishing will continue to be allowed year-round. Foot access to the entire refuge will continue. Ice fishing will continue to be allowed. Under low water conditions (elevation < 1,722 feet), a seasonal boat closure will be implemented on the entire reservoir October 1 to April 1. Under high water conditions (elevation > 1,722 feet), the seasonal boat closure will be lifted to provide additional fishing opportunities. Efforts to provide wildlife observation and photography opportunities will be expanded where feasible.

Wildlife and Habitat Management

Under this alternative, wildlife and habitat management practices will be expanded and enhanced (figure 8).

Habitat management for waterfowl and game species will continue to be a high priority. Habitat management for nongame species (e.g., water birds, shorebirds, prairie grassland-nesting birds) and bird species of conservation concern will be elevated to a higher priority. Large open habitat for prairie grassland birds will increase in size with enhanced structural composition through an expanded program for managing and planting native grasses and forbs.

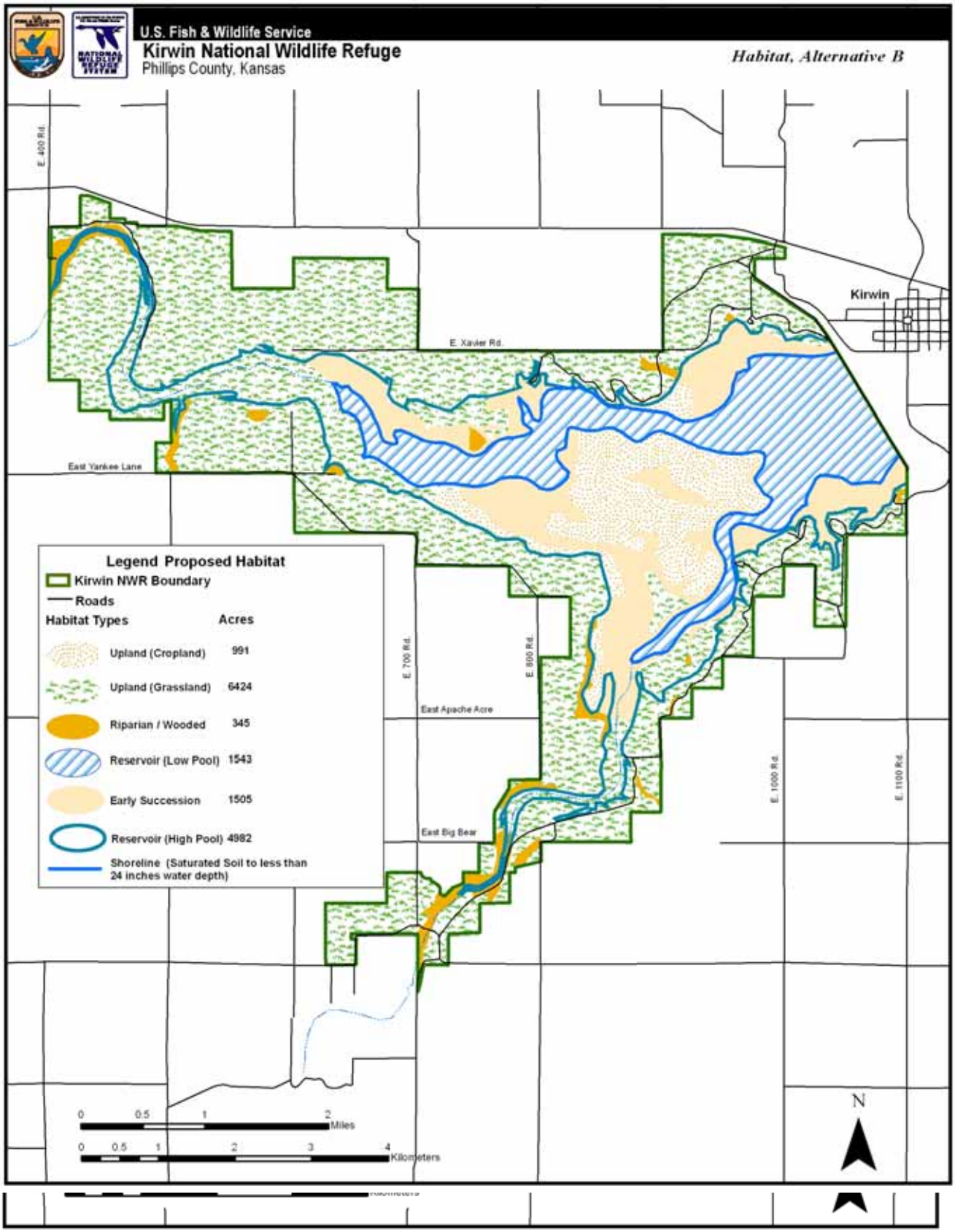


Figure 7. Public Use Map, Alternative B

Figure 8. Habitat Map, Alternative B

Food crops will be used as a habitat management tool. Potential uses of cropland include planting crops to reduce the encroachment of invasive plant species, and the utilization of crops (e.g., sorghum) to prepare the soil bed for conversion to native grasses and forbs. Under this alternative, the majority of existing cropland in the uplands will be restored to prairie grassland habitat within the life of this plan.

The small area designated as low disturbance for migrating and wintering waterfowl will be expanded by implementing a seasonal boat closure on most of the reservoir from October 1 to April 1. The motor boat closure area in the Solomon Arm will be moved upriver one mile and will occur from Grays Park west, which will provide added protection for nesting, migrating and wintering water birds.

Management of invasive species will be enhanced. Weed management will be expanded and diversified in the shoreline, riparian, upland, and/or transition zone areas.

In-depth baseline data will be collected for wildlife and habitats. Increased efforts in operations and maintenance for natural resources will occur. Increased efforts in the maintenance and development of partnerships that promote wildlife and habitat management will occur.

3.6 Comparison of Alternatives

The two alternatives evaluated in this planning process are 1) No Action, and 2) Wildlife, Habitat and Public Use. A comparison of the alternatives is shown in table 2.

Table 2. Comparison of Alternatives

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—Service's Proposed Action*
Summary of Management Direction	• Manage in accordance with the Comprehensive Management Plan.	• Enhance wildlife and habitat management. • Focus on migratory birds and species of conservation concern. • Promote hunting, fishing and other wildlife-dependent recreation.
	OWNERSHIP	
Land ownership within the Kirwin Reservoir Area	• The United States will maintain ownership of the land, which will be managed by the Service and Reclamation according to their jurisdictional responsibilities, and in accordance with existing agreements between the two agencies.	• Same as A
	ECOLOGY	
Reservoir (Deepwater) Habitat	• Minimal ability of the Service to manage deepwater habitat. ➢ Reservoir elevations are determined by other federal entities (e.g., Reclamation, USACE) • Continue to maintain a small narrow area of low disturbance for waterfowl and other migratory birds. ➢ Continue boat closure west of Railroad Flats. ➢ Continue buoy line at Railroad Flats at low water levels. ➢ Conduct additional reservoir treatments (see fishing section).	• Enhance aquatic food resources and make them available for migratory water birds by reducing dramatic water level fluctuations. ➢ Attempt to maintain higher water levels in reservoir for migratory birds and wildlife-dependent recreation. ➢ Expand efforts to work with Reclamation and the Kirwin Irrigation District to provide small spring fluctuations in water levels. • Expand the area of low disturbance for waterfowl during migration. ➢ Under low water conditions (< 1,722 feet), implement seasonal boat closure on most

Table 2. Comparison of Alternatives

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
		of the reservoir (October 1 to April 1). ➢ Allow boats in Bow Creek south of Crappie Point year-round. ➢ Maintain the year-round boat closure buoy line at Grays Park at all water levels. • Conduct additional reservoir treatments (see fishing section).
Shoreline Habitat	• Continue current level of invasive species management.	• Expand and diversify invasive species management. ➢ Enhance control of state-listed noxious weeds and invasive plant species.
Riparian Habitat	• Continue current level of invasive species management.	• Expand and diversify invasive species management. ➢ Enhance control of state-listed noxious weeds and invasive plant species. • Provide openings in timber to benefit declining migratory birds (this will also benefit game species such as deer, turkey, and quail).
Upland Habitat	• Continue current level of invasive species management. • Provide open habitat for prairie grassland birds. ➢ Continue to plant native grass and forbs above the conservation pool.	• Expand areas of open habitat for prairie grassland birds with few hostile areas and reduce disturbance to wildlife. ➢ Maximize habitat for prairie grassland birds by actively managing prairie grasslands (this will also benefit resident game species such as prairie chickens, quail, and pheasants). ➢ Expand program to convert cropland to areas of native grass and forbs above the conservation pool. ➢ Permanently and/or seasonally close some roads. • Augment and enhance adjacent native prairie by using Partners for Fish and Wildlife resources. • Expand and diversify invasive species management. ➢ Enhance control of state-listed noxious weeds and other invasive plant species.
Transition Zone Habitat	• Continue to provide open areas with little disturbance near water for feeding and resting migratory water birds. • Continue to plant native grasses. • Continue current level of invasive species management.	• Expand efforts to provide open areas with little disturbance near water for feeding and resting migratory water birds. ➢ Enhance prairie grassland corridors to facilitate habitat continuity and associated

Table 2. Comparison of Alternatives

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
	➢ Continue to plant crops below the conservation pool in specified locations.	prairie grassland bird movement. ➢ Create savannah habitat for declining migratory bird species (this will also benefit game species such as deer, turkeys, pheasants, and quail). • Expand and diversify invasive species management. ➢ Continue to plant crops below the conservation pool in specified locations. ➢ Enhance control of state-listed noxious weeds and other invasive plant species.
	VISITOR SERVICES	
Hunting	• Continue existing hunting program to manage wildlife and provide compatible wildlife-dependent recreation. ➢ Maintain current archery deer only hunting area. ➢ Maintain current area that is open to upland game and archery deer only. ➢ Maintain current area in Bow Creek that is open to upland game, waterfowl, and archery deer. ➢ Maintain current area that is closed to hunting. ➢ Maintain current six shell area for all bird hunting.	• Same as A, plus: • Enhance the existing hunting program by increasing the quality of hunting experience. ➢ Increase habitat block size to attract more birds to the area. ➢ Decrease disturbance to hunters.
Fishing	• Continue partnership with Kansas Department of Wildlife and Parks (KDWP) to manage the fishery by updating the current Cooperative Agreement between the Service and KDWP. • Continue current fishing opportunities to provide compatible wildlife-dependent recreation. ➢ Continue foot access to entire refuge. ➢ Continue current No Wake Zones.	• Same as A, except: ➢ Under low water conditions (< 1,722 feet), implement seasonal boat closure on most of the reservoir October 1 to April 1. ➢ Maintain the year-round boat closure buoy line at Grays Park at all water levels.
Wildlife Observation and Photography	• Continue to promote and provide wildlife observation and photography as a priority public use.	• Expand efforts to promote and provide wildlife observation and photography opportunities.
Interpretation and Environmental Education	• Continue current programs such as Eagle Day and monthly wildlife educational programs.	• Same as A, plus add new interpretation and environmental education programs where feasible.

Table 2. Comparison of Alternatives

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
Other Public Uses	• Existing non-wildlife-dependent recreational uses will continue until these uses are reevaluated through the compatibility determination process (see chapter 1, section 1.2, Compatibility Policy).	• Non-wildlife-dependent uses of the refuge will not be allowed.
	WATER RESOURCES	
Water Quality	• Kansas Department of Health and Environment continues to monitor water quality.	• Same as A.
	RESEARCH AND SCIENCE	
Habitat	• Continue limited baseline data collection.	• Collect in-depth baseline data from which to monitor management actions.
Wildlife	• Continue limited baseline data collection.	• Collect in-depth baseline data from which to monitor management actions.
Visitor Services	• Continue limited monitoring.	• Conduct studies of visitor uses.
	CULTURAL RESOURCES	
Extent of Cultural Resources Management	• Continue to protect cultural resources in accordance with federal and state laws, policies and guidelines. ➢ The Service Regional Archeologist is consulted during the planning phase of proposed projects and determines the need for an archeological site clearance from the Kansas State Historic Preservation Office.	• Same as A.
	REFUGE OPERATIONS	
Staffing	• Approved staffing level is 7.5 FTEs. Current on-site staff consists of 3 FTEs. • Hiring priority: outdoor recreation planner. • Continue to supplement staff with seasonal labor, inmate work crew, volunteers, and contract labor.	• Same as A (7.5 FTE), except reallocate staff time to focus on wildlife and habitat management for migratory birds and species of conservation concern. • Hiring priorities: assistant refuge manager, refuge biologist. • Expand efforts to supplement staff with seasonal labor, inmate work crew, volunteers, and contract labor.
Operations and Maintenance	• Maintain existing visitor services facilities. • Continue current level of operations and maintenance for natural resources.	• Increase operations and maintenance efforts that support wildlife and habitat management for migratory birds and species of conservation concern. • Maintain and expand where feasible, visitor services facilities that support wildlife-dependent recreation.

Table 2. Comparison of Alternatives

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
		• Remove visitor services facilities that support non-wildlife-dependent recreation.
	PARTNERSHIPS	
Extent of Partnerships	• Continue to maintain existing partnerships. • Continue partnership between the Service and the KDWP to help provide law enforcement and assist with management of the fishery in the Kirwin Reservoir.	• Same as A, plus: • Increase efforts to maintain and expand existing partnerships that focus on wildlife and habitat management, adding new partnerships where feasible. • Increase efforts to maintain and expand existing partnerships that promote wildlife-dependent recreation, adding new partnerships where feasible.

Chapter 4. Affected Environment

4.1 Physical Environment

The majority of the information presented in the following chapter was taken from a report to the U.S. Fish and Wildlife Service by Northern Prairie Wildlife Research Center titled, A Biological Assessment of Kirwin National Wildlife Refuge (Laubhan, 2003).

Kirwin NWR is located west of the town Kirwin in Phillips County, north-central Kansas. The 10,778-acre refuge includes Kirwin Reservoir and bordering areas in southeast Phillips County.

Topography of the area is characterized by rolling hills, the gently sloping Kirwin terrace, and a narrow river valley formed by the North Fork Solomon River (Leonard 1952; Christensen 1999).

Like other valleys in north-central Kansas, the North Solomon Valley and its tributaries are asymmetrical and typically have steep south walls and gently sloping north walls.

The Kirwin terrace slopes gently, is moderately well drained, and represents the primary area of cultivated farmland.

The refuge encompasses portions of the North Fork Solomon River and Bow Creek. These rivers drain an area of 359,874 ha (889,248 ac) above the reservoir (Reclamation 2002). The flood plain varies in width from 201 to 805 m (600–2,640 ft) (Leonard 1952), and the gradient of the North Fork Solomon River channel is about 1.3 m/km (7.1 ft/mi) in Phillips County.

Climate

The Solomon Basin is classified as subhumid. Summers are characterized by hot days and cool evenings. Winters are normally moderate with light snowfall and occasional short periods of severe cold. The average length of the growing season is about 167 days (Leonard 1952) and the frost-free period extends from April 29 to October 13 (Albertson 1937). The mean monthly maximum temperature ranges from 3.1° C (37.5° F) in January to 33.4° C (92.2° F) in July. The mean monthly minimum temperature ranges from -11.3° C (11.6° F) in January to 17.8° C (64.0° F) in July.

Average annual precipitation is 58.5 cm (23.0 in), with 44.2 percent of total annual precipitation occurring in May, June, and July. Not all of this moisture is available for plant growth because evaporation also occurs during these months. Months with highest evaporative losses are June, July, and August.

The Palmer Drought Severity Index (PDSI) represents the severity of dry and wet spells based on monthly temperature and precipitation data as well as the soil-water holding capacity at a location (Palmer 1965). For north-central Kansas, the long-term PDSI (1895–2002) indicates cyclic patterns of drought and wetness. The reported long-term drought/wet cycle is 30 years with about 23 years of drought and 7 years of wet conditions (Erich Gilbert, 2003, refuge manager, Kirwin NWR, March). Current models indicate the refuge is entering a drought period. Low precipitation is normal.

Fire Regime and History

Wildfire is one of the primary natural disturbances of the native prairie. Historical records describe huge prairie fires started by lightning or humans. Fire burned millions of acres, as there were few natural fuel breaks and no suppression. Wright (1980) and others believe that fire frequency in the grasslands is 5–10 years.

Prior to the twentieth century, the role of fire in the prairie had been one of continued perpetuation of the prairie ecosystem. Fire restored vigor to plant growth, increased seed production, released nutrients, and reduced accumulations of litter (Higgins 1986a,b). Since the early 1900's, and the establishment of the refuge, nearly all fires within the boundaries have been suppressed, and the adjacent habitat has been fragmented by agricultural practices. These activities have significantly reduced the role of fire plays as a vital element of the prairie ecosystem.

Prior to dam construction, the mixed and tall grasses were diverse and unique, with the forests and woodlands rare, in the center prairie ecosystem. Summer fires, periods of drought, and herbivory helped to maintain the prairie, with fire suppression reducing the woody vegetation. The fire season in north-central Kansas generally corresponds with weather patterns which produce lightning, most prevalent beginning in early April and continuing through September. Dry lightning is most likely to occur during drought years.

Over a 10-year period (1994–2003), 3 wildland fires burned on the refuge, burning approximately 217 acres, or in the 10-year period, 1 wildland fire, burning approximately 22 acres per every 3 years. This limited acreage burned is partly attributed to barriers such as roads, plowed fields, or the reservoir that serve as breaks. Prescribed fire was started in the year 2000. A total of 21 prescribed fire projects, in the 4 years, were conducted, burning approximately 2,557 acres, or roughly 5 prescribed fire projects per year, burning approximately 640 acres/year. In 2001, one prescribed fire project in the "Wildland Urban Interface" (WUI) area was completed, burning approximately 80 acres. For more information on fire management, see appendix F.

Geology

The surface geology of the Solomon Basin consists of unconsolidated and consolidated rocks. The unconsolidated surface deposits consist of Quaternary alluvium, loess, and the Tertiary Ogallala Formation. Cretaceous and Permian rocks form the bedrock. In general, the basin is underlain by strata of marine origin (Christensen 1999). The dendritic and asymmetrical drainage pattern of the Solomon River suggests the lack of faults and folds and the presence of flat underlying rock units (Reclamation 1984).

The Greenhorn Limestone, Graneros Shale, and Dakota Sandstone outcrop as far east as western Clay County, Kansas. Permian beds outcrop in counties farther east. The Greenhorn Limestone consists of alternating beds of calcareous shale and chalky limestone. The Graneros Shale is non-calcareous, fissile shale with sandstone lenses. The Dakota Formation consists of lenticular sandstone bodies that are embedded in mudstone. Generally, the sandstones are fine to medium grained, well sorted, and exhibit cross-bedding (Kansas Department of Agriculture 2002–2004).

The North Fork Solomon River is underlain by, or incised into, Cretaceous beds that generally dip to the west, whereas the erosional surface generally slopes to the east. The oldest subsurface rocks at the eastern end of the basin are of the Sumner Group. Above the Sumner Group is Cretaceous marine sediment beginning with the Dakota Formation, which is overlain by the Cheyenne Sandstone, Kiowa Shale, Graneros Shale, Greenhorn Limestone, and Carlile Shale. The Carlile Shale is exposed in stream valleys in Phillips County. Above the Carlile Shale is the Niobrara Formation, which is exposed in much of the North Fork Solomon River Basin (Leonard 1952), and the Pierre shale, of which there is only one known small outcrop in the basin upstream from Webster Reservoir (Moore and Landes 1937; Ross 1991). The Pierre Shale lies conformably on the Niobrara Chalk, which is a gray, shaly, fossiliferous chalk with weathered surfaces. The chalk contains bentonite beds and limonite concretions (Kansas Department of Agriculture 2002–2004).

The divides north and south of the Solomon River are capped by remnants of the Ogallala Formation in the western part of the Solomon Basin, whereas the uplands and valley walls over much of north-central Kansas are composed of loess of the Sanborn Formation that was deposited during glacial retreat (Leonard 1952). The Ogallala Formation was formed during the Pliocene by eastward flowing streams that filled pre-existing valleys with alluvial sediments. Continued deposition of alluvial sediments formed a broad alluvial plain. The Ogallala Formation consists mainly of silt, sand, gravel, and "mortar beds" formed by cementation of sediments with calcium carbonate. However, lenticular beds of well-sorted sand, gravel, bentonite, and volcanic ash also exist. The Ogallala Formation lies unconformably on the Pierre Shale in the western part of the basin and on the Niobrara Formation in the eastern part of the basin. The surface of the Ogallala Formation dips to the east-northeast and the average gradient is 2.1 m/km (11 ft/mi) (Kansas Department of Agriculture 2002–2004).

Narrow belts of recent alluvium adjacent to the Solomon River and its tributaries occupy the flood plain (Leonard 1952). The alluvium consists mainly of gravel, sand, silt, and some clay. However, loess may also occur along major streams. The loess is underlain by stream-deposited sands that are in a high terrace position with respect to the valleys (Leonard 1952). At several places in the flood plain, wind has deposited sand from the alluvium into dunes or in thin layers that cover the terrace surfaces (Leonard 1952). These areas of sand deposition occur in Phillips County, but thickness of the fluvial and loess deposits is < 3.0 m (10 ft) (Kansas Department of Agriculture 2002–2004). A map illustrating the locations of these geologic features on the refuge was developed by Johnson

and Arbogast (1993) and can be obtained from the Kansas Geological Survey at: <http://www.kgs.ukans.edu/General/Geology/County/nop/phillips.html>.

Groundwater

The Sanborn Formation, which consists of a thin layer of loess that overlies Cretaceous rocks, is a locally important source of groundwater (Leonard 1952). The most important aquifer in the area, however, occurs in the deposits underlying the Kirwin terrace surface. In general, this terrace is underlain by 9.1 to 27.4 m (30 to 90 ft) of unconsolidated deposits (e.g., coarse textured sand and gravel) that is quite permeable and lies below the water table (Leonard 1952). The broad, nearly flat terrace surface constitutes a large recharge area and streams that originate in nearby hills contribute additional recharge. Groundwater moves laterally through the terrace deposits and into the alluvium or into the channel of North Fork Solomon River. Thus, the water table in the Recent alluvium is continuous with the water table in the terrace deposits and with the water level in the flowing streams. The coarse nature of the alluvium makes it an important potential source of groundwater (Leonard 1952). Hydraulic conductivity has been estimated at 51.8 m/day (170 ft/day) with an average transmissivity of 241.5 m2/day (2,600 ft2/day) (Phillips 1980). Well yields vary from 38 to 1,893 l/min (10 to 500 gal/min) (Laubhan 2003a). Net loss/depletion of groundwater (pumping of aquifer) leads to loss in inflows/baseflows.

The water table in the valley slopes from east to west, and from the sides of the valley toward the center. The downstream slope of the water table varies from about 2.2 m/km (11.5 ft/mi) in western Phillips County to about 1.2 m/km (6.4 ft/mi) near the town of Kirwin (Leonard 1952). Most ephemeral streams in the area are above the water table and, when flowing, probably contribute to the groundwater. In contrast, the Solomon River and Bow Creek are gaining streams (i.e., flow in these streams is partially maintained by groundwater that seeps into the channel) (Leonard 1952).

Surface Water

The water supply for Kirwin Reservoir is furnished by flows from the North Fork Solomon River and its major tributary, Bow Creek. The North Fork Solomon River originates in western Thomas County, approximately 120 miles west of Kirwin Dam, and drains an area of 1,373 square miles.

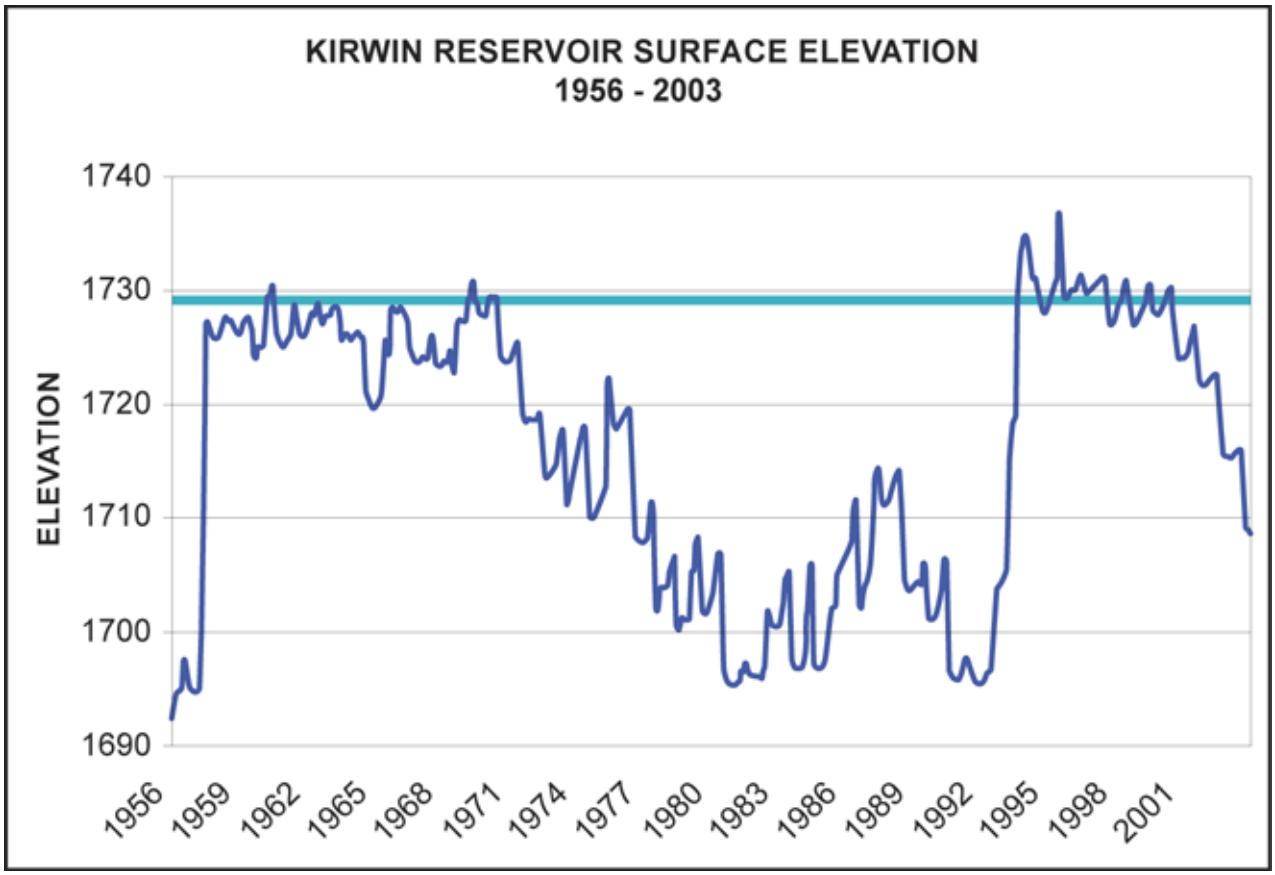
Both the North Fork and South Fork Solomon rivers derive their flows from precipitation runoff and groundwater discharge from underlying aquifers. The upper reaches of the basin overlie eastern portions of the High Plains Aquifer.

Since the mid-1960s, inflows to Kirwin Reservoir have experienced significant declines. The average annual inflow to Kirwin Reservoir declined from the 1960s through the mid 1980s. During the 1990s, however, the reservoir registered a significant increase in inflows because of increased precipitation (Reclamation 2002).

The apparent trend in reduction of inflows could be a combination of several factors. Precipitation during the 1960s through 1980s was frequently below normal. There also was a dramatic increase in the development of groundwater irrigation systems in the watersheds above the dam. Increasing groundwater withdrawals and less precipitation recharging the aquifers have probably resulted in reduced aquifer-to-stream contributions. Another factor potentially impacting streamflow is an increase in on-farm soil and moisture conservation practices, which reduce runoff (Reclamation 2002).

Kirwin Reservoir's conservation pool of 89,639 acre-feet is between elevation 1,697 feet and elevation 1,729 feet. Added to the reservoir's inactive conservation and dead storage pools, total storage is 98,154 acre-feet (Reclamation 2002).

The reduced inflow to both reservoirs has resulted in a corresponding reduction in storage volumes since initial filling. Kirwin Reservoir last filled to capacity in 1970 and did not fill again until 1993. For the period 1970–92, the average May end-of-month content for Kirwin Reservoir was 34,000 acre-feet (figure 9) (Reclamation 2002).



Source: BBC Research & Consulting.

Figure 9. Kirwin Reservoir Surface Elevation, 1956–2003

Water rights are held by the Kirwin Irrigation District. A petition of organization and an application for water rights were filed with the Division of Water Resources, state of Kansas, by the Kirwin Irrigation District on April 22, 1948 and approved on September 25, 1948. The application is for the maximum use of 35,600 acre-feet of water annually and the storage of all flows of the North Fork Solomon River to a maximum quantity of 80,000 acre-feet. The Kirwin Irrigation District is capable is irrigating up to 11,423 acres of cropland below the dam. Reclamation and the USACE also reserve the right to store up to 220,000 acre-feet of water for flood control purposes. The Service has no water rights or water control capability on Kirwin Reservoir (Service 1996).

During the last two decades, reduced reservoir contents have resulted in less water available for delivery to the Kirwin Irrigation District. Historically, an average of 6,900 acres have been irrigated with diversions from Kirwin Reservoir. In the 1980s and early 1990s, 5 years occurred during which no deliveries were made to the Kirwin Irrigation District (Reclamation 2002).

Soils

In north-central Kansas, soils are composed primarily of Mollisols in the suborder Ustolls. A dark surface horizon rich in bases are primary characteristics of Mollisols. Nearly all have a mollic epipedon, but many also have an argillic, nitric, or calcic horizon. Specifically, soils of the North Solomon Valley are primarily fertile, silty clay loams derived from reworked loess (Leonard 1952), some of which are rich in selenium. The soils in valleys are slightly sloping, friable, and generally have high agricultural productivity. In the western and central parts of the basin, soils are generally friable and relatively impermeable, with some silt loam and loess. The more level soils in the western and central parts of the basin are used for grain cultivation and are moderately productive. Soils in the eastern part of the basin range from shallow sands to thick clays and generally have low agricultural productivity (Reclamation 1984).

Air Quality

The air quality in this area of Kansas is good, with little heavy industry in the area.

4.2 Ecology

Vegetation communities within this region are classified as mixed-grass prairie with forested river bottoms. Historically, the flood plains of the North Fork Solomon River and Bow Creek supported woody vegetation, tall grasses, and forbs, while the uplands largely were mixed-grass prairie (Kuchler 1974).

Human settlement and associated land use activities altered historical processes and plant and wildlife communities. Prairie grassland, cropland, deepwater and shoreline habitats of the reservoir, and riparian zones bordering the tributary rivers are dominant communities on the refuge. In addition, shelterbelts, palustrine wetlands, and chalk bluffs also occur within the refuge boundary.

Reservoir (Deepwater) Habitat

Prior to dam construction, there was no deepwater habitat on the area that now constitutes the refuge. Flows from the North Fork Solomon River and Bow Creek flowed unimpeded through refuge lands and occasionally inundated the flood plain during wet periods. Construction of the Kirwin Reservoir changed these conditions. Damming the flows of the Solomon River and Bow Creek and impounding water in the historical flood plain of the rivers created deepwater habitat.

The surface acreage of the reservoir varies dramatically from about 2,024 ha (5,000 ac) at conservation pool (527 m [1,731 ft] elevation) to 356 ha (879 ac) during drought periods (Erich Gilbert, 2003, refuge manager, Kirwin NWR, March). These fluctuations are likely due to a combination of frequent drought periods coupled with upstream pumping from the aquifer. More than 150 alluvial wells occur above the refuge (Reclamation 2002).

There also have been less obvious influences to biological resources from damming and agricultural activities. Prior to settlement, some amount of sediment was transported from the uplands to the channel during storm events. The amount of sediment varied, but intact upland and flood plain vegetation probably reduced the amount of sediment that entered the channel. Cultivation and intensive grazing likely have increased the amount of erosion and, therefore, sediment, entering the flood plain. Although sediment deposition can occur at various locations upstream of Kirwin Dam, the dam itself represents a terminal location that traps the majority of sediment entering the reservoir.

The potential impacts of increased sedimentation at one location are numerous. In terms of quantity, sediment is the major pollutant of wetlands, lakes, estuaries, and reservoirs in the United States (Baker 1992). Sediment quality is an environmental concern because sediment may act as both a sink and source for water-quality constituents (U. S. Geological Survey 2005). Once in the food chain, sediment-derived constituents may bioaccumulate, posing a concern to fish, wildlife, and humans. In addition, sediment loads may never consolidate with bottom materials.

The surface waters in the basin of the North Fork Solomon River are reported as turbid with moderate to high concentrations of dissolved solids (Reclamation 2002). Increased sedimentation may increase turbidity even more due to wind and wave action that periodically suspends sediment throughout the water column. This could lead to other impacts, including reduced dissolved oxygen concentrations, altered nutrient availability, and reduced sunlight penetration. If sufficient, these changes can eliminate or reduce growth of submerged aquatic vegetation (Robel 1961; Kullberg 1974; Dieter 1990).

In 1998, Reclamation initiated a sampling program to assess the presence or absence of organic and inorganic compounds in reservoir waters. Part of this study involved collecting two groups of four sediment cores near the dam (Christensen 1999). Sediment thickness estimated from these cores ranged from 2.9 to 3.4 m (9.5–11.3 ft) in the first group of four cores to 2.1 to 2.3 m (6.9–7.4 ft) in the second group.

One objective of the Reclamation sampling program was to determine potential environmental effects due to elevated levels of total organic carbon (TOC), trace metals, and major nutrients. The Environmental Protection Agency has established two threshold concentrations for many of these elements. The threshold effect level (TEL) is assumed to represent the concentration below which toxic effects rarely occur, whereas the probable effect level (PEL) indicates the concentration that usually or frequently results in toxicity. Both the TEL and PEL are guidelines used to screen for possible hazardous chemical levels, but are not regulatory criteria.

The median TOC concentration in the reservoir was 11,600 mg/kg. The trend was not increasing. There are no published TEL and PEL limits for TOC; thus, there is no classification of existing levels.

Selenium (Se) is a naturally occurring trace element common in the marine shales underlying the Solomon River Basin (see section on Geology). This metal is of concern because irrigation in areas underlain by marine shales has resulted in elevated Se concentrations that have caused birth defects, reproductive failure, and death in fish and wildlife (Reclamation 2002). Concentrations of Se in Kirwin Reservoir bottom-sediment ranged from < 0.3 to 2.2 mg/kg, indicating low potential for bioaccumulation (Christensen 1999). However, Se did exhibit a significant increasing trend (P = 0.006) in one of the two cores, suggesting that concentrations may be of concern in the future. No TEL/PEL has been established for Se.

Reports by Christensen (1999) and Christensen and Juracek (2001) indicate median arsenic concentrations (range = 4.6 to 10.0 mg/kg) exceeded the TEL (7.24 mg/kg) but not the PEL (41.6 mg/kg) established for this element. The median concentration of copper also exceeded the TEL (18.7 mg/kg) as did cadmium in four samples. In contrast, chromium, lead, nickel, silver, zinc, and mercury either were not detected or did not exceed TEL limits. These results indicate that subsequent monitoring of heavy metals and other water quality parameters are warranted.

Phosphorous (P) and nitrogen (N) are nutrients required for plant growth, but excessive amounts can enter reservoirs from fertilizer runoff or other nonpoint pollution sources and create problems. The median P and N concentrations in core samples from Kirwin were 616 mg/kg and 1,700 mg/kg, respectively. P exhibited a significant increasing trend. Excessive P has been shown to cause algal blooms that can reduce dissolved oxygen concentrations and cause fish mortality, or reduce light penetration to levels that prevent growth of some aquatic plant species.

Plant composition and biomass occurring in the deepwater community greatly influences potential wildlife values. Plants capable of growing in deep water provide substrate for invertebrates (Krull 1970; Voigts 1976) that, in combination with plant parts, provide food for many different vertebrates (e.g., fish, water birds). If SAV is not present, the deepwater community may only provide roosting and loafing habitat for birds.

Waterfowl counts conducted between 1983 and 2001 document ducks, geese, and swans occurring on the refuge in varying numbers. The primary periods of use occur during spring and fall migration; however, some species, primarily Canada geese and mallards, remain on the refuge during some winters (Reclamation 2002). Both diving ducks and geese use the deepwater portion of the reservoir. Plant composition and biomass information is lacking; thus, it is not possible to determine if foraging habitat is available. However, at a minimum it is likely that the deepwater community provides roosting and loafing habitat for waterfowl (ducks, geese, swans), as well as sanctuary from shooting during hunting season (Reclamation 2002). This zone also could provide additional benefits in the form of foraging habitat if SAV beds or invertebrates are present.

Management Potential

The ability of the Service to manage the deepwater habitat is minimal. Reservoir elevations are determined by other federal entities that must consider several factors (e.g., irrigation, flood control) other than wildlife. Hydrology, including the direction, magnitude, and time of water level fluctuations, is the primary factor influencing resource production and availability (Mitsch and Gosselink 1993; Fredrickson and Laubhan 1994). The inability of the Service to determine these hydrologic parameters prevents the ability to reliably stimulate or maintain desired plant communities and associated food resources, or influence resource availability (i.e., water depth between food resources and water surface). Although direct management is minimal, the deepwater community still provides resources that contribute to the overall value of the refuge.

Shoreline Habitat

Definitions vary, but the shoreline community is defined in this CCP as the portion of the reservoir (excluding the riparian zone) with water depths that range from saturated soils to < 61 cm (24 in). The general shape of the shoreline is linear, but the width, topography, and spatial position of this area change both annually and seasonally depending on reservoir water levels and the topography of reservoir bottom sediments. A coarse estimate of 91 to 271 ha (224 to 670 ac) for the shoreline community at conservation pool was derived to provide some perspective.

The primary value of the shoreline community, based on the geographic location of the refuge, is foraging habitat for a variety of water birds. This area constitutes a zone of high biological productivity. The growth of plants during drawdown results in the production of food resources (e.g., seeds, tubers) and the release of nutrients when vegetation decomposes upon reflooding can be assimilated by small aquatic organisms (Fredrickson and Laubhan 1994). These organisms make up the forage base for

macroinvertebrates, fish, and amphibians, which are the primary foods of many water birds. In addition, the hydrologic fluctuations that occur within this area create numerous microhabitats that can be used by a number of species.

According to refuge files, double-crested cormorants have nested on the refuge since 1959 and great blue herons have nested on the refuge since 1960. Reproductive effort varies annually, but between 1960 and 1995 the number of great blue heron nests ranged from 1 to 34 with production of 2–103 young. During the same period, double-crested cormorant nests ranged from 3 to 37, and produced from 40 to 60 young. The current location of rookeries occurs within or adjacent to the shoreline community near the main reservoir body in the eastern portion of the refuge. Trees currently used for nesting appear to be adjacent to stream channels that were inundated when water was impounded by the reservoir. Many of these trees were killed as a result of high water in the 1990s, but some remain standing and still provide suitable nesting habitat.

Ducks (diving and dabbling) and shorebirds also forage within the shoreline community (Fredrickson and Reid 1986; Skagen and Knopf 1994). In fact, the scarcity of palustrine wetlands suggests that these species rely almost extensively on the shoreline for foraging when using the refuge.

Least terns occasionally nest within the shoreline community and protection of ground nests is required. Exposed sandbars constitute the preferred nesting substrate of least terns. However, substrates similar to sandbars are exposed along the shoreline when reservoir elevation recedes and some least terns occasionally nest in these areas.

Observations from different years provide evidence that the seed bank within the shoreline community is diverse and includes both desirable (e.g., browse, seed-bearing) and undesirable (e.g., invasive, exotic) plant species. Most species that germinate in the shoreline area require substrates that are moist to wet, but not flooded (van der Valk and Davis 1978). The most important factor controlling germination likely is the annual changes in reservoir water levels, including the magnitude, timing, and rate of water level fluctuations. These hydrologic parameters greatly influence recruitment from the seed bank by affecting time of soil exposure, soil temperature and oxygen levels, and the rate of soil moisture loss (Leck 1989; Fredrickson 1991).

Management Potential

Similar to the deepwater portion of the reservoir, the ability of the Service to manage the shoreline community is constrained by the lack of hydrologic control. Consequently, the value of the shoreline community to water birds likely will vary among species and years.

Trees adjacent to the reservoir and the presence of fish near the shoreline are consistently available. Thus, suitable habitat for breeding great blue herons and double-crested cormorants, as well as migrating and wintering bald eagles, is present on the refuge in most years.

In contrast, foraging habitat for ducks and shorebirds will be more variable for two primary reasons. First, it is not possible to manipulate water levels to match the germination requirements of plants that produce a large biomass of foods (e.g., seeds, tubers, browse) and provide substrate for invertebrates. Second, water levels cannot be intentionally manipulated to coincide with duck and shorebird migration periods. In the absence of hydrologic control, some exposed and vegetated shoreline habitat will be available to shorebirds and ducks every year, but water level changes that expose abundant foods during migration will occur only sporadically.

The availability of habitat for least terns varies, but likely is more predictable than ducks and shorebirds. This statement is based on the reported long-term drought/wet cycle of 30 years with about 23 years of drought and 7 years of wet conditions (Erich Gilbert, 2003, refuge manager, Kirwin NWR, March). According to the refuge staff, reservoir pool elevations tend to consistently decrease during the drought phase. When this occurs, the availability of substrates suitable for least tern nesting tends to become more reliable, and the probability of nest destruction due to flooding less likely, during a period of several years. During the start of the wet period, water levels in the reservoir start to increase, available nesting habitat decreases, and, if nesting is attempted, there is a greater likelihood of nests being destroyed by flooding.

Typically, the land/water interface in this zone is a prime area for the establishment and proliferation of many invasive species due to the frequent presence of exposed soil, variable soil moisture, and high nutrient availability. For example, along the north shoreline, numerous saltcedar seedlings and stems of Canada thistle and reed canarygrass are evident. Although currently present in small numbers, the potential exists for expansion of these invasive species (or others) along the shoreline.

Evidence of this potential exists in the flood plain of the lower riparian zone where reed canarygrass and Canada thistle currently dominate the herbaceous vegetation. The Service cannot alter the hydrology of the reservoir to minimize the potential for invasive species to occur. Similarly, the Service cannot intentionally raise pool elevations to eliminate invasions that do occur.

In summary, the shoreline community has the potential to provide many values to water birds that other communities on the refuge do not provide. There also is potential for extensive, rapid colonization of invasive species. These detrimental impacts are common on many reservoirs, and approaches to minimize impacts are frequently difficult to develop due to constraints imposed by the reservoir operation plan.

Riparian Habitat

The riparian community, which includes the flood plain and channel of the Solomon River and Bow Creek, was dynamic prior to dam construction. Although both streams were considered perennial (Leonard 1952), flows were highly variable depending on precipitation cycles. Stream hydrology was characterized by flood flows in the spring and low flows or ponding during the summer and fall (Reclamation 2002). These extremes in hydrology influenced the types of flora that developed and the fauna that inhabited the riparian system.

Kuchler (1974) described this community as "flood plain forest and savanna" with scattered trees and shrubs and a dominant ground cover of bluestem prairie. However, he also states that "the prairie was suppressed in areas of dense woody growth," suggesting that certain areas of the flood plain were extensively forested. The wooded component apparently was continuous but narrow based on accounts of early settlers and one aerial photograph of the Solomon River near Glade, Kansas (Leonard 1952). Dominant woody species included cottonwood, American elm, hackberry, and peachleaf willow, while the dominant herbaceous vegetation consisted of big bluestem, little bluestem, switchgrass, and Indiangrass. Marshes were dominated by prairie cordgrass and lesser numbers of myriad species, including bulrushes, cattail, and rice cutgrass (Kuchler 1974).

Prior to dam construction, wildlife community inhabiting the riparian community was diverse and unique. Forests were rare in the Great Plains and woody vegetation provided cover, forage, and nesting substrates for Neotropical migrants that were not available in other communities. The tall grasses provided important resources for both migratory and resident wildlife, and marshes provided resources for a host of waterfowl. The stream fishery was not rich and included only species (e.g., plains killifish, red shiner, and creek chub) that could tolerate extremes in temperature, current velocity, and dissolved oxygen concentrations (Reclamation 2002).

As with other communities on the refuge, American settlement and the accompanying changes have greatly altered processes and influenced vegetation in the riparian community. The composition of trees in the mid-1990s was dominated by eastern cottonwood (58 percent) and willow (25 percent) with lesser amounts of American elm (4 percent) and green ash (3 percent), hackberry, boxelder, and mulberry (Sevigny 1998; Eddy 1994).

The shrub and vine component (5 percent) also was evident, and some invasive trees have invaded the Refuge System, including saltcedar (Eddy 1994), Siberian elm, and honey locust (Sevigny 1998; Gilbert, 2003).

Perhaps the greatest change from historic structure and composition has occurred in the ground vegetation. The once dominant tall, warm-season grasses described by Kuchler (1974) have been replaced by shorter cool-season grasses (e.g., smooth brome), which has altered structural and floristic diversity (Laubhan, personal observation, 2003b).

The avian community remains diverse. However, the composition and relative abundance of species have likely changed due to landscape level changes in land use (e.g., agriculture). In 1997, a study of the riparian bird community on the refuge during spring migration resulted in the identification 87 species from 19 families (Sevigny 1998). A detailed inspection of this list identified some intriguing (although not substantiated) aspects that may be related to changes in ground flora.

- The nine most abundant species were the house wren, blue jay, black-capped chickadee, mourning dove, northern cardinal, common yellowthroat, red-winged blackbird, and brown-headed cowbird.
- Based on Breeding Bird Survey (BBS) data for region 6 of the Service, the black-capped chickadee, mourning dove, northern cardinal, common yellowthroat, red-winged blackbird, and brown-headed cowbird exhibited stable population trends, whereas the house wren and blue jay exhibited

increasing population trends between 1966 and 2003 (Sauer 2004). Most of these species are capable of adapting to changes occurring in the riparian communities throughout the western United States (Saab 1999).

- In contrast, however, the list also included 19 species whose status is of some concern according to current regional and national plans. The presence of these species in low abundance suggests the riparian plant community has not been completely altered, but subtle, significant changes have occurred that has reduced habitat suitability.

Increased groundwater pumping, canals, diversion dams, and reservoir construction have contributed to altered stream flow in both streams (Christensen and Juracek 2001). Groundwater pumping, canals, and diversion dams occur above the refuge, are associated largely with agriculture, and have changed the annual hydrograph by reducing the volume of water in the channel and changing when peak and low-flow periods occur in the stream (Reclamation 2002). Compared to historical conditions, the general effect is that larger storm events or longer wet periods are required to cause the same amount of overbank flooding and channel scouring. The periodic occurrence of these actions is critical to maintaining channel diversity (e.g., pools, riffles) and creating conditions suitable for germination of new woody and herbaceous vegetation.

Construction of the reservoir occurred immediately downstream of the riparian community managed by the refuge. Similar to upstream hydrologic alterations, the dam has reduced flow velocity in the stream because water no longer can be transported downstream unobstructed. Historically, these events were important because flood plain vegetation was disturbed and areas suitable for new germination were created. The reduced frequency or absence of these events likely lowers the potential of bare, moist substrate necessary for regeneration of species such as cottonwood and willow (Scott et al. 1993).

During prolonged wet periods, or during extreme precipitation events, the impoundment of floodwaters can result in inundation of the flood plain to deeper depths and for longer periods than historically occurred. If inundation lasts a sufficient time it can lead to the mortality of vegetation (Teskey and Hinckley 1977). Also, the release of water from the reservoir is timed to coincide with irrigation needs, usually summer and early fall (Reclamation 2002). This, in combination with upstream activities, has changed the period of maximum stream flow from spring to summer. This shift has several impacts, but one of the most important is the potential effect on germination of riparian vegetation. Seeds of many species, including cottonwood and willow, are dispersed in spring, are short-lived, and require bare, moist substrate for germination. Thus, the shift from spring to summer flows can negatively impact germination of these species.

Because the most recent wet period (1993–2000) ended in 2000, reservoir water levels should continue to decline over the next 20 years. However, even if these long-term predictions are correct, the impacts of recent high water have been severe. Tree mortality has been significant, regeneration of the woody component is sparse, and invasive vegetation has replaced natives in the understory. Undoubtedly, such changes have altered the avian community from what was reported in the mid-1990s.

Management Potential

Streams, and their associated flood plains, are complex ecological systems that provide many benefits to society. The ability to successfully manage a reach for a specific outcome is often influenced by uses both upstream and downstream of the site. Past alterations upstream and downstream of the refuge have caused significant changes that affect the ability of the Service to maintain the functions and processes that supported the historical riparian community.

Of primary concern are the hydrologic alterations that result in extreme water level fluctuations in the flood plain. High water similar to that experienced in the mid-1990s may occur infrequently, but the cost of restoring the native community following such events will be time-consuming and costly. Further, this effort may be required every 20 to 30 years based on long-term predictions.

Potential solutions that address the entire riparian community are not readily apparent because release of water from the reservoir during high spring flow periods would be required. This is not likely because a primary reason for reservoir construction was to store water for irrigation below Kirwin NWR.

Upland

Kirwin NWR is within the central dissected, or mixed-grass, prairie region historically dominated by the bluestem-grama association (Launchbaugh and Owensby 1978). According to Kuchler (1974),

the bluestem-grama association is characterized by dense communities of grasses and forbs that often are in two distinct layers: one of low-growing grasses and one of medium tall grasses and forbs that is usually more open. Dominant species are big and little bluestem, sideoats grama, and blue grama. Other characteristic species include western wheatgrass, western ragweed, leadplant, purple threeawn, hairy grama, buffalograss, Freemont's clematis, purple coneflower, and Canada wildrye among others.

Factors historically controlling the mixed-grass prairie included precipitation, fire, and herbivory. The plant species composing this prairie are sensitive to major precipitation fluctuations; thus, their relative abundance shifts east and west in response to alternating periods of intense drought or wetness (Kuchler 1967, 1972). Summer fires (Sauer 1950) and herbivory (Dyksterhuis 1958) also helped maintain the prairie by suppressing woody vegetation. Certain woody plants were always present as natural components in some areas (Kuchler 1974). Herbivores, including bison and smaller vertebrates such as prairie dogs, altered soil characteristics and other factors that influenced plant establishment and growth (Kuchler 1974).

Following the onset of human settlement, processes were modified that profoundly affected the prairie (Knopf and Samson 1997). Fire suppression, development and expansion of agricultural crops, changes in herbivores and herbivory, and planting of trees have significantly altered the prairie landscape. In addition, technological advances brought about other less obvious but equally important changes, including the development and introduction of new grasses and crops, groundwater pumping, herbicides, and fertilization. These and other actions have resulted in significant loss and fragmentation of the prairie community.

Roads also result in habitat fragmentation. Existing road density on the refuge is high. This results in many areas of habitat being dissected by roads, reducing habitat continuity and quality. Currently there are approximately 15 miles of roads on the refuge, a road density of .89 mile per square mile.

The refuge encompasses about 2,833 ha (7,000 ac) of uplands at conservation pool. Prairie grasslands dominate this acreage, but the refuge staff reports that only about 81 ha (200 ac) of native prairie occur on the refuge. The remainder is either restored prairie or reseeded grass. Much of the native grass is isolated (i.e., fragmented) and occurs in small blocks.

Other habitats occurring in the uplands include shelterbelts, croplands, chalk bluffs, and a few temporary wetlands. Although the exact area of shelterbelts is not known, many appear to be 15 to 31 m (50 to 100 ft) wide and extend for various distances along roads and fence lines. The tree composition includes a mix of both hardwood and evergreen species.

Wheat, sorghum, corn, and alfalfa are the dominant crops on the refuge and approximately 486 ha (1,200 ac) are planted annually when the reservoir is at an elevation of 527.1 m (1,729.25 ft). The cropping program is designed to prepare agricultural land for conversion to grass and provide foods for migratory birds and resident wildlife. Farming is accomplished using cooperative farmers and arrangements vary depending on crop (Gilbert 2003). For example, the refuge share of row crops is 25–33 percent, whereas stubble constitutes the refuge share of wheat. Chalk outcroppings occur at higher elevations in the uplands, and a few isolated wetlands occur in depressional areas.

Although much of the historical prairie on the refuge was converted or degraded prior to establishment, this community (excluding areas adjacent to the reservoir) appears to be the least effected by the reservoir. Consequently, the Service has more direct control and can likely influence future conditions more reliably. The current condition of refuge prairie grasslands varies greatly. Small areas, many on the south side of the reservoir contain a high proportion of native grass and forb species. In contrast, other areas are primarily composed of invasive, cool-season grasses. The dominant invasive species is smooth brome, but small areas of Kentucky bluegrass also are present (Gilbert 2003). Areas in various stages of restoration also occur on the refuge. Species composition of these stands is mixed, with the presence of both warm-season natives and cool-season invasives.

Management Potential

In many respects, the Service can exert the greatest influence on the upland community compared to other community types. However, constraints still exist that will influence future conditions.

Uplands adjacent to the reservoir are wetter during high water years and extensive groundwater pumping upstream of the refuge likely has altered the subsurface hydrology of some upland habitats. The effects of these alterations are unknown, but research indicates changes in the

water table can effectively alter environmental conditions and, therefore, plant species occurrence (Currier 1988).

Restoration of native grasses and forbs adjacent to the reservoir may not be feasible due to changes in soil characteristics. Invasive species have altered floristic and structural attributes of many prairie grassland tracts. Although techniques have been developed for controlling many of these species, desirable vegetation must be established following control of invasive species or there are no long-term biological benefits.

Wildlife

Birds

Baseline information on the avian community of Kirwin NWR was developed using a checklist of 205 bird species sighted on the refuge (Igl 1996). Scientific names for all species mentioned are given in appendix G.

The current refuge bird list includes 233 species, of which 45 are recorded as nesting and four (piping plover, bald eagle, whooping crane, and least tern) are listed as threatened or endangered under the Endangered Species Act. Kirwin NWR is recognized as a Globally Important Bird Area by the American Bird Conservancy (undated). The Important Bird Area program was developed to recognize and support sites of importance to birds.

Refuge files of duck, goose, and swan counts were used to generate graphs of total annual use days, average annual populations, and average peak populations spanning a 20-year period (appendix G).

Birds of Conservation Concern

The Birds of Conservation Concern is the most recent effort to satisfy the 1988 amendment to the Fish and Wildlife Conservation Act, which mandates the Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973" (Service 2002).

There are 28 species known to occur on Kirwin NWR that are considered to be of national conservation concern in the Birds of Conservation Concern (Service 2002). Among these are eight shorebirds, five hawks and falcons, two owls, and two sparrows. Twenty-one of these 28 species also are considered to be of conservation concern at either Service region 6 or Bird Conservation Region 19 scale (appendix G).

Reptiles and Amphibians

Ninety-one species of reptiles and amphibians have been identified in Kansas. Thirty-nine of these species potentially occur in Phillips County. No federally listed threatened or endangered reptiles or amphibians occur in this area. The presence of two state species in need of conservation, the eastern and western hog-nose snake, has been confirmed (Service 1996).

Invertebrates

Prairie grasslands of the refuge provide for a wide variety of insect life. The range of the federally listed endangered American burying beetle extends throughout Kansas. Surveys of the area have failed to find any local populations and no extant populations are known in western Kansas (Service 1996).

Fish

Fisheries management in the reservoir is conducted in partnership with the KDWP through a cooperative agreement. Due to the fluctuating nature of the reservoir, extensive stocking has been used to maintain viable fish populations, especially walleye and wiper (white bass/striped bass hybrid). Current game fish populations include walleye, largemouth bass, channel catfish, flathead catfish, bullhead, black crappie, white crappie, white bass, wiper, bluegill, and green sunfish. Introduced prey fish species include gizzard shad. In addition, large numbers of carp and freshwater drum are present in the reservoir. No threatened or endangered fish are present (Service 1996).

Mammals

Thirty-four species of native mammals have been documented as occurring on the refuge at the present time. Three other species have been identified as locally common, occurring in areas of preferred habitat. Additionally, seven species are listed as probable and nine species are listed as possible. One state-threatened species, the eastern spotted skunk, is known to rarely occur in this area (Service 1996).

The refuge hosts one of the few remaining black-tailed prairie dog colonies in Phillips County, Kansas (Service 1996).

Threatened and Endangered Species

Birds

Bald eagles are the most visible and common of the threatened and endangered birds that utilize the refuge. Previously listed as endangered, the status

of the bald eagle was upgraded to threatened in July 1995. They are a common visitor during the winter months, arriving in late October/early November and leaving by late March. Unusually high numbers of eagles have been censused in recent high water years, including peaks of 50 in March 1994, and 67 in March 1995. Eagle use at the refuge appears to be tied to the migration of waterfowl, especially Canada geese, with eagles feeding on sick and injured ducks and geese during the winter. During periods of open water, fish also make up an important component of the eagle's diet (Service 1996).

Endangered whooping cranes, although infrequent visitors to the refuge, are sighted almost annually in Phillips and surrounding counties. They pass through the area during spring and fall migrations with most sightings in April and October. Sightings in this area are mainly in cropfields or shallow ponds with a large, unobstructed field of view. The last confirmed sighting on the refuge was in 1977, during a period of receding water. Since 1977, the most limiting factors to their use of the refuge have been the absence of large open expanses of mud flat and shallow water (Service 1996).

Peregrine falcons are uncommon visitors to the area, pausing briefly during spring and fall migrations.

Interior least terns, federally listed as endangered, are occasional visitors to the refuge. Nesting has been confirmed in the past with young produced in 1974, 1976, and 1980 (Service 1996). This was during a period of receding water levels. The nests were located on open rocky shorelines and islands as the water level receded. The majority of this type of habitat is found on the east end of the reservoir.

Piping plovers, federally listed as threatened, are occasional visitors to the refuge during spring and fall migration (Service 1996). This plover occupies sandy areas bordering vegetation and open shorelines. Piping plover use is often determined by the presence or absence of large open shoreline areas.

In addition to federally listed species, the refuge is host to two state-listed threatened bird species. Snowy plovers and white-faced ibis are rare visitors to the refuge during the migration season. Six state species in need of conservation (golden eagle, ferruginous hawk, prairie falcon, long-billed curlew, and bobolink) have been documented on the refuge, although no evidence of nesting of these species has been observed.

Plants

The refuge is outside the range of any federally listed endangered, threatened, or candidate plant species.

Invasive Plants

State designated invasive plants present on the refuge include Johnson grass, musk thistle, Canada thistle, and field bindweed.

Johnson grass is restricted to a few small sites located in refuge prairie grasslands. Canada thistle was primarily associated with old shoreline elevations. Field bindweed is present in farm fields, prairie grasslands, and along roads throughout the refuge. Musk thistle is the most persistent problem in refuge prairie grasslands. It-often competes with, and has a negative effect on, prairie grassland species.

Biological control agents for musk thistle have been released and are established on the refuge. Other invasive plants are controlled using mechanical and chemical methods.

4.3 Cultural Resources

In May 1947, prior to construction of Kirwin Dam, an archeological and paleontological resource survey was conducted by the Smithsonian Institute. This survey identified two archeological sites. One was a prehistoric site that was later destroyed during the construction of the dam. The other was the site of historic Fort Kirwin, a U.S. Government fortification established in 1865. A supplemental survey was conducted in 1952, identifying three additional archeological sites.

In March 1978, the Archeology Department from the Kansas State Historical Society contracted with the Service to conduct an archeological survey of selected areas within the refuge. Approximately one-fourth of the refuge was surveyed, with three additional sites being identified. Of the eight identified sites, one was destroyed as noted in the previous paragraph, five are inundated by the reservoir, one is located in the transition areas between the reservoir and croplands, and one is located in a reseeded native grass area.

The Museum of Anthropology at the University of Kansas conducted a cultural resource survey of much of the refuge from 1999 to 2002. The survey was done under a cooperative agreement with the Bureau of Reclamation and included approximately 85 percent of the federal lands above the conservation pool. Using a combination of

traditional archaeological survey methods and geomorphological techniques, the crews recorded several surface sites and identified a number of localities with a high potential for buried cultural remains. The report is incomplete as of February 2006, but some general information is available (Logan 2004).

A total of 33 sites were found—two of which were previously recorded. The majority of the sites are sparsely represented historical trash and construction material scatters from the early twentieth century. Sixteen of the resources are prehistoric and many of these consist of a single artifact. Only two of the sites, both prehistoric open camps, are considered significant and therefore eligible for the National Register of Historic Places.

The Regional Archeologist is consulted during the planning phase of any proposed project and determines the need for an archeological site clearance from the Kansas State Historic Preservation Office.

4.4 Special Management Areas and Designations

Wilderness

Due to the small size of the refuge and current and past land use patterns, the refuge does not appear to meet the criteria for wilderness described below.

To be determined a wilderness area, lands must meet certain criteria as outlined in the Wilderness Act of 1964. A wilderness area: 1) generally appears to have been affected primarily by the forces of nature, with the human imprint substantially unnoticeable; 2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; 3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and 4) may contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Research Natural Area

The Solomon River Grasslands Research Natural Area was established on Kirwin NWR in 1967. It consists of 120 acres of bluestem-grama prairie, and is located in the southwest corner of the Solomon River arm. Topographically, the area is made up of a series of low hills set off by arroyos that extend toward the river.

The area of the refuge designated as an RNA is not native prairie, but rather old farmland that was reseeded to a few grass species shortly after the refuge was established. At this time it is uncertain if this land still qualifies for the RNA designation.

The Service administratively designates Research Natural Areas on refuges. Currently, there are 210 such areas on refuges totaling 1,955,762 acres. Research natural areas are part of a national network of reserved areas under various ownerships. A research natural area is an area where natural processes are allowed to predominate and which is preserved for the primary purpose of research and education. Research natural areas have these objectives:

1. To assist in the preservation of examples of all significant natural ecosystems for comparison with those influenced by man.
2. To provide educational and research areas for scientists to study the ecology, successional trends, and other aspects of the natural environment.
3. To serve as gene pools and preserves for rare and endangered species of plants and animals.

Scientists and educators are encouraged by participating federal agencies to use research natural areas. Restrictions are applied only to preserve the natural values of the area and to protect the research projects already underway. Research on natural areas must be essentially nondestructive and reasonably consistent with the purpose and character of the surrounding land. Studies that require manipulation of the environment normally are done elsewhere.

Important Bird Area

Kirwin NWR received designation as an Important Bird Area by the American Bird Conservancy in August 2002. The American Bird Conservancy's Important Bird Area Program concentrates on identifying and documenting the top important bird sites throughout all 50 states. Some of these sites are important primarily within the context of other sites; they exist as links or endpoints in a chain along a migratory pathway. Other sites are important independent of any other site, and a few—most notably several in Hawaii—support species found nowhere else on earth.

For a site to be designated an Important Bird Area, it must, during at least some part of the year, contain critical habitat that supports 1) significant numbers of an endangered or threatened species such as piping plover, red-cockaded woodpecker, or

Kirtland's warbler; 2) a watch list species such as black rail, cerulean warbler, or Henslow's sparrow; 3) a species with a limited range such as tricolored blackbird, yellow-billed magpie, or brown-capped rosy-finch; or 4) a significantly large concentration of breeding, migrating or wintering birds, including waterfowl, seabirds, wading birds, raptors or land birds.

4.5 Visitor Services

Kirwin NWR provides an important recreation area for the citizens of Phillips County and the surrounding area. Recreational activities such as hunting, fishing, wildlife observation and photography can be enjoyed at Kirwin NWR.

Hunting

In the fall, hunting is a major draw to the Kirwin NWR. The lack of public hunting areas in this part of the state concentrates hunters on and around the refuge. Opportunities for hunting white-tailed deer, Canada geese, ducks, ring-necked pheasants, and bobwhite quail attract hunters from across Kansas and other states. Canada goose hunting provides a major economic boost to the area, with several commercial hunting operations surrounding the refuge.

The north-central portion of the refuge, from Solomon Bend to the four-way intersection east of Cottonwood Grove, is closed to hunting.

Archery deer hunting is the only hunting allowed in the western portion of the refuge. This area is to the west of Solomon Bend and Quillback Cove.

The Bow Creek area, roughly encompassing the area south of Prairie Dog Town and Crappie Point, is open to: waterfowl, doves, pheasants, quail, turkey, prairie chickens, snipe, coots, cottontail rabbits, fox squirrels and deer (archery only). Hunting of cottontail rabbits and fox squirrels is allowed only during pheasant season. This area is the only place where hunting on the water is permitted.

The area between Quillback Cove and Prairie Dog Town is open to the same species as the Bow Creek Area; however, a maximum of six shotgun shells per person, per day is permitted during all dark goose seasons.

The area from Crappie Point to the south end of the dam, and the area from the four-way intersection east of Cottonwood Grove to the north end of the dam is open to: doves, pheasants, quail, turkey, prairie chickens, snipe, coots, cottontail rabbits, fox squirrels and deer (archery only). Hunting of cottontail rabbits and fox squirrels is allowed only during pheasant season.

Nontoxic shot is required on the refuge for all shotgun hunting, including turkeys. Rifles and pistols are not permitted on the refuge.

Fishing

Fishing is a popular activity, especially in the spring and early summer. The reservoir is the only major water body in the county, attracting many people to the area. Fishing for walleye, largemouth bass, black crappie, channel catfish, and other species is permitted in accordance with Kansas State Fishing Regulations, in the reservoir, the North Fork Solomon River, and Bow Creek, unless signs indicate a particular closed area.

There is a "no wake zone" in effect within 300 feet of all shorelines and islands, as well as on the Bow Creek arm.

The North Shore boat ramp is available during periods of high water.

The South Shore boat ramp is available at times of high water and when the water is at medium height.

The Low Water Boat ramp is available at low water levels. It is located on the north end of the dam.

Historically, the Bureau of Reclamation has permitted the launching of boats from the face of the dam.

Wildlife Observation and Photography

The entire Refuge is open to foot travel for wildlife observation and wildlife photography. Open roads are also open to wildlife observation and wildlife photography. Two observation platforms, called pergolas, are also available. One is located north of the Visitor Center at the Refuge Overlook, and the other one is at Crappie Point.

Environmental Education and Interpretation

Six informational kiosks dispersed throughout the refuge contain interpretive panels about migratory birds, wildlife habitat and management. Refuge regulations are located in boxes labeled "Refuge Information" at the six kiosks and other sites to provide Refuge-specific information to visitors. Periodically, information addressing migratory birds, wildlife habitat and management is provided in the boxes.

At times, educational programs have been held in the evenings. Until recently, an Eco-Meet program for high school science classes, has been held annually. Eagle Day is held in January of each year to educate school groups and the public about the Refuge System, the refuge, and migratory birds of prey.

Refuge staff have historically hosted groups of Boy Scouts and Girl Scouts and school groups. Staff have also taught environmental classes at camps.

4.6 Socioeconomic Environment

This section characterizes current socioeconomic conditions in Phillips County, Kansas (figure 10).

Background

Kirwin NWR plays a socioeconomic role in Phillips County by serving the local community and attracting visitors and dollars from outside Phillips County.

Direct visitor spending at the refuge, as well as ancillary visitor activity, such as spending on supplies, gasoline, and overnight accommodations in the local area, helps support local business establishments and increases the local tax base.

Refuge management decisions regarding refuge operations may affect the amount of hunting/fishing, and wildlife viewing traffic that occurs in Phillips County, and thus the economic activity associated with Kirwin NWR operations.

Current Socioeconomic Conditions

Kirwin is known as the "Goose Capital of Kansas" as the county is an attractive stopover point for many species of migratory birds, including hawks, pelicans, geese, and ducks.

Phillips County also offers blue-ribbon hunting for deer and upland game. The area is the home of "Kansas' Biggest Rodeo," which occurs every summer in Phillipsburg, the county seat. Other communities in Phillips County include Agra, Glade, Gretna, Kirwin, Logan, Long Island, Prairie View, Speed, Stuttgart, and Woodruff — each of which has less than 1,000 residents.

Population

Phillips County, like many other rural counties in the Midwest, is experiencing slow but steady population decline. The 2004 population estimate (5,547) represents a 7.6 percent decline from just four years ago, and a 15.8 percent loss from 1990. U.S. Census projections indicate that the population will decline by 9.4 percent over the next five years. Population decline in Phillips County occurs despite steady statewide growth. This loss of population influences other socioeconomic components of Phillips County.

Demographics

The percentage of the population between 18 and 34 years old declined from 21 percent in 1980 to 16 percent in 2004. Other age group percentages (over 65 and under 18) have stayed relatively consistent across the same period, or have modestly increased (35 years to 64 years). The median age in Phillips County has increased from 38 to nearly 44 since 1980. In 2004, the median age in Phillips County was 8 years older than the rest of the nation (36). The population in Phillips County is not only declining, but aging as well.

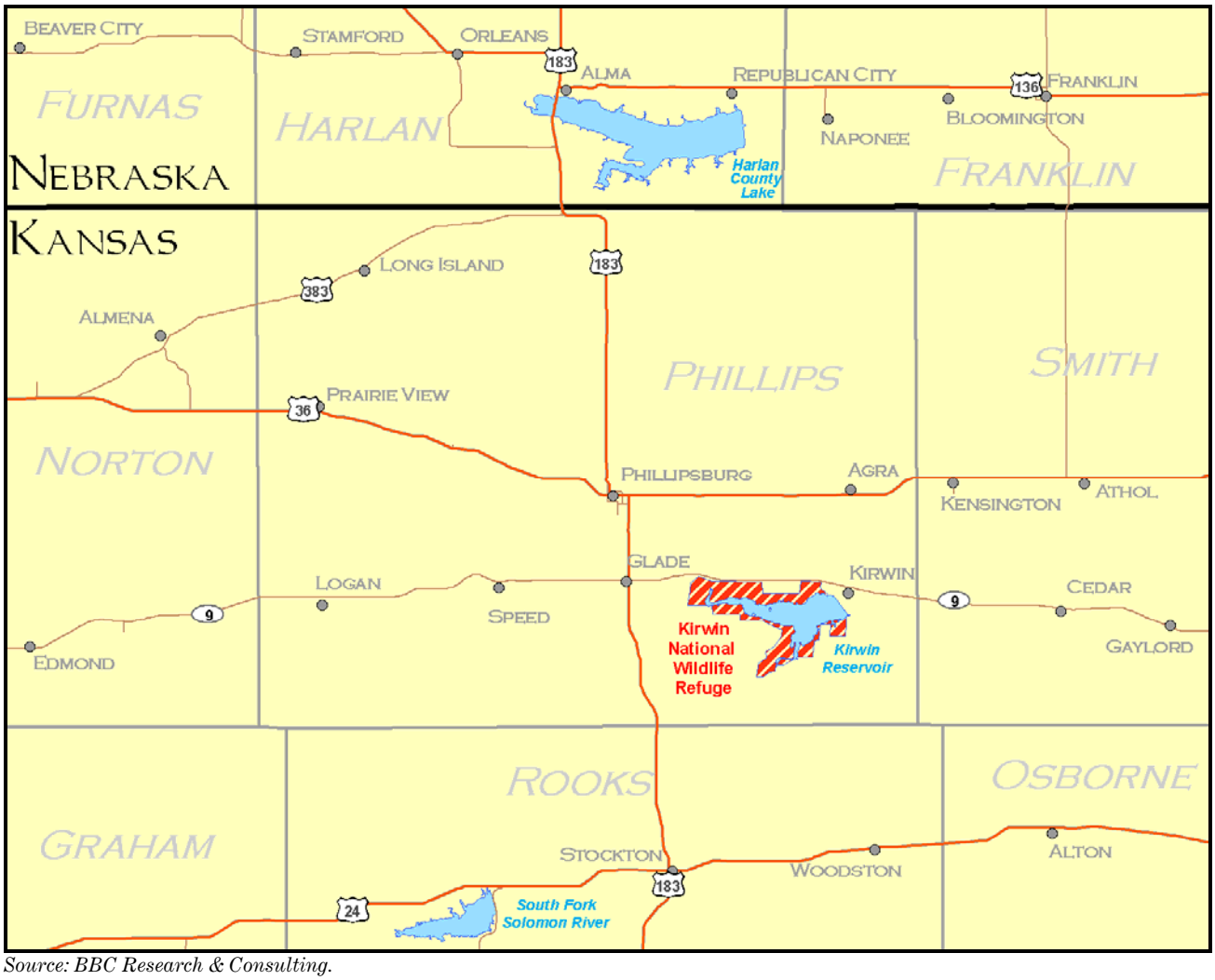
Business and Economic Climate

Phillips County has an agriculturally based economy, yet the deterioration of agriculture as a viable business is evident as farms lost an average of $4,360 per farm in 2002. The farm loan/asset ratio rose to 60 percent in 2002, up from 28 percent in 1998. Financial losses have contributed to the decline in the number of farms from 600 in 1990 to 510 in 2002. Farm employment has also become less prominent. In 1980, farm employment accounted for 22 percent of all employment in Phillips County, that figure has slipped to 14 percent in 2002.

Most nonfarm businesses in Phillips County (220) are small and have less than twenty employees. Fourteen businesses have between 20 and 99 employees, and only two businesses have over 100 employees. The retail trade sector accounted for most (38) of the business establishments. The finance/insurance and construction sectors are also strong. Lodging/food, healthcare, professional/technical services, wholesale trade, and transportation/warehousing businesses each had between 14 and 18 establishments in 2002. The total number of businesses fluctuated between 233 and 241 between 1999 and 2003, but dropped to 212 in 2004.[1]

The retail pull factor, which measures the strength of the retail market relative to the state average, has been declining steadily since 1985. At .60 in 2002, the Phillips County retail pull factor indicates that residents leave the county to buy retail goods more often than the average Kansas resident, an indication of consolidating retail services in larger

[1] Data from 2004 came from the Bureau of Economic Analysis. An industry breakdown was not available.



Source: BBC Research & Consulting.

Figure 10. Map of Phillips County, Kansas and Vicinity

towns, and of Phillips County's eroding economic base.

Employment

Since 1985, the civilian workforce (3,229) has declined 7.2 percent. The unemployment rate in Phillips County (2.3 percent) was lower than the rest of rural Kansas (3.9 percent) in 2002. Local government employed the most people (776) in 2002. The retail sector employed 11 percent (451) of all nonfarm workers in 2002, yet retail employment has declined by 33 percent since 1996. Other large employers were manufacturing (371), healthcare/social services (367), and other services (264), which include religious organizations, auto repair services, beauty salons, funeral homes, and other nonrecreation services.

Business Characteristics

Approximately 40 lodging businesses are within 35 miles of Kirwin NWR in Phillips County, which includes 6 campground/RV parks, 4 motels, 2 bed and breakfasts, and 2 hunting lodges. There are 13 locally owned and 2 fast food restaurants, 3 grocery stores, 3 gas stations, 8 bait/convenience stores, and 7 banks. Phillipsburg is the retail center of Phillips County and offers a healthy mix of personal services, clothing, furniture, antique, hardware and drug stores, along with insurance agents and lawyers. Several antique stores are scattered throughout the other communities in Phillips County.

Kirwin National Wildlife Refuge Current Conditions

Facilities and Operations

Kirwin NWR contains nearly 11,000 acres, including Kirwin Reservoir. Reclamation has primary jurisdiction and the Service has secondary

jurisdiction, commonly called an overlay, on the area upstream of the dam. The refuge does not overlay the Kirwin Dam, and approximately 500 acres of land downstream of the dam. Reclamation and Kirwin Irrigation District control the outflow of water from the reservoir for irrigation purposes. Six campgrounds on the refuge have a capacity to accommodate approximately 48 people, and Reclamation allows camping on its undeveloped land.

Full employment at Kirwin NWR is 7.5 permanent FTEs. Current employment is 3.0 FTEs. Kirwin NWR had a $234,140 budget in 2000. The refuge does not collect any fees for use of its facilities and does not directly generate any revenue.

Activities

Recreational opportunities at Kirwin NWR include fishing, hunting, wildlife observation and photography. Wildlife viewing, fishing and hunting are the most popular activities, accounting for 98 percent of annual visitation (KNR 2004; Mowry 2005).

Visitors can hunt various waterfowl, doves, pheasants, quail, turkey, prairie chickens, snipe, coots, cottontail rabbits, fox squirrels, and deer (archery only) at the refuge. Hunting season for all species falls between September 1st and May 31st. The most popular fishing season is during May and June, but the reservoir is open for fishing year-round.

Motorized and nonmotorized boating, water skiing, jet skiing, and swimming are also recreational activities available at Kirwin NWR.

Visitation Levels

Visitation levels fluctuate between 40,000 and 90,000 visitor days per year, depending on the water level and the fishing quality. During a typical day in hunting season, the refuge will attract approximately 100 persons. It is estimated that a typical breakdown of annual visitation by use is as follows:

- 17 percent hunting
- 29 percent fishing
- 52 percent wildlife viewing
- Less than 2 percent non-wildlife-dependent recreation

It is estimated that most refuge visitors (60 percent to 70 percent) live in Phillips County and vicinity (Mowry 2005). Most destination visitors come for the weekend and stay approximately 2 to 3 days. It is estimated that 2 percent of destination guests camp on the refuge. Some visitors prefer the refuge for outdoor recreation because it does not charge admission for any activity. State parks in Kansas charge an entrance fee ($6.50 per vehicle) and a camping fee ($8 to $15 per night). Private hunting grounds near the refuge charge admission fees that range from $25 to $150 per day.

Employment

The refuge currently employs 3.0 FTEs. There are no retail operations at the site.

Retail Sales

Off-site spending by visitors helps support local lodging and retail establishments in surrounding towns. Approximately 30 percent of refuge visitor days, or 19,500 visitor days, are from nonlocal visitors. If 50 percent of these guests spend the night locally in commercial lodging or campgrounds, and on average nonlocal visitors spend $60 per day for lodging, food and supplies, then refuge activity spurs about $585,000 of new annual spending in the Phillips County economy.

Agriculture

Kirwin NWR permits farming on specified portions of the refuge. The cooperative farming permits usually stipulate that the farming cooperator harvests 66 to 75 percent of the crop and the refuge gets the remainder of the yield. The refuge usually leaves its share of the crop in the field to serve as a food supply for migratory birds and other wildlife. Private farm revenues from crop production at the refuge are modest and have little impact on the local economy.

Chapter 5. Environmental Consequences

This section analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each management alternative described in chapter 3.

A few potential effects would be the same under each alternative. These effects are summarized below.

5.1 Effects Common to all Alternatives

The following considerations apply to all future actions, regardless of the specific goals, objectives, and strategies that would be used to achieve the vision for the Program.

Environmental Justice

Environmental justice refers to the principle that all citizens and communities are entitled to:

- Equal protection from environmental occupational health or safety hazards;
- Equal access to natural resources and;
- Equal participation in the environmental and natural resource policy formulation process.

On February 11, 1994, President Clinton issued Executive Order (EO) 12898: "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations." The purpose of this order is to focus attention of federal agencies on human environmental health and to address inequities that may occur in the distribution of costs/benefits, land use patterns, hazardous material transport or facility siting, allocation and consumption of resources, access to information, planning, and decision making.

The mission of the Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. The Service's environmental justice strategy extends this mission by seeking to ensure that all segments of the human population have equal access to America's fish and wildlife resources, as well as equal access to information that would enable them to participate meaningfully in activities and policy shaping.

Within the spirit and intent of EO 12898, no minority or low income populations would be impacted by any Service action under any alternative described in this plan.

Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long-range planning endeavors.

Preserving natural habitat for wildlife is the heart of any long-range plan for National Wildlife Refuges. The actions proposed in both alternatives would preserve or restore land and water, and would thus enhance carbon sequestration. This in turn contributes positively to efforts to mitigate human-induced global climate changes.

Cultural Resources

The Department of the Interior and its representative agencies are responsible for managing archeological and historic sites found on federal land. Prior to all habitat and facility maintenance activities, appropriate efforts would be made to identify known and possible cultural resources with the area of potential impact. Avoidance of cultural resources would be the preferred treatment. Mitigation of any impacts would be undertaken if impacts cannot be avoided.

Cultural resources would continue to be protected under state and federal laws. Shoreline erosion periodically exposes new cultural resources. The Regional Archeologist would be consulted during the planning phase of any proposed project and would determine the need for a cultural inventory site clearance from the Kansas State Historic Preservation Office.

Maintenance of Roads and Existing Rights-of-Way

State, county, and townships would retain maintenance obligations for roads and their rights-of-way under their jurisdiction within refuge boundaries. Existing rights-of-way and terms of other easements would continue to be honored. New rights-of-way and easements would be considered in relation to the existing refuge and/or flowage easement agreements, Refuge System regulations, and likely impacts of the rights-of-way or easements to wildlife resources.

Management Activities

All management activities that could affect natural resources, including subsurface mineral reservations, utility lines and easements, soil, water and air, and historical and archaeological resources would be managed to comply with all laws and regulations.

Water Resources

Under all alternatives, KDHE would continue to monitor water quality and Reclamation would continue to monitor sedimentation.

Socioeconomics

Each alternative will the maintain core wildlife viewing, fishing, and hunting functions that are central to Kirwin NWR's role in the local economy (BBC 2004).

5.2 Description of Consequences by Alternative

This section describes the environmental consequences of adopting each refuge management alternative.

Alternative A (No Action—Current Management)

Alternative A assumes continued management for wildlife-dependent and non-wildlife-dependent uses. Existing non-wildlife recreation uses would be reviewed for compliance with the Improvement Act and accompanying regulations and policies through a CD process. Cropland acres would remain the same. Current levels of invasive plant management would continue. The refuge has not used grazing as a management tool for the last few years, but may utilize it in the future. The refuge would retain current facilities (including visitor center, kiosks, and campgrounds; additional details provided in section 4.6).

Ecology

Reservoir (Deepwater) Habitat. Under Alternative A, there would be no change in management of the refuge's Reservoir (Deepwater) Habitat. Existing trends in boat and traffic disturbance and low quality and quantity of resting and feeding habitat for migrating bird species would continue. Continued dramatic fluctuations in water levels would continue to inhibit the establishment of SAV beds and associated feeding habitat. Management would continue to focus on waterfowl to the exclusion of other migratory species. Under alternative A, the Reservoir would provide only resting habitat for migratory waterfowl. Existing disturbance trends and lack of feeding habitat for migratory waterfowl and other birds would continue.

Shoreline. Under alternative A, there would be no change in management of the refuge's Shoreline Habitat. Existing trends in boat and traffic disturbance and low quality and quantity of resting and feeding habitat for migrating bird species would continue. There would be a continued decline in the quality and quantity of resting, nesting, and feeding habitat due to the current trend of increasing invasive plant populations and corresponding decrease in native plant populations. Management would continue to focus on waterfowl to the exclusion of other migratory species.

Riparian. Under alternative A, there would be no change in management of the refuge's riparian habitat. Existing trends in boat and traffic disturbance and low quality and quantity of habitat for migrating bird species would continue. There would be a continued decline in the quality and quantity of resting, nesting, and feeding habitat due to the current trend of increasing invasive plant populations and corresponding decrease in native plant populations. Invasive woody species such as Russian olive, Siberian elm, and black locust would continue to increase by out competing native species such as cottonwoods, American elm, and green ash and the wooded corridor along the Solomon River and Bow Creek would become less favorable for migratory woodland birds.

The trend of change in the riparian understory also would continue to change from native warm-season grasses to invasive cool-season grasses such as smooth broom and Kentucky bluegrass, which provide lower quality nesting habitat compared to the native grasses. Under alternative A, management would continue to focus on waterfowl to the exclusion of other migratory species.

Upland. Under alternative A, there would be no change in management of the refuge's Upland Habitat. Existing trends in traffic disturbance and low quality and quantity of habitat for migrating bird species would continue. There would be a continued decline in the quality and quantity of resting, nesting, and feeding habitat due to the current trend of increasing invasive plant populations and corresponding decrease in native plant populations. Invasive woody vegetation from riparian areas may spread into the upland prairies and further degrade native and restored habitat. The trend of decline in habitat quality and quantity would continue despite maintained benefits of restored and native prairie grasslands, and use of croplands to aid in invasive plant control. Under alternative A, management of uplands would continue to focus on waterfowl to the exclusion of other migratory species.

Transition Zone (Bottomland). Under alternative A, there would be no change in management of the refuge's Transition Zone (Bottomland) Habitat. Existing trends in traffic disturbance and low quality and quantity of habitat for migrating bird species would continue. There would be a continued decline in the quality and quantity of resting, nesting, and feeding habitat due to the current trend of increasing invasive plant populations and corresponding decrease in native plant populations. Prairie grassland dependent birds and birds that nest in shrubs (such as the Bell's vireo) face the greatest risk due to continued habitat degradation. Under alternative A, management of the transition zone would continue to focus on waterfowl to the exclusion of other migratory species.

Visitor Services

Hunting. Under alternative A, there would be no change in current hunting management and hunting opportunities.

Fishing. Under alternative A, there would be no change in current fishing management and fishing opportunities.

Wildlife Observation, Photography, Interpretation, and Environmental Education. Existing opportunities would remain the same as current management. Current programs such as Eagle Day and monthly wildlife programs would continue as funding and personnel allow.

Other Public Uses (Non-wildlife-dependent). Existing non-wildlife recreation uses would be reviewed for compliance with the Improvement Act and accompanying regulations and policies through a CD process. These uses would continue until the CD process is complete. These uses would continue to divert staff time and funding away from wildlife habitat projects. The refuge would continue to have areas of degraded wildlife habitat due to camping and other current non-wildlife-dependent recreation.

Water Resources

Under alternative A, water quality would likely follow existing trends in decline and sediment would continue to accumulate in Kirwin Reservoir. KDHE would continue to monitor water quality, and Reclamation would continue to monitor sedimentation.

Cultural Resources

As funding and staffing allow, a cultural resource management plan will be developed for the refuge which will describe how ongoing effects to cultural resources will be addressed.

Socioeconomics

Under alternative A, the refuge would continue to be managed much as it is today; thus, socioeconomic change would be minimal. CDs allowing non-wildlife-dependent uses of the refuge would be reviewed to assure compliance with current regulations and policies. No significant capital investment in active recreation facilities would be made. Wildlife-dependent recreation likely would remain a minor element of the refuge's operations.

Under alternative A, the refuge likely would remain a destination hunting and fishing location. Onsite employment and visitor counts, as well as offsite impacts, would remain at or near current levels.

Other Issues and Resources

Research and Science activities would continue at their current level under alternative A. Limited baseline data collection and monitoring would continue. Refuge operations would continue at current levels of staffing, operations, and maintenance. Existing partnerships would continue.

Alternative B (Wildlife, Habitat, and Public Use—Proposed Action)

Alternative B would primarily focus management efforts on improving migratory bird habitat. This alternative emphasizes grassland restoration and management. Management of the grassland will promote expansion of native species and provide appropriate structure and composition of grassland habitat for migratory birds. Efforts to reduce invasive plant species and dramatic water level fluctuations would enhance migratory bird

habitat, and improve fish populations. This alternative supports and encourages the six high priority public uses identified in the Improvement Act. The priority public uses are hunting, fishing, wildlife observation, wildlife photography, interpretation, and environmental education. Some existing non-wildlife-dependent public uses would be discontinued. Cropping and grazing would continue to be used as management tools to achieve habitat requirements for migratory birds and to achieve refuge goals such as restoring prairie and controlling invasive plants.

Ecology

Reservoir (Deepwater) Habitat. Under alternative B, talks would be initiated with the Kirwin Irrigation District, Reclamation, and other entities regarding stabilization of water levels in Kirwin Reservoir. Water level stabilization would result in increased cover of SAV and lead to more and better habitat for invertebrates and small fish which provide feeding habitat for water birds and large fish. Improved feeding habitat would improve spring and fall migration and wintering habitat for water birds, and water birds would remain in the area longer.

Changes in management of boating and public access under alternative B also would reduce disturbance to migrating and wintering waterfowl. Under alternative B, Kirwin Reservoir would provide resting habitat for migratory waterfowl and feeding habitat for many migratory birds, including eared grebe, western grebe, American white pelican, redhead, lesser scaup, Franklin's gull, common tern, and black tern. Increased SAV also would benefit federally listed species, particularly the bald eagle and least tern.

Shoreline. Under alternative B, efforts to stabilize water levels would benefit the refuge's Shoreline Habitat by reducing invasive plants. In addition, increased staff time would be focused on controlling invasive plants. The combination of these two factors—stabilized water levels and increased invasive plant control efforts—would result in increased native plant populations and improved quality and quantity of resting and feeding habitat for migrating bird species.

In addition, changes in management of boating and public access under alternative B also would reduce disturbance to migrating and wintering waterfowl. As mentioned under the Reservoir (Deepwater) Habitat section above, reducing dramatic drawdowns would increase submerged and emergent aquatic plants, increasing invertebrates along the shoreline and providing more food for migratory birds. The combination of reduced disturbance and improved habitat would benefit many migratory bird species, including eared grebe, western grebe, American white pelican, Canada goose, white-front goose, snow-Ross' goose, wood duck, mallard, northern pintail, American widgeon, redhead, lesser scaup, snowy egret, whooping crane, piping plover, snowy plover, American avocet, semipalmated sandpiper, least sandpiper, Baird's sandpiper, long-billed dowitcher, Wilson's phalarope, Franklin's gull, common tern, and black tern as well as threatened and endangered species such as bald eagle and least tern.

Riparian. Under alternative B, invasive plant management efforts would be expanded, resulting in improved quality and quantity of resting, nesting, and feeding habitat for migratory woodland birds. Created openings from the removal of invasive tree species would allow native warm-season grasses and shrubs to establish, benefiting migratory woodland bird species. In addition, removal of invasive tree species would eliminate a seed source that currently is spreading into prairie habitat. Improvements to riparian habitat would benefit species of concern such as wood duck, Swainson's hawk, northern bobwhite quail, yellow-billed cuckoo, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, American tree sparrow, and Harris' sparrow, as well as threatened and endangered species such as the bald eagle.

Upland. Under alternative B, invasive plant management efforts would be expanded, resulting in improved quality and quantity of resting, nesting, and feeding habitat for migratory prairie grassland birds. Methods that would be used include grazing, burning, haying, restoring cropland to prairie, establishing permanent and/or seasonal road closures, removing non-wildlife-dependent recreation facilities, and establishing partnerships to enhance prairie habitat that is adjacent to the refuge boundary. These prairie improvements would benefit migratory bird species that use prairie grassland habitat during all or a portion of their lifecycle, including mallard, Swainson's hawk, northern harrier, greater prairie chicken, upland sandpiper, burrowing owl, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, chestnut collared longspur, and Lapland longspur.

Transition Zone (Bottomland). Under alternative B, invasive plant management efforts in the transition zone would be expanded,

resulting in improved quality and quantity of resting, nesting, and feeding habitat for migratory prairie grassland, woodland, and savannah birds. Existing cropped areas, which provide control of invasive trees and other plants, a food source, and a seedbed for future seeding edits, would be maintained. Habitat improvements from these management efforts would benefit Swainson's hawk, northern harrier, greater prairie chicken, yellow-billed cuckoo, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, and chestnut collared longspur. ·In addition, management efforts would result in improved perching habitat for bald eagle and open cropped areas for whooping crane.

Visitor Services

Hunting. Improved quality of the hunting experience is anticipated under alternative B due to decreased traffic disturbance and improvements to the quality, quantity, and continuity of habitat. Some reduction in motorized hunting access to portions of the refuge is likely based on the road evaluation that will begin in 2007.

Fishing. Under alternative B, boat fishing access would vary based on the water level on Kirwin Reservoir. Pedestrian fishing access would remain the same. At all water levels, boating and fishing opportunities would be expanded by moving the boat closure buoy line from Railroad Flats to Grays Park, an increase of approximately 500 acres (acreage varies based on water level), for 6 months out of the year (April 1 to October 1). Under high water conditions (elevation > 1,722 feet), boating and fishing opportunities would be expanded by about 3,000 acres by not implementing the seasonal closure and maintaining the boat closure buoy line at Grays Park. Under low water conditions (elevation < 1,722 feet), boating and fishing opportunities would be reduced by closing most of the reservoir to boating during October 1 to April 1. In addition, the overall boat-fishing experience would improve due to the discontinuation of competing, non-wildlife-dependent water recreation including jet skiing and water skiing. Reservoir access to fish from a boat in Bow Creek would remain available by launching boats from Crappie Point.

Wildlife Observation, Photography, Interpretation, and Environmental Education. Under alternative B, many opportunities for wildlife observation, photography, interpretation, and environmental education would remain the same. As staffing is available, all existing programs would be supported. In addition, the quality of the visitor experience for these wildlife-dependent recreation activities would improve by discontinuing competing non-wildlife-dependent uses such as jet skiing and water skiing.

Other Public Uses (Non-wildlife-dependent). Under alternative B, support for non-wildlife-dependent recreation uses would decrease. Jet/water skiing, camping, swimming, horseback riding uses would be discontinued in order to comply with current Service policies, regulations, and federal laws. The six existing campsites would be closed and the areas revegetated. Restrooms associated with the campsites also would be closed and removed, changing the number of restrooms on the refuge from six to three.

Although these activities are currently allowed on the refuge, they are low-use activities. For instance, informal surveys of camping by refuge staff indicate that during holiday weekends when demand for campsites is generally highest, the maximum number of occupied campsites is about 6. It is estimated that less than 2 percent of destination guests camp on the refuge. Approximately 30 percent of refuge visitor days, or 19,500 visitor days, are from nonlocal visitors. Camping uses and other discontinued non-wildlife-dependent uses on the refuge are easily absorbed by other facilities in the area, including Reclamation lands adjoining the refuge. Within 45 miles of Kirwin NWR, 42 camping and lodging facilities, and seven city, state, and federal reservoirs allow similar non-wildlife recreation.

Beginning in 2007, the refuge manager will evaluate all refuge roads (see section 3.5 alternative B). If a road is determined to fail the screening criteria, then it will be seasonally and/or permanently closed, resulting in changes to vehicle access. Pedestrian access would not change.

The refuge manager may issue Special Use Permits for various activities, including university research and Boy Scout safety training.

Water Resources

Water quality and sedimentation trends would likely remain the same as alternative A. There may be some water quality and sedimentation control benefits from improvements to vegetation communities within riparian, shoreline, and transition zones.

Cultural Resources

A cultural resource management plan will be developed for the refuge which will describe how ongoing effects to cultural resources will be addressed.

Socioeconomics

Removal of refuge campgrounds may modestly increase lodging revenues and lodging tax revenues in Phillipsburg and surrounding communities, as local entrepreneurs step up to offer alternative locations for these discontinued services. It is estimated that the current campground supports less than 5,000 visitor nights; thus, the transference of a portion of this activity to the regional economy would have a very modest but beneficial impact.

Given the small number of non-wildlife-dependent activities, the discontinuation of swimming, jet skiing, and water skiing would have no significant socioeconomic consequences. Less than 2 percent of refuge visitors participate in jet/water skiing; thus, the loss of this business would have minor consequences. Economic value would be redistributed but not entirely lost because it is likely that this recreation market can find suitable substitutes in nearby locations.

Changes in management practices may increase hunter/fisher visitation over time because noncompatible uses on the reservoir would be discontinued. Wildlife viewing, fishing, and hunting are the most popular activities at the refuge. Improvement in the quality of the hunting and fishing experience may, over time bring in a minor number of additional visitors and additional local spending.

Other Issues and Resources

Research and Science activities would increase under alternative B to include in-depth baseline data collection and studies of visitor use. While approved staffing levels at the refuge would remain the same (7.5 FTE), staff time and hiring priorities would be refocused on wildlife and habitat management for migratory birds and species of conservation concern. With the discontinuation of non-wildlife-dependent uses and facilities, staff time would be diverted to wildlife and habitat management efforts including increased invasive weed control efforts, planting and seeding, and controlled burns. Efforts to expand supplemental staff sources, including seasonal labor, inmate work crews, volunteers, and contract labor would be initiated. Operations and maintenance efforts also would be focused on wildlife-dependent uses and wildlife and habitat management for migratory birds and species of conservation concern. Existing partnerships would continue. In addition, efforts to expand existing and develop new partnerships would be initiated, with the focus on partnerships that promote wildlife-dependent uses and habitat improvement.

5.3 Comparison of Effects by Alternative

Table 3 provides a summary of the potential effects on environmental resources associated with the implementation of each of the management alternatives.

Table 3. Environmental Consequences

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
Summary of Management Direction	Continue to manage the refuge in accordance with the CMP completed in 1996.	Enhance wildlife and habitat management practices on the refuge. Manage all wildlife and fish resources with a focus on migratory birds and species of conservation concern. Promote hunting, fishing and other wildlife-dependent recreation.
	ECOLOGY	
Reservoir (Deepwater) Habitat	No Change in Management • Continued disturbance from boat presence to waterfowl during migration and winter. • Continuation of low/non-existent levels of SAV and aquatic invertebrates; low volume of food sources for some migrating species. • Reservoir provides mainly resting	Management Improvements • Reduced disturbance from boat presence (seasonal boat closures) to waterfowl during migration, and winter. • Stabilization of water levels results in increased SAV volumes and increased production of aquatic invertebrates and small fish for winter and migration food source for waterfowl.

Table 3. Environmental Consequences

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
	habitat (limited feeding habitat). • Management focused on waterfowl.	• Reservoir provides resting and feeding habitat. • Management focused on waterfowl and the following species of concern: eared grebe, western grebe, American white pelican, redhead, lesser scaup, Franklin's gull, common tern, black tern. Increased SAV also benefits threatened and endangered species: bald eagle, least tern.
Shoreline	• Dramatic water level fluctuations increase abundance of invasive plants such as salt cedar and Canada thistle. • Continued decline in quality and quantity of resting, nesting and feeding habitat for shorebirds due to increase in invasive plants and continued decrease in relative abundance of native plants due to competition with invasive plant species.	• Increased efforts to stabilize water levels result in reduction in invasive plants. • Increased efforts to improve habitat through control of invasive plants results in improved quality and quantity of resting, nesting, and feeding habitat for shorebirds. • Species of concern that benefit from improved shoreline habitat: eared grebe, western grebe, American white pelican, Canada goose, white-front goose, snow-Ross' goose, wood duck, mallard, northern pintail, American widgeon, redhead, lesser scaup, snowy egret, whooping crane, piping plover, snowy plover, American avocet, semipalmated sandpiper, least sandpiper, Baird's sandpiper, long-billed dowitcher, Wilson's phalarope, Franklin's gull, common tern, black tern. • Decreases in invasive plants also benefits threatened and endangered species such as bald eagle and least tern.
Riparian	• Current level of invasive plant control not sufficient to limit spread of salt cedar, Canada thistle, Siberian elm, Russian olive, eastern red cedar, locust, hedge and other species. • Continued decline in quality and quantity of resting, nesting and feeding habitat for migratory woodland birds due to invasive plants and continued decrease in relative abundance of native plants due to competition with invasive plants.	• Increased efforts to improve habitat through control of invasive plants results in improved quality and quantity of resting, nesting, and feeding habitat for migratory woodland birds. • Created openings from removal of invasive tree species will allow understory transition from cool-season grasses (smooth brome) to native warm-season grasses (big bluestem, Indiangrass, and switchgrass) and shrubs (sumac, currants, snowberry), which benefit migratory woodland birds. Habitat improvements resulting from removal of invasive shrubs, forbs, and grasses would benefit other species of concern such as wood duck, Swainson's hawk, northern bobwhite quail, yellow-billed cuckoo, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, American tree

Table 3. Environmental Consequences

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
		sparrow, and Harris' sparrow. • Decreases in invasive plants also benefits threatened and endangered species such as the bald eagle.
Upland	• Current level of invasive plant control not sufficient to limit spread of musk thistle, smooth brome, Siberian elm, Russian olive, eastern red cedar, locust, hedge and other species. • Continued decline in quality and quantity of resting, nesting and feeding habitat for migratory prairie grassland birds due to invasive plants. • Continued decrease in relative abundance of native plants due to competition with invasive plant species. • Maintain benefits of restored and native prairie, including reducing habitat fragmentation, tree and invasive plant control, and prairie grassland bird food sources • Maintain benefits of croplands, including tree and invasive plant control, waterfowl food, and seedbed for future prairie grassland restoration	• Increase quality of nesting and feeding habitat for migratory prairie grassland birds through active management of invasive plants such as musk thistle, smooth brome, Siberian elm, Russian olive, eastern red cedar, locust, and hedge using practices such as burning, grazing, haying, and invasive plant control on existing prairie. • Increase quantity of habitat for migratory prairie grassland birds by restoring cropland to prairie. • Permanent and/or seasonal road closures result in increased habitat block size, reduced disturbance, and reduced fragmentation for migratory prairie grassland birds. • Creation of the 45,000 acre block increases effectiveness of habitat and management. On a larger scale, performs the same functions as above. • Use Partners for Fish and Wildlife resources to augment and enhance adjacent native prairie by controlling invasive plants and restoring prairie. • Restore prairie areas and reduce habitat fragmentation by discontinuing non-wildlife-dependent facilities and reducing concentrations of disturbance. • Habitat improvements resulting from removal of invasive plants, restoring cropland, road closures, and habitat expansion would benefit species of concern that use prairie grassland habitat such as mallard, Swainson's hawk, northern harrier, greater prairie chicken, upland sandpiper, burrowing owl, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, chestnut collared longspur, and Lapland longspur.
Transition Zone	• Current level of invasive plant control not sufficient to limit spread salt cedar, Canada thistle, Siberian elm, Russian olive, eastern red cedar, locust and other species. • Continued decline in quality and quantity of resting, nesting and feeding habitat for migratory prairie grassland birds due to	• Increase quantity, quality, and continuity of resting, nesting and feeding habitat for migratory prairie grassland and woodland birds through active management of invasive plants such as salt cedar, Canada thistle, Siberian elm, Russian olive, eastern red cedar, locust and other species. • Maintain benefits of croplands, including tree and invasive plant

Table 3. Environmental Consequences

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
	invasive plants. Continued decline in quality and quantity of resting, nesting and feeding habitat for migratory woodland birds due to invasive plants.	control, waterfowl food, and seedbed for future prairie grassland restoration. • Creation of savannah habitat will benefit Bell's vireo, red-headed woodpecker, orchard oriole, Baltimore oriole, and other savannah species. • Habitat improvements resulting from removal of invasive plants would benefit species of concern that use transition zone habitat such as Swainson's hawk, northern harrier, greater prairie chicken, yellow-billed cuckoo, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, and chestnut collared longspur. • Improved feeding habitat for bald eagle; maintain benefits of open areas for whooping crane.
	VISITOR SERVICES	
Hunting	• No change.	• Potential for improved quality of hunting due to decreased traffic disturbance and improved quality, quantity, and continuity of habitat. • Potential for reduced motorized vehicle access based on road evaluation that would begin in 2007.
Fishing	• No change.	• At all water levels, ➢ Expand boat fishing opportunities (about 500 acres, depending on water level) for 6 months (April 1 to October 1) by moving the boat closure buoys from Railroad Flats to Grays Park. • Under low water conditions (elevation < 1,722 feet): ➢ Decrease boat fishing opportunities (about 2,000 acres depending on water level) for 6 months (October 1 to April 1; boat closure on most of the reservoir). • Under high water conditions (elevation > 1,722 feet). • Expand boat fishing opportunities (about 3,000 acres depending on water level) year-round by moving the boat closure buoys from Railroad Flats to Grays Park and not implementing seasonal boat closure. • Improve fishing experience by discontinuing non-wildlife-dependent competing uses such as jet skiing and water skiing.

Table 3. Environmental Consequences

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
Wildlife Observation, Photography	• No change.	• Improve wildlife observation and photography experience by discontinuing non-wildlife-dependent competing uses such as jet skiing and water skiing.
Interpretation and Environmental Education	• No change.	• Improve Interpretation and Environmental Education experience by discontinuing non-wildlife-dependent competing uses such as jet skiing and water skiing.
Other Public Uses	• Review existing non-wildlife-dependent recreation uses for compliance with the Improvement Act and accompanying regulations and policies through a CD process. Incompatible uses would be discontinued.	• Discontinue non-wildlife-dependent uses and reduce non-wildlife-dependent recreation facilities and focus staff time on improving wildlife habitat and wildlife-dependent uses. • Discontinued uses are easily absorbed by other facilities in the region. • If a road is seasonally and/or permanently closed, changes to vehicle access would result. Pedestrian access would not change.
Water Resources		
Water Quality and Sedimentation	• No change in existing conditions of water quality • No change in existing sedimentation trends	Same as A
RESEARCH AND SCIENCE		
Habitat, Wildlife, Visitor Services	• Continue limited baseline data collection and/or monitoring.	• Collect in-depth baseline data from which to monitor management actions; conduct studies of visitor uses.
CULTURAL RESOURCES		
Cultural Resources	No change.	A cultural resource management plan will be developed.
SOCIOECONOMICS		
Employment, Income, Housing, Community	• Maintain current economic involvement in the local community.	• Increase contributions to the local economy (to over $600,000 per year) by employing 7.5 FTEs. • Increase operational spending in the local economy as budgets increase. • Total input to the local economy would be approximately one million dollars per year. • Improvement in quality of hunting and fishing experience may, over time, bring in a minor number of additional visitors and local spending.
REFUGE OPERATIONS		
Staffing	• Approved staffing level is 7.5 FTEs. Current on-site staff consists of 3.5 FTEs. • Hiring priority: outdoor recreation planner • Continue to supplement staff with seasonal labor, inmate work crew,	• Same as A (7.5 FTE), except reallocate staff time to focus on wildlife and habitat management for migratory birds and species of conservation concern. • Hiring priority: refuge biologist • Expand efforts to supplement staff with seasonal labor, inmate work crew,

Table 3. Environmental Consequences

Management Categories	*Alternative A* *No Action*	*Alternative B* *Wildlife, Habitat and Public Use—* *Service's Proposed Action*
	volunteers, and contract labor.	volunteers, and contract labor.
Operations and Maintenance	• Maintain existing visitor services facilities. • Continue current level of operations and maintenance for natural resources.	• Increase operations and maintenance efforts that support wildlife and habitat management for migratory birds and species of conservation concern. • Maintain and expand where feasible, visitor services facilities that support wildlife-dependent recreation. • Discontinue visitor services facilities that support non-wildlife-dependent recreation.
	PARTNERSHIPS	
Changes to partnerships with agencies, conservation, and community groups	• Continue to maintain existing partnerships. • Continue partnership between the Service and the KDWP to manage the fishery in the Kirwin Reservoir.	• Increase efforts to maintain and expand existing partnerships that focus on wildlife and habitat management, adding new partnerships where feasible. • Increase efforts to maintain and expand existing partnerships that promote wildlife-dependent recreation, adding new partnerships where feasible. • Continue partnership between the Service and the KDWP to manage the fishery in the Kirwin Reservoir.

Chapter 6. Implementation of the Proposed Action

6.1 Introduction

Once the preferred 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 begins. If the Proposed Action is selected for implementation, the objectives and strategies presented below will be realized during the next 15 years. The CCP will serve as the primary management document for Kirwin NWR until it is formally revised. The Service will implement the final CCP with assistance from existing and new partner agencies and organizations, and the public.

Overview of Selection of this Alternative

It is the responsibility of the planning team to recommend a Proposed Action that best achieves planning unit purposes, vision, and goals; helps fulfill the Refuge System mission; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; addresses the significant issues and mandates; and is consistent with principles of sound fish and wildlife management.

During the development and analysis of alternatives for the CCP, Alternative B (Wildlife, Habitat, and Public Use) was selected as the Proposed Action by the Service. The planning team believes alternative B best achieves the mission of the Refuge System and the goals of the refuge, while addressing the substantive issues identified during the scoping process.

Alternative Description

Alternative B, the Proposed Action, strives to fully implement the Improvement Act, which directs that each refuge in the Refuge System will be managed for the benefit of wildlife first. Management actions emphasize wildlife and habitat management for migratory birds and species of conservation concern.

Revisiting the visitor services program will be a priority in this alternative. Wildlife-dependent recreation will be emphasized and promoted, with hunting, fishing, wildlife observation, photography, environmental education, and interpretation receiving priority attention. Non-wildlife-dependent uses would be discontinued. These refuge uses, and the facilities that support them will be phased out within 1 year of CCP implementation.

Management of invasive species will be enhanced. There will be an expansion and diversification of invasive plant management in the shoreline, riparian, upland, and transition zone areas.

With increased funding and staffing, the refuge will be able to collect in-depth baseline data for wildlife and habitats. Increased efforts in operations and maintenance for natural resources will occur. Increased efforts in the maintenance and development of partnerships that promote wildlife and habitat management will occur.

The Service will continue to manage the refuge in accordance with the MOA between Reclamation and the Service. The MOA may be updated and revised during the life of this plan.

The Service will continue to seek assistance from KDWP to help manage portions of the fishery in Kirwin Reservoir. The existing MOA between the Service and KDWP needs to be updated due to the 1954 MOA being voided by the 1966 National Wildlife Refuge System Administration Act to comply with Service laws, policies and regulations.

6.2 Goals, Objectives and Rationale, and Strategies

The following objectives and strategies outline the actions needed to achieve the vision and goals of Kirwin NWR.

Although a number of needs have been identified during the planning process, there are no assurances that any projects or staff positions will be fully or even partially funded. Implementation of some of the following objectives will be subject to future increases in staffing and/or funding for the refuge. However, within every planning effort,

there are opportunities to examine current allocations of funding and resources and determine the best available uses based on a comprehensive evaluation of critical needs.

Ecology Goal

Restore the native mixed-grass prairie ecosystem (e.g., prairie grasslands, wooded draws, and limestone outcrops) and riparian areas above flood levels by emulating natural processes. When water levels are low, diversify wildlife habitats within the dry reservoir basin.

Deepwater (Reservoir) Habitat

Species of concern that use deepwater habitat include eared grebe, western grebe, American white pelican, redhead, lesser scaup, Franklin's gull, common tern, black tern. Threatened and endangered species that use deepwater habitat include bald eagle and least tern.

Objective 1: Within 1 year of CCP approval, initiate discussions with Reclamation, and the Kirwin Irrigation District to discuss the feasibility of maintaining greater stability of water levels (with target elevations between 1,710 feet and 1,729 feet) in the reservoir to allow the development of food resources and to make those resources available to migratory waterfowl, shorebirds, wading birds and other wetland-dependent wildlife.

Rationale: The water supply is currently managed by Reclamation and the Kirwin Irrigation District, for flood control and irrigation purposes. By working with these agencies, the Service will have an opportunity to discuss wildlife benefits that occur with greater stability of water levels. Reducing dramatic drawdowns during summer months for elevations below 1,729 feet will benefit deepwater dependent fish and wildlife species. Water levels between 1710 feet and 1,729 feet were chosen because sufficient shoreline and waterfowl habitat is significantly reduced as water levels drop below 1,710 feet.

When water levels exceed conservation pool (elevation 1,729) for an extended amount of time, vegetation that becomes flooded dies. This flooded area is extremely vulnerable to invasive plants. For example, if the water level is held just 2 feet above conservation pool, 591 acres of vegetation are damaged. This will also protect riparian and prairie grassland habitats above the conservation pool from flood kill when the water level rises above 1,729 feet.

Reclamation hydrologists project water levels will be down for +/- 40 years. Inflows have been decreased substantially due to upstream development of wells, farm ponds, and terraces.

Strategies:

- Discuss wildlife benefits of modified hydrology with Reclamation, Vicksburg, MS (Waterways Experiment Station), USACE, and the Kirwin Irrigation District.
- Discuss invasive plant species management with Reclamation, Vicksburg, MS (Waterways Experiment Station), USACE, and the Kirwin Irrigation District.
- Conduct waterfowl surveys.

Objective 2: Within 1 year of CCP approval, create an optimum area of low disturbance for waterfowl by introducing a seasonal boat closure on the majority of the reservoir between October 1 and April 1.

Rationale: Providing an area of low disturbance for migrating and wintering waterfowl will retain birds in the area for a longer period of time than having a small narrow area that can be easily disturbed. Holding more geese in the area will improve goose hunting on the refuge and the surrounding area. Boating can impact waterfowl by lowering productivity, reducing use of preferred habitat, and increasing indirect mortality, aberrant behavior, and stress (Pomerantz 1988).

Strategies:

- Implement a seasonal (October 1—April) boat (motorized and nonmotorized) closure on the majority of the reservoir (north of Crappie Point).
- Allow nonmotorized boats in the motorized boat closure area from August through September (Grays Park — west).
- Open Bow Creek to boating year-round from Crappie Point upstream (south of Crappie Point).
- Allow boats to launch at Crappie Point to access Bow Creek to the south.

Objective 3: Throughout the life of the CCP, Reclamation will continue to monitor sedimentation.

Rationale: Reclamation owns the dam, is responsible for irrigation operations, and monitors sedimentation levels.

Shoreline Habitat

Species of concern that use shoreline habitat include eared grebe, western grebe, American white pelican, Canada goose, white-front goose,

snow-Ross' goose, wood duck, mallard, northern pintail, American wigeon, redhead, lesser scaup, snowy egret, whooping crane, piping plover, snowy plover, American avocet, semipalmated sandpiper, least sandpiper, Baird's sandpiper, long-billed dowitcher, Wilson's phalarope, Franklin's gull, common tern, and black tern. Threatened and endangered species that use shoreline habitat include bald eagle and least tern.

Objective 1: Within 1 year, initiate discussions with Reclamation, and the Kirwin Irrigation District to discuss the feasibility of maintaining greater stability of water levels (with target elevations between 1,710 feet and 1,729 feet) in the reservoir to allow the development of food resources and to make those resources available to migratory waterfowl, shorebirds, wading birds and other wetland-dependent wildlife.

Rationale: The water supply is currently managed by Reclamation and the Kirwin Irrigation District, for flood control and irrigation purposes. By working with these agencies, the Service will have an opportunity to discuss wildlife benefits that occur with greater stability of water levels. Reducing dramatic drawdowns during summer months for elevations below 1,729 feet will benefit deepwater dependent fish and wildlife species. Water levels between 1710 feet and 1,729 feet were chosen because sufficient shoreline and waterfowl habitat is significantly reduced as water levels drop below 1,710 feet.

When water levels exceed conservation pool (elevation 1,729) for an extended amount of time, vegetation that becomes flooded dies. This flooded area is extremely vulnerable to invasive plants. For example, if the water level is held just 2 feet above conservation pool, 591 acres of vegetation are damaged. This will also protect riparian and prairie grassland habitats above the conservation pool from flood kill when the water level rises above 1,729 feet.

Reclamation hydrologists project water levels will be down for +/- 40 years. Inflows have been decreased substantially due to upstream development of wells, farm ponds, and terraces.

Strategies:

- Discuss wildlife benefits of modified hydrology with Reclamation, Vicksburg, MS (Waterways Experiment Station), USACE, and the Kirwin Irrigation District.
- Discuss invasive plant species management with Reclamation, Vicksburg, MS (Waterways Experiment Station), USACE, and the Kirwin Irrigation District.
- Conduct waterfowl surveys.

Riparian Habitat

Species of concern that use riparian habitat include wood ducks, Swainson's hawk, northern bobwhite quail, yellow-billed cuckoo, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, American tree sparrow, and Harris' sparrow. Threatened and endangered species that use riparian habitat include the bald eagle.

Objective 1: Throughout the life of the CCP, provide openings in wooded riparian corridors along Bow Creek and North Fork Solomon River for the benefit of declining migratory birds (e.g., Baltimore oriole, yellow billed cuckoo, and Swainson's hawk) by removing all nonnative trees.

Rationale: Most species of concern utilize woodland edge, brush, or patch woodland; not large blocks of continuous canopy woodland. Consequently, removing nonnative trees and using fire to restore woodland-prairie mosaic is desirable (Busby 2005). Invasive tree removal provides openings beneficial to migratory bird species of conservation concern. Removal of invasive tree species (e.g. cedar, locust, Siberian elm, and Russian olive) is desired above the conservation pool because they provide a seed source for expansion into prairie grassland areas. Native trees such as green ash, hackberry, boxelder, American elm, and eastern cottonwood provide better foraging areas for tree dependent birds (Sevigny 1997). A mixture of native plants (trees, herbaceous and shrubby vegetation) in riparian areas will create habitat for species of conservation concern (Peak 2002). Resident game species such as white-tailed deer, turkeys, and bobwhite quail will benefit as well.

Vegetation requires periodic manipulation to achieve the stated objectives. The combination of grazing, rest, mechanical treatments, burning, herbicides, and biological agents are the best tools to accomplish this. Certain tree species seedlings increase with grazing and when overstory trees are removed. Light to moderate grazing of shrubs produces greater vegetative growth than nongrazing (Uresk 1986). Healthy riparian habitat helps filter runoff, reduces sedimentation, improves water quality, and provides habitat for associated wildlife species (Meyer 2003).

Strategies:

- Provide openings in the canopy along Bow Creek and the North Fork Solomon River by removing invasive trees.
- Retain most of the native trees.
- Plant warm-season native grasses in the understory.
- Complete a detailed habitat inventory of the refuge.
- Establish a vegetation-monitoring plan to assess health of established riparian areas, and measure and document success or changes needed in management efforts. The plan should include herbivory and hydrology factors.
- Develop a wildlife-monitoring plan that correlates wildlife use and habitat condition.
- Develop an integrated pest management plan.
- Utilize grazing at varying stocking rates, seasons, and intensities as a management tool.
- Use nongrazing as a management tool.
- Use a variety of mechanical treatments, prescribed burning, herbicides, and biological agents as management tools.

Objective 2: Throughout the life of the plan, the Service's Partners for Fish and Wildlife Program will continue to work in cooperation with other agencies to provide funding and technical assistance to private landowners in order to improve riparian health on the surrounding private lands for the benefit of declining migratory birds that use the wooded corridor.

Rationale: Issues in riparian corridors adjacent to the refuge that Service's Partners for Fish and Wildlife Program will address are the essentially the same as on the refuge.

Strategies:

- Use a Partners for Fish and Wildlife biologist to work with local partners and willing landowners to identify, prioritize, and restore/enhance degraded areas for the benefit of riparian birds.
- Have a Partners for Fish and Wildlife Program biologist apply for funding to accomplish the work listed above.
- Provide openings in the wooded riparian corridors along Bow Creek and the North Fork Solomon River.
- Remove invasive trees.
- Retain most of the native trees.
- Plant warm-season native grasses in open areas.
- Use prescribed fire, grazing, and mechanical means as management tools.

Upland Habitat

Species of concern that use upland habitat include mallard, Swainson's hawk, northern harrier, greater prairie chicken, upland sandpiper, burrowing owl, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, chestnut collared longspur, and Lapland longspur.

Objective 1: Within 5 years of CCP approval, create a minimum of 5,000 acres of restored prairie habitat on the refuge that contains less than 5 percent trees and a diversity of vegetation height, litter depth, and floristic composition to provide habitat for prairie grassland dependent birds (e.g., prairie chicken, upland sandpiper, and Swainson's Hawk).

Rationale: The patch size of the prairie grassland habitat and the structure of the vegetation (visual obstruction, height, and litter depth) are the most important qualities of prairie grassland habitat (Skinner 1975). Because different prairie grassland bird species require different habitat conditions, the refuge will manage sections of the 5,000-acre block differently in order to ensure a diversity of vegetation height, floristic composition and litter depth. Prairie chickens require the largest size tract of prairie grassland (minimum ~640 acres) (Robel et al. 1970; Niemuth 2000), upland sandpipers require the next largest tract of prairie grassland (minimum ~160 acres) (Winter 1999), with other prairie grassland birds requiring smaller parcels of prairie grassland to minimally inhabit an area. Therefore, if size requirements for prairie chickens can be obtained, all other prairie grassland bird area requirements will be met. Removing trees within the uplands will also discourage predators (Rodgers 2003; Bakker 2002). Trees within wooded draws and riparian areas and parts of the transition zone will not be totally removed. [See bird list for more specific habitat requirements].

Prairies are dynamic and may change rapidly if left undisturbed. Dead vegetation builds up suppressing new growth and woody vegetation

may invade changing the characteristic vegetation of the area (Naugle 2000). Periodic manipulations using prescribed fire, seeding, mowing, and grazing are used to maintain the diversity of the prairie vegetation and ensure the continuance of the prairie community (USFWS 1996). A completed inventory of the upland vegetation will assist in determining outcomes and utilizing adaptive management. Monitoring the response of the flora and fauna will aid in assessing the success of the tools applied and help improve these methods. Resident game species such as mule deer, ring-necked pheasants, prairie chickens, and bobwhite quail will benefit as well. Research advocates periodic treatment of prairie grasslands to remove excessive litter accumulations and invasions of woody vegetation that negatively affect vegetative health, structure, and vigor. Burning provides the fastest and most effective means of litter removal (Naugle 2000). Many prairie grassland birds avoid woody vegetation. Upland sandpiper, greater prairie chicken, ferruginous hawk, short-eared owl, horned lark, bobolink, western meadowlark, savannah sparrow, and grasshopper sparrow all avoid woody vegetation (Wildlife Habitat Management Institute 1999).

Strategies:

- Restore 1,300 acres of cropland to native prairie grassland above the conservation pool.
- Plant a diverse mix of native grasses and forbs containing over 100 different species.
- Use equipment such as a grass drill, and broadcasters to plant the seed.
- Use a variety of tools to encourage plant establishment and growth such as prescribed burning, mowing/haying, and grazing.
- Complete a detailed habitat inventory of the refuge.
- Establish a vegetation monitoring plan to assess health of established riparian areas, and measure and document success or changes needed in management efforts. The monitoring plan should include herbivory and hydrology factors.
- Develop a wildlife monitoring plan that correlates wildlife use and habitat condition.
- Develop an integrated pest management plan.
- Use nongrazing as a management tool.
- Implement seasonal and permanent road closures in selected areas.

Objective 2: Within 5 years of CCP approval, create one block of restored prairie habitat with a minimum block size of 42,000 acres connecting two isolated prairie grassland areas of private land (17,000 and 20,000 acres) through the restoration of the 5,000-acre block of refuge prairie habitat, for the benefit of prairie grassland birds.

Rationale: Virtually all of the suggestions in conservation biology literature pose two ideas for preserving biodiversity in fragmented landscapes: 1) establish corridors; 2) buffer native patches with native habitat (Marzluff 2001). The refuge is the focal point between two large blocks of adjacent prairie grassland (see figure 11). A 42,000-acre block of prairie grassland is desirable because it fulfills the minimum area requirements of all prairie grassland birds. The larger the block, the less the habitat is degraded by outside sources (i.e., herbicide drift from cropland).

The 37,000 acres of prairie that is adjacent to the refuge is owned and managed by many different people. These tracts are similar in numerous ways. This variety of management potentially produces the appropriate litter depths, visual obstruction readings, and vegetation heights necessary to support prairie grassland birds. However, the refuge block of 5,000 acres is the only area that will be managed specifically for prairie grassland birds. The refuge habitat will be the cornerstone of the 42,000-acre block.

Strategies:

- Same as strategies for upland habitat objective 1.

Objective 3: Provide approximately 500 to 2,000 acres, over a 5-year average, of native and restored prairie habitat with a vegetation height of < 6 inches, composed of < 5 percent woody vegetation over 8 feet in height to benefit vesper sparrow, chestnut collared longspur, horned lark, upland sandpiper, grasshopper sparrow, western meadowlark, Sprague's pipit, clay-colored sparrow, ferruginous hawk, McCown's longspur, lark bunting, burrowing owl, Swainson's hawk, lark sparrow, and greater prairie chicken.

Rationale: Same rationale as upland habitat objective 1.

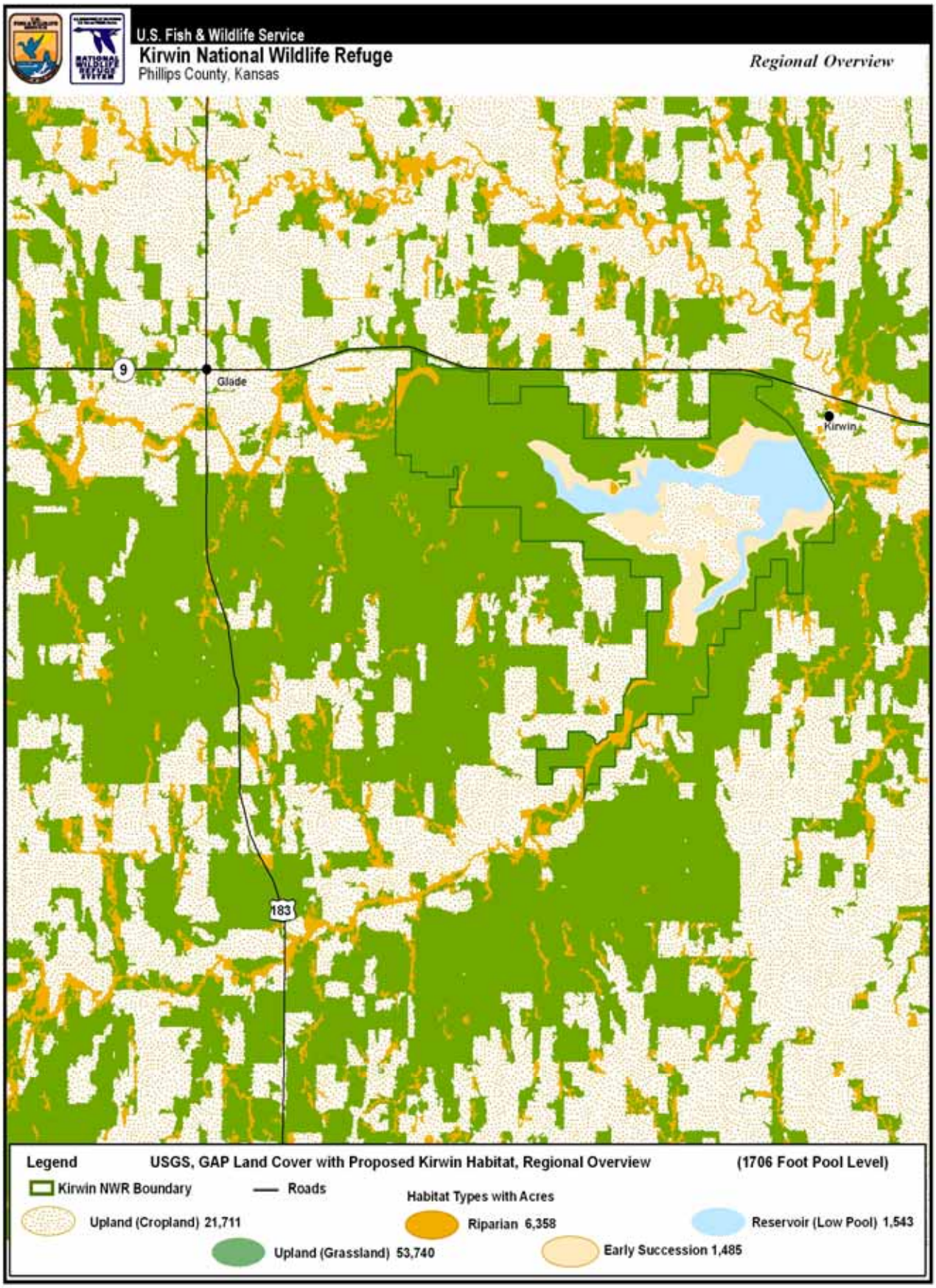


Figure 11. Regional Overview

In addition, Vesper sparrows and chestnut-collared longspurs prefer open prairie with short grasses (Dechant 2003). Clay-colored sparrows prefer grasses 10 to 30 cm high (Dechant et al. 2003e, 2001). McCown's longspurs use short vegetation (Dechant 2003). Lark buntings use prairie grasslands of low to moderate height (Dechant 2003).

Burrowing owls prefer prairie grasslands of sparse vegetation, bare ground and relatively short vegetation (Dechant 2003). Lark sparrows prefer areas that are burned and have moderate to heavy grazing with 13 cm grass height (Dechant 2003).

Strategies:

- Same as strategies for upland habitat objective 1.

Objective 4: Provide approximately 500 to 2,000 acres, over a 5-year average, of native and restored prairie habitat with a vegetation height of 6 to 20 inches, composed of < 5 percent woody vegetation over 8 feet in height to benefit chestnut collared longspur, horned lark, upland sandpiper, grasshopper sparrow, savannah sparrow, western meadowlark, bobolink, Sprague's pipit, clay-colored sparrow, short-eared owl, northern harrier, dickcissel, ferruginous hawk, short-eared owl, eastern meadowlark, lark bunting, Swainson's hawk, lark sparrow, and greater prairie chicken.

Rationale: Same rationale as upland habitat objective 1.

In addition, upland sandpipers prefer areas moderate to high litter cover with moderate grazing and low woody cover (Dechant 2003). Western meadowlarks use a wide variety of vegetation heights, however, they avoid extremely sparse or tall cover (Dechant 2003). Bobolinks prefer habitat with moderate to tall vegetation (Dechant 2003). Grasshopper sparrows prefer prairie grasslands of intermediate height (Dechant 2003). Dickcissels prefer habitat with dense, moderate to tall vegetation (Dechant 2003). Short-eared owls prefer large open areas with a vegetation height of 30 to 60 cm, with a maximum vegetation height of 90 cm (Dechant 2003).

Strategies:

- Same as strategies for upland habitat objective 1.

Objective 5: Provide approximately 500 to 2,000 acres, over a 5-year average, of native and restored prairie habitat with a vegetation height of > 20 inches, composed of < 5 percent woody vegetation over 8 feet in height to benefit savannah sparrow, northern harrier, dickcissel, bobolink, and grasshopper sparrow.

Rationale: Same rationale as upland habitat objective 1.

In addition, northern harriers prefer tall vegetation (Johnson 1998). Dickcissels prefer habitat with dense, moderate to tall vegetation (Dechant 2003). Grasshopper sparrows and bobolinks occur most frequently in area of tall, dense vegetation (Arnold 1986). Savannah sparrows usually do not occur in areas that contain shrubs (Arnold 1986).

Strategies:

- Same as strategies for upland habitat objective 1.

Objective 6: Throughout the life of the plan, the Service's Partners for Fish and Wildlife Program will continue to work in cooperation with other agencies to provide funding and technical assistance to private landowners for improved upland habitat management to benefit prairie grassland birds.

Rationale: Private lands adjoining the refuge are a priority for the Service. To more effectively maintain refuge habitat, the landscape surrounding the refuge must also be managed (Marzluff 2001).

Strategies:

- Partners for Fish and Wildlife Program biologist may apply for funding to address stocking rates, tree encroachment, and lack of rest, fire, and residual cover.
- A Partners for Fish and Wildlife biologist will continue to work with local partners and willing landowners to identify, prioritize, and restore/enhance degraded areas for the benefit of prairie grassland birds.

Transition Zone (Dry Reservoir) Habitat

Species of concern that use transition zone habitat include Swainson's hawk, northern harrier, greater prairie chicken, yellow-billed cuckoo, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, and chestnut-collared longspur. Threatened and

endangered species include bald eagle and whooping crane.

Objective 1: Throughout the life of the CCP, manage the dry reservoir bottom to provide approximately 0 to 2,000 acres of prairie habitat for the benefit of prairie grassland dependent birds.

Rationale: Same rationale as upland habitat objective 1.

Strategies:

- Retain treeless areas of prairie.
- Use native prairie grassland seedings, prescribed fire, grazing and mowing, as well as mechanical and chemical removal to create prairie grassland corridors (relatively devoid of trees) in selected locations within the Bow Creek and Solomon Arms. Examples of this will occur between Catfish Cove and the confluence of Hungry Hollow, and between Solomon Bend and Big Bend.

Objective 2: Throughout the life of the CCP, manage the dry reservoir bottom to provide approximately 0 to 2,000 acres of shrub-savannah habitat with occasional dense timber stands for the benefit of migratory birds that depend on shrubs for survival.

Rationale: Migratory bird species of conservation concern (e.g., redheaded woodpecker and Baltimore oriole) require a more savannah-like habitat than dense stands of timber. Migratory bird species of conservation concern (e.g., Bell's vireo) require shrub habitat.

Strategies:

- Use native prairie grassland seedings, prescribed fire, grazing and mowing to create savannah habitat dominated by grasses and forbs interspersed with shrubs, stunted trees and occasional mature trees.

Objective 3: Throughout the life of the plan, manage portions of the dry reservoir bottom to provide approximately 0–1,500 acres open areas (without trees) for feeding and resting waterfowl, sandhill cranes and whooping cranes.

Rationale: Cropping is the most efficient way to retain open areas. Without cropping, the area will develop into stands of trees. These trees will not benefit waterfowl and cranes. Cropping also helps control the spread of invasive plants and provides a food source for migratory birds and resident wildlife. Without open areas, waterfowl and cranes will not remain in the area as long, which will reduce hunting and wildlife viewing opportunities significantly. As the water level fluctuates, the cropland will flood and become shoreline habitat. Areas of open shoreline are desirable for shoreline birds and other water birds.

Endangered whooping cranes are sighted almost annually on the refuge and in the surrounding area. They pass through the area during spring and fall migrations with most sightings occurring in April and October. Sightings are mainly in crop fields or shallow ponds with a large, unobstructed field of view. Historically, times of receding water are when whooping7 cranes visit the refuge. The most limiting factors to their use of the refuge have been the absence of large open expanses of mud flat and shallow water, and the excess growth of trees and brush along exposed shorelines (USFWS 1996).

Strategies:

- Utilize cooperative farmers to control state-listed invasive plants in select areas.
- Plant native grasses in select areas.
- Use cropping to retain open areas, control invasive plants, and provide a food source.

Threatened and Endangered Species Habitat

Threatened and endangered species that occur at the refuge include the bald eagle (threatened), whooping crane (endangered), interior least tern (endangered), and piping plover (threatened).

Objective 1: Throughout the life of the plan, protect federally listed threatened and endangered species. Inform and educate the public to their presence and needed protection. Cooperate with Reclamation on all management of threatened and endangered species that occur on and around the face of the dam.

Rationale: Federal law requires that threatened and endangered species are protected. Least terns are a federally endangered species that are very sensitive to use and were documented nesting in late 1970s and early 1980s on the refuge. In many years they use the refuge during migration.

Strategies:

- Protect nesting least terns by installing signs and increasing patrols.
- Develop an MOU with the Reclamation for nesting least terns on Reclamation land.

- Develop informational kiosks to educate the public.
- Protect future nesting bald eagles.
- Close specific areas, roads, or the entire refuge to all access or hunting when whooping cranes or other sensitive wildlife are present.

Invasive Species

Objective 1: Throughout the life of the plan, annually treat a minimum of 50 percent of the acres that contain state-listed invasive plants.

Rationale: For native birds to be retained, invasive plants must be actively controlled (Marzluff 2001). Invasive species pose a serious threat to existing fish and wildlife resources. Once present, it is important to maximize efforts to gain control of invasive plants. State laws mandate that all landowners control certain invasive plants. Currently, Canada thistle is the primary invasive plant of concern. Canada thistle invades along the shoreline; the magnitude of water drawdowns in summer months facilitates the spread of invasive plants within the transition and shoreline zones.

Strategies:

- Use of any tool available to control invasive species.

Visitor Services

The Improvement Act declares that compatible wildlife-dependent recreational uses are legitimate and appropriate priority general public uses of the Refuge System. Six wildlife-dependent public uses (hunting, fishing, wildlife observation, photography, environmental education, and interpretation) receive enhanced consideration in this CCP. These activities receive special attention because they help foster an appreciation and understanding of wildlife and the outdoors. Consequently, these six activities are priorities for the refuge's available staff and financial resources.

A CD is required for all proposed refuge uses. A compatible use is one that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from fulfillment of the Refuge System mission or a refuge purpose. CDs for proposed uses at Kirwin NWR can be found in appendix E.

Visitor Services Goal

All public uses will be compatible with the purpose of Kirwin NWR and the mission of the Refuge System. The following wildlife-dependent public uses—hunting, fishing, wildlife observation, photography, environmental education, and interpretation—will be prioritized. In association with other compatible uses, the refuge will strive to provide a diversity of outreach, research, and education and interpretation.

Hunting

Objective 1: Throughout the life of the CCP, maintain the existing hunting program to manage wildlife and maximize hunting opportunities consistent with refuge goals and objectives (waterfowl, pheasant, quail, doves, turkey, prairie chicken, snipe, coots, cottontail rabbit, fox squirrel, and archery deer). See public use map for designated hunting areas.

Rationale: The existing upland game and archery deer only areas were established to disperse the deer population, and to provide additional compatible wildlife-dependent recreation opportunities (USFWS 1996).

Areas closed to hunting and flotation devices provide a sanctuary that attracts wildlife, promotes wildlife observation, and causes waterfowl to stay at the refuge longer. This provides more hunting opportunities on the refuge and on adjacent lands. The presence of hunters and boats increases disturbance responsible for substantial population decreases (Service 1976). Human disturbance reduces the quality of staging and wintering areas (Korschgen 1985). Boating impacts to waterfowl include indirect mortality, lowered productivity, reduced use of preferred habitat, and aberrant behavior and stress (Pomerantz 1988).

The potential exists for enhancing waterfowl hunting opportunities by enlarging or developing a new crop field in the Bow Creek area. Most of the area between Quillback Cove and Prairie Dog Town will be restored to prairie and is key to connecting the two large parcels of prairie that are adjacent to the refuge. Historically, when the water level is low, this area is not used as much by geese as when the water level is higher.

Strategies:

- Hire a park ranger (refuge law enforcement officer).
- Continue archery-only deer hunting in the western part of the refuge.
- Continue existing hunting regulations along the north and south sides of the main body of the reservoir: open to doves, pheasants,

quail, turkey, prairie chicken, snipe, coots, cottontail rabbit, fox squirrel and deer (archery only). Closed to waterfowl hunting.

- Continue existing hunting regulations in the Bow Creek area: open to doves, pheasants, quail, turkey, prairie chicken, snipe, coots, cottontail rabbit, fox squirrel and deer (archery only). Open to waterfowl hunting.
- Continue existing no hunting zone.
- Enhance or develop a new crop field along Bow Creek.

Objective 2: Throughout the life of the CCP, continue to allow motorized and nonmotorized boating in designated areas and at designated times to support hunting.

Rationale: The six wildlife-dependent uses will continue to be supported when compatible.

Strategies:

- Continue to allow boats to be launched at Crappie Point in order to access Bow Creek year-round.

Objective 3: Within the life of the CCP, enhance the quality of hunting opportunities, reduce disturbance to hunters and wildlife, increase the chance of harvest, and promote sound hunting practices.

Rationale: Reducing disturbances to hunters and wildlife will improve opportunities to observe and harvest game. Animals feel safer when they have greater open distance between themselves and potential threats. Disturbance causes increased mortality of young by forcing adults to leave the nests, reducing parental attentiveness, and increasing the odds of the young being preyed upon (Knight 1991). Minimize resource damage caused by vehicles.

Definition of Quality Hunt: A better than average opportunity to observe and harvest an animal while providing an opportunity for solitude.

Strategies:

- Increase habitat block size by increasing the acres of open prairie.
- Implement seasonal and permanent road closures in selected areas.
- Adjust hunting and fishing parking areas to minimize wildlife and habitat disturbance.
- Enhance the quality of refuge prairie.
- Provide more cover for wintering and nesting prairie grassland birds.

Objective 4: Within 3 years, improve the availability of information for hunters regarding the refuge's specific hunting regulations.

Rationale: Clear, concise, and current information is necessary for hunters to plan a hunt at the refuge and to be sure they are following the regulations once they arrive. Hunter awareness of ethics, methods and opportunities increases the quality of the hunting experience for all hunters and provides a safe environment.

Strategies:

- Develop a new hard copy brochure that will be available a designated locations.
- Update the refuge website to include a map of the hunting areas.
- Provide hunting brochures at the visitor center and select locations on the refuge.
- Develop signage that facilitates hunting.

Fishing

Objective 1: Where compatible, opportunities for fishing will be provided based on refuge goals and objectives.

Rationale: Fishing is a compatible priority use and will continue to be supported.

Strategies:

- Continue to allow motorized and nonmotorized boating in designated areas and at designated times to support the priority wildlife-dependent uses.
- Continue foot access to the entire refuge.
- Encourage fishing opportunities on the refuge.
- Provide fishing brochures and information at the visitor center and other locations on the refuge.

Objective 2: Within 1 year, enhance boat fishing opportunities by opening the area between Railroad Flats and Grays Park to motorized boats at all water levels between April 1 and October 1.

Rationale: The opportunity is made compatible by having the seasonal boat closure (October 1 to April 1). While the refuge does produce some

waterfowl, its primary use is during migration and winter. Fall migration brings up to 70,000 Canada geese, 40,000 white-fronted geese, 26,000 snow/Ross' geese, and 220,000 ducks to the refuge annually. Depending on weather conditions, many Canada geese and mallards stay through the winter. Numbers build up again during spring migration with only a few local birds left by April 1 (USFWS 1996). Providing an area of low disturbance for migrating and wintering waterfowl will hold birds in the area for a longer period of time than having a small narrow area that can be easily disturbed (Dahlgren 1992). Holding more geese in the area will improve goose hunting on the refuge and the surrounding area.

Strategies:

- Move the "closed to boats" boundary from Railroad Flats to Grays Park.
- Keep buoy line at Grays Park at all water levels.
- Implement a seasonal (October 1 to April 1) boat closure on the majority of the reservoir.
- Keep Bow Creek open to boating year-round from Crappie Point upstream.
- Allow boats to be launched at Crappie Point to access Bow Creek.
- Allow nonmotorized boats in the motorized boat closure area from August 1 through September 30.

Wildlife Observation, Photography, Interpretation, and Environmental Education

Objective 1: Throughout the life of the plan, continue to provide wildlife observation and photography opportunities based on refuge habitat goals and objectives.

Rationale: These are compatible priority public uses. The refuge overlook and pergola at Crappie Point provide excellent areas for viewing and photographing many kinds of wildlife. Prairie Dog Town provides the opportunity to view and photograph animals up close.

Strategies:

- Hire an outdoor recreation planner.
- Maintain foot access to the refuge.
- Maintain pergolas at the refuge Overlook and Crappie Point.
- Maintain trails at Prairie Dog Town and Crappie Point.

Objective 2: Within one year of hiring an outdoor recreation planner, provide interpretive and environmental education programs such as Eagle Day, Eco-Meet, and monthly wildlife education programs.

Rationale: The public should be made aware of the Refuge System and Kirwin NWR and the benefits it provides to wildlife and the local community.

Strategies:

- Hire an outdoor recreation planner to conduct outreach and education activities.
- Create programs for students and volunteers to assist in management tasks for service learning.
- Use existing environmental education opportunities as they occur, such as scouting, school groups, and refuge field trips.
- Maintain and potentially modify existing facilities to reflect new management strategies.

Other Public Uses (Non-wildlife-dependent)

Objective 1: Within 1 year of CCP approval, gain compliance with current laws, policies and regulations. For the benefit of declining prairie grassland and woodland dependent migratory birds, reduce habitat fragmentation, wildlife disturbance, and conflicts with fishermen, and increase acres of available habitat and public safety by discontinuing non-wildlife-dependent uses.

Rationale: The Improvement Act defines what public uses are compatible and priorities on National Wildlife Refuges. Noncompatible, non-wildlife-dependent uses are not in compliance with the Improvement Act.

In high water years, several fishing tournaments were permitted. These created conflicts with other fishermen. At current, normal, low water, water levels, tournament fishing has all but disappeared. Tournament fishing is considered an economic use of an NWR and is held to a higher standard than a noneconomic use of an NWR. An economic use must benefit wildlife to be allowed on an NWR. Fishing tournaments do not benefit wildlife.

Discontinuing camping will reduce fragmentation of upland habitat and disturbance to wildlife, and improve available habitat. Although many forms of non-wildlife-dependent uses seem innocuous, they can cause displacement, detrimental changes in

behavior, and reproductive declines in wildlife (Gutzwiller 1993). Campsites disturb or alter vegetation, soil, topography, microclimates, and light and moisture conditions (Knight 1991). Camping may disturb wildlife through trampling of habitat. Habitat changes caused by trampling generally reduce vegetation diversity and increase soil compaction, resulting in an overall loss of habitat (Boyle 1985). Reductions in ground- and shrub-nesting birds occur in campsites due to the altered habitat (Knight 1991). Campsite impacts decrease rapidly once the disturbance is terminated (Marion 1996).

Strategies:

- Discontinue volleyball, power/speed boating, water/jet skiing (personal water craft), camping, swimming, and horseback riding.
- Remove facilities associated with camping and rehabilitate the areas.

Research and Science Goal

A scientific approach utilizing the best available information will guide the restoration, protection, and enhancement of the refuge's water resources and fish and wildlife habitat for the prosperity of native flora and fauna.

Objective 1: Within 1 year after hiring a wildlife biologist, initiate a detailed baseline inventory of all habitat types and use the data to identify and prioritize habitat management research needs.

Rationale: A baseline inventory is necessary to understand what habitat types exist on the refuge. The inventory will also expose areas that require additional research. Refuge staff will benefit from research targeted to specific habitat management techniques.

Strategies:

- Hire a wildlife biologist.
- Conduct baseline habitat inventories.

Objective 2: Within 1 year after hiring a wildlife biologist, initiate a detailed baseline inventory of all species of conservation concern.

Rationale: A baseline inventory is necessary to understand what species exist on the refuge. The inventory also will expose areas that require additional research. Refuge staff will benefit from research targeted to specific species management techniques.

Strategies:

- Hire a wildlife biologist.

Objective 3: Within 1 year after hiring a wildlife biologist, initiate a formal monitoring program to measure burn response, prairie grassland restoration, and invasive species control. Within 5 years of that, start monitoring vegetation response to management activities.

Rationale: Provide current research information for the purpose of enhancing management techniques and result son the refuge. In contrast to alternative A, formal monitoring will consist of refuge staff collecting baseline data through surveying and operation.

Strategies:

- Hire a wildlife biologist.
- Conduct baseline habitat inventories.

Objective 4: Within 1 year after hiring a wildlife biologist, initiate surveys of migratory birds and monitor wildlife responses to management activities with an emphasis on migratory birds.

Rationale: Monitoring data will provide valuable information on the success of management techniques. Through observation and surveys refuge staff will monitor wildlife populations in order to gauge fluctuations in population sizes.

Strategies:

- Hire a wildlife biologist.

Cultural Resources Goal

The refuge will protect significant prehistoric, Native American, and other cultural resources.

Objective 1: Throughout the life of the plan, continue to maintain the relationship with Reclamation in which Reclamation and the Service jointly determine which agency will be responsible for cultural resource management on the refuge.

Rationale: At the time of the plan Reclamation and the Service are revisiting this relationship.

Strategies:

- Protect cultural resources found on the refuge by minimizing disturbance in sensitive areas.
- Develop an interpretive display about Fort Kirwin.

- Develop a cultural resources management plan to address ongoing effects to cultural resources.

Refuge Operations Goal

The refuge will prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, partnerships, and volunteer programs.

Objective 1: Within 5 years of CCP approval, fill the approved minimum staffing level vacancies (4.5 FTE) to fully implement the CCP. This will be dependent on national and regional level budgets.

Rationale: The additional staff will be necessary to fully implement the CCP. Currently, there are 4.5 vacant FTEs. The staffing assessment of the refuge concluded that 7.5 FTEs was the minimum staffing level required to complete necessary functions.

Strategies:

- Fill the following vacant positions.
  - Deputy refuge manager to assist in administration and guide day-to-day activities.
  - Wildlife biologist to monitor management actions and recommend modifications to habitat management actions.
  - Park ranger to assist in administering the refuge's public use program.
  - Equipment operator to focus on habitat restoration activities, invasive species control and facilities maintenance.
  - Outdoor recreation planner (0.5 FTE) to assist in the administration and development of public use program.

Objective 2: Throughout the life of the CCP, maintain current headquarters, administrative facilities and equipment.

Rationale: Adequate support should be provided for management activities.

Strategies:

- Continue operation of the shooting range to facilitate law enforcement firearms prequalification for refuge officers.
- Continue operation of the rock pit to support refuge road requirements.

Objective 3: Throughout the life of the CCP, increase public safety and aesthetic values, and reduce hazards to wildlife by expanding resource clean-up of old building foundations and by closing abandoned water wells.

Objective 4: Throughout the life of the CCP, retain public use facilities that support compatible wildlife-dependent recreation and remove all facilities previously used to support non-wildlife-dependent recreation.

Strategies: The restrooms at the South Shore Boat Ramp, North Shore Boat Ramp, and Knob Hill will remain and continue to be maintained. There are a few facilities that support non-wildlife-dependent recreational uses on the refuge that should be discontinued such as the restrooms at Grays Park, Cottonwood, and Crappie Point.

Objective 5: Throughout the life of the CCP, strive to provide boat ramp access at all water levels.

Rationale: Boat ramps provide access to the reservoir and support compatible wildlife-dependent recreation.

Objective 6: When funding is attained, expand the multi-purpose room in the visitor center to provide adequate space for environmental education programs, hunter education classes, and other uses.

Rationale: Provide adequate space for environmental education programs, hunter education, and other uses.

Partnerships Goal

The refuge will work to complement habitat on the refuge and surrounding landscape by developing partnerships regarding land and water habitat restoration, environmental education, wildlife-dependent public use, research and infrastructure.

Objective 1: Throughout the life of the CCP, seek to maintain existing partnerships and continue to seek new partnerships that promote sound wildlife management on and in the vicinity of the refuge.

Rationale: Refuge staff will continue partnerships to promote sound ecosystem management within and outside the refuge. The refuge will actively participate in partnerships that result in improvements to land health and provide appropriate wildlife habitat in the area. The refuge will collaborate with partners on management of critical wildlife habitats on the refuge and in the surrounding area. The Partners for Fish and

Wildlife biologist will continue to contribute biological expertise and resources to landowners as requested. Improve community awareness and foster appreciation of the refuge and its environment. Existing partnerships include: Solomon Valley Birdwatchers, Kansas, Biological Survey, Boy Scouts, Kirwin Volunteer Fire Department, KDWP, USACE, Reclamation, Kirwin Irrigation District, Fort Hays State University, Aphis, Kirwin NWR Association, Kansas Department of Corrections, Phillips County Visitors and Convention Bureau, Phillips County Invasive Weed Department, and local school districts and educators.

Strategies:

- Increase partnerships focused on habitat and wildlife management.
- Work with partners to promote wildlife-dependent recreation opportunities.
- Work with partners to achieve refuge goals and objectives.
- Engage in partnerships that result in wildlife and/or land-health improvements.
- Participate in the Platte/Kansas Rivers Ecosystem team and others to protect, enhance, and restore wildlife habitats.

6.3 Personnel

Current staffing at the refuge consists of 3 permanent FTEs. Additional permanent and career seasonal staff will be required to implement the strategies in the CCP and effectively monitor the flora and fauna to determine if the goals and objectives of the CCP are being met.

Table 4 shows the current staff and the proposed additional staff required to fully implement the CCP. A staffing assessment of the refuge concluded that 7.5 permanent FTEs was the minimum staffing level required to complete necessary functions. If all positions are funded, the refuge staff will be able to carry out all aspects of this CCP, which will provide maximum benefits to wildlife, maximum efficiency, improve facilities, and provide for increased public use. Projects that have adequate funding and staffing will receive priority for accomplishment. Staffing and funding are requested for the 15-year period of the CCP.

Table 4. Refuge Staffing

	Current	*Proposed (Approved Minimum Staffing)*
Management Staff	Refuge Manager GS-12	Refuge Manager GS-12 Assistant Manager GS-11
Biological Staff		Wildlife Biologist GS-11
Public Use Staff		Park Ranger (law enforcement) GS-9 Outdoor Recreation Planner (6-month career seasonal) GS-9
Administrative Staff	Administrative Assistant GS-8	Administrative Assistant GS-8
Maintenance Staff	Maintenance Mechanic WG-8	Maintenance Mechanic WG-8 Equipment Operator WG-8

6.4 Funding

Projects required to implement the CCP are funded through two separate systems. The first system is the Refuge Operations Needs System (RONS). RONS documents requests to Congress for funding and staffing needed to carry out projects above the existing base budget. Amounts shown include a startup cost of implementing each program with successive yearly costs that are significantly less. Table 5 lists RONS projects required to fully implement the CCP.

Table 5. Refuge Operating Needs System Projects

	Initial Year (thousands $)	*Recurring Annual (thousands $)*
Biologist	$151	$86
Park Ranger (LEO)	$140	$75
Deputy Refuge Manager	$151	$86
Outdoor Recreation Planner	$140	$75
Equipment Operator	$140	$75
Habitat Projects (invasive plants)	$283	$30
Research/Monitoring (RLGIS)	$56	$8
Total	$1,061 k	$435 k

The second system, the Maintenance Management System (MMS), documents the equipment, buildings, and other existing properties that require repair or replacement. Table 6 lists MMS projects required to implement the CCP and maintain the structures and equipment to a safe and productive standard for the 15 years of the CCP.

Table 6. Maintenance Management System Projects

Project	*Cost*
Replace 1982 tractor	$88,000
Expand visitor center	$627,000
Replace unsafe shop building	$410,000

6.5 Step-down Management Plans

The Kirwin NWR CCP is intended to be a broad umbrella plan that outlines general concepts and objectives for habitat, wildlife, public use, cultural resources, and partnerships that will guide refuge management over the next 15 years. Step-down management plans provide greater detail for implementing specific actions authorized by the CCP. Table 7 presents those plans that are anticipated to be needed for Kirwin NWR, their current status, and next revision date.

Table 7. Step-down Management Plans for Kirwin NWR

Step-down Management Plan	*Status of Plan Year Completed*	*Proposed Revision Date*
Integrated Pest Management	1996	2010
Visitor Services	1990	2012
Hunting	1998	Incorporated in next revision of visitor services plan
Habitat Management	1997, 2001	2011
Fire Management	2002	2007
Cultural Resource Management	none	2014

6.6 Monitoring and Evaluation

Adaptive management is a flexible approach to long-term management of biotic resources. This 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 implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

To apply adaptive management, specific survey, inventory, and monitoring protocols will be adopted for the refuge. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations will include ecosystem and other appropriate partner participation. If monitoring and evaluation indicate undesirable effects for target and nontarget species and/or communities, then alterations to the management projects will be made. Subsequently, the CCP will be revised.

Specific monitoring and evaluation activities will be described in the step-down plans (see section 6.5).

6.7 Plan Amendment and Revision

This CCP will be reviewed annually to determine the need for revision. A revision will occur if and when significant information becomes available, such as a change in ecological conditions. The final CCP will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the CCP 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, this plan will be evaluated every 5 years and revised after 15 years.

Contributors

Planning Team

This plan is the result of the extensive, collaborative, and enthusiastic efforts by members of the planning team for the Kirwin National Wildlife Refuge. Many others contributed insight and support. The draft Comprehensive Conservation Plan and Environmental Assessment were written by refuge staff and the refuge planner, with input from other team members.

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Appendix A. Glossary

adaptive 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.

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.

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.

biomass—The total amount of living material, plants and animals, above and below the ground in a particular habitat or area.

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

Birds of Conservation Concern—The Birds of Conservation Concern is the most recent effort to satisfy the 1988 amendment to the Fish and Wildlife Conservation Act, which mandates the Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973" (Service 2002).

boat closure—Closed to all flotation devices.

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

CCP—*See* comprehensive conservation plan.

CFR—*See* Code of Federal Regulations.

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.

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 at the refuge 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.

cultural resource inventory—A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories may involve various levels including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register follows the criteria found in 36 CFR 60.4 (Service Manual 614 FW 1.7).

cultural resource overview—A comprehensive document prepared for a field office that discusses, among other things, its prehistory and cultural history, the nature and extent of known cultural resources, previous research, management objectives, resource management conflicts or issues, and a general statement on how program objectives should be met and conflicts resolved. An overview should reference or incorporate information from
a field office background or literature search described in Section VIII of the Cultural Resource Management Handbook (Service Manual 614 FW 1.7).

dense nesting cover (DNC)—is a mixture of cool-season grasses and legumes, like alfalfa and yellow sweetclover. Some wildlife species, like pheasant, use it for nesting, rearing their broods, roosting and loafing. DNC is high quality nesting cover designed to maximize nesting activity and reproductive success. Many Conservation Reserve Program lands are established with a DNC mixture.

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.

ecological diversity—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).

ecosystem—A dynamic and interrelating complex of plant and animal communities and their associated nonliving environment (climate, water, rocks, nonliving components); 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.

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.

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.

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

federal trust resources—a resource 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, anadromous fish once they enter inland U.S. waterways, and native plant and 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.

FONSI—finding of no significant impact.

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 (Koford et al. 1994); the process of reducing the size and connectivity of habitat patches, making movement of individuals or genetic information between parcels difficult or impossible.

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 (e.g., points, lines and polygons) with nongeographic attributes such as species and age (Koford et al. 1994).

GIBA—Globally Important Bird Area, as designated by the American Bird Conservancy.

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).

GPS—*See* global positioning system.

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 (e.g., wildland fire) or human-caused events (e.g., timber harvest and disking).

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

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.

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.

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 (e.g., 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).

maintenance management system (MMS)—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.

management alternative—*See* alternative.

migration—Regular extensive, seasonal movements of birds between their breeding regions and their wintering regions (Koford et al. 1994); to

pass usually periodically from one region or climate to another for feeding or breeding.

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

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

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

mixed-grass prairie—A transition zone between the tall-grass prairie and the short-grass prairie dominated by grasses of medium height that are approximately 2–4 feet tall. Soils are not as rich as the tall-grass prairie and moisture levels are less.

MMS—*See* maintenance management system.

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—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.

NAWMP—North American Waterfowl Management Plan.

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.

non-wildlife-dependent recreation uses—Use of a refuge that does not depend on the presence of wildlife (e.g., water and jet skiing, personal water craft, camping, swimming, horseback riding, volleyball, basketball, tournament fishing, power and speed boating).

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 (i.e., 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.

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).

palustrine—"Palustrine" comes from the Latin word "palus" or marsh. Wetlands within this category include inland marshes and swamps as well as bogs, fens, tundra, and flood plains.

Palustrine systems include any inland wetland which lacks flowing water and contains ocean derived salts in concentrations of less than .05 percent.

Partners in Flight (PIF)—A Western Hemisphere program designed to conserve Neotropical migratory birds and officially endorsed by numerous federal and state agencies and nongovernmental organizations; also known as the Neotropical Migratory Bird Conservation Program (Koford et al. 1994).

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.

pergola—an arbor formed of horizontal trelliswork supported on columns or posts, over which vines or other plants are trained. A colonnade having the form of such an arbor.

PIF—*See* Partners in Flight.

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 (e.g., ponderosa pine or bunchgrass).

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).

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.

restoration—Management emphasis designed to move ecosystems to desired conditions and processes (e.g., 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.

SAV—*See* submerged aquatic vegetation.

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

SDGFP—South Dakota Department of Game, Fish and Parks.

seasonal boat closure—Closed to all flotation devices.

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

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

shelterbelts—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.

six shell area—A maximum of six shotgun shells per person per day is permitted during all dark goose seasons.

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

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.

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).

submerged aquatic vegetation (SAV)—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.

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.

warm-season grasses—Grasses that begin growth later in the season (early June). These grasses require warmer soil temperatures to germinate and actively grow when temperatures are warmer. Examples of warm-season grasses are Indiangrass, switchgrass, and big bluestem.

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)—a feral administrative unit that is charged with acquiring, overseeing, and managing the waterfowl production areas and easements within a specified group of counties. Most districts are large, covering several counties.

wildlife-dependent recreational use—Use of a refuge that is dependent on the presence of wildlife (e.g., 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.

WPA—waterfowl production area.

Appendix B. Public Involvement

Planning team response to public comments will be completed prior to final approval of the plan.

Appendix C. Key Legislation and Policies

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.

American Conservation and Youth Service Corps: Offers an opportunity for young adults between the ages of 16-25, or in the case of summer programs, 15-21, to engage in approved human and natural resources projects which benefit the public or are carried out on federal or Indian lands. To be eligible for assistance, natural resources programs will focus on improvement of wildlife habitat and recreational areas, fish culture, fishery assistance, erosion, wetlands protection, pollution control and similar projects.

Americans With Disabilities Act (1992): Prohibits discrimination in public accommodations and services.

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

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

Archaeological Resources Protection Act (1979) As Amended: Protects materials of archaeological interest from unauthorized removal or destruction and requires federal managers to develop plans and schedules to locate archaeological resources.

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

Bald and Golden Eagle Protection Act (1940): Prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions.

Clean Air Act (1977) As Amended: Establishes federal standards for various pollutants from both stationary and mobile sources and to provide for the regulation of polluting emissions via state implementation plants. In addition, and of special interest for National Wildlife Refuges, some amendments are designed to prevent significant deterioration in certain areas where air quality exceeds national standards, and to provide for improved air quality in areas which do not meet federal standards ("nonattainment" areas). Federal facilities are required to comply with air quality standards to the same extent as nongovernmental entities (42 U.S.C. 7418).

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

Emergency Wetland Resources Act (1986): Authorizes the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. The Act also requires the Secretary to establish a National Wetlands Priority Conservation Plan, requires the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transfers to the Migratory Bird Conservation Fund amount equal to import duties on arms and ammunition.

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

Environmental Education Act (1990): Establishes the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program. The Office is required to develop and support environmental programs in consultation with other federal natural resource management agencies, including the Fish and Wildlife Service.

Executive Order No. 11593, Protection and Enhancement of the Cultural Environment (1971): Consults with federal and state historic preservation officers to comply with Section 106 of the National Historic Preservation Act of 1966, as amended, if the Service proposes any development activities that would affect the archaeological or historical sites.

Executive Order No. 11987, Exotic Organisms (1977): Requires federal agencies, to the extent permitted by law, to: restrict the introduction of exotic species into the natural ecosystems on lands and waters owned or leased by the United States; encourage States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the U.S.; restrict the importation and introduction of exotic species into any natural U.S. ecosystems as a result of activities they undertake, fund, or authorize; and restrict the use of federal funds, programs, or authorities to export native species for introduction into ecosystems outside the U.S. where they do not occur naturally.

Executive Order No. 11988, Flood plain Management (1977): Provides leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by flood plains.

Executive Order No. 11990, Protection of Wetlands (1977): Directs all federal agencies to avoid, if possible, adverse impacts to wetlands and to preserve and enhance the natural and beneficial values of wetlands. Each agency shall avoid undertaking or assisting in wetland construction projects unless the head of the agency determines that there is no practicable alternative to such construction and that the proposed action includes measures to minimize harm. Also, agencies shall provide opportunity for early public review of proposals for construction in wetlands, including those projects not requiring an EIS.

Executive Order No. 12898, Environmental Justice (1994): Requires minority and low-income populations an opportunity to comment on the development and design of Reclamation activities. Federal agencies shall make achieving environmental justice part of their missions by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

Executive Order No. 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 No. 13007, Indian Sacred Sites (1996): Directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Executive Order No. 13084, Consultation and Coordination with Indian Tribal Governments (1998): Maintains a unique legal relationship with Indian tribal governments as set forth in the Constitution of the United States, treaties, statutes, Executive Orders, and court decisions. Since the formation of the Union, the United States has recognized Indian tribes as domestic dependent nations under its protection. In treaties, our Nation has guaranteed the right of Indian tribes to self-government. As domestic dependent nations, Indian tribes exercise inherent sovereign powers over their members and territory. The United States continues to work with Indian tribes on a government-to-government basis to address issues concerning Indian tribal self-government, trust resources, and Indian tribal treaty and other rights.

Federal Aid in Wildlife Restoration Act (1937) As Amended: Provides funding to States for game and nongame wildlife restoration work. This Act, commonly referred to as the "Pittman-Robertson Act," funds from an excise tax on sporting arms and ammunition are appropriated to the Secretary of the Interior annually and apportioned to States on a formula basis for approved land acquisition, research, development and management projects and hunter safety programs.

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.

Fish and Wildlife Act (1956): Establishes a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Fish and Wildlife Conservation Act (1980): Creates a mechanism for federal matching funding of the development of state conservation plans for nongame fish and wildlife. Subsequent amendments to this law require that the Secretary monitor and assess migratory nongame birds, determine the effects of environmental changes and human activities, identify birds likely to be candidates for endangered species listing, and identify conservation actions that would prevent this from being necessary. In 1989, Congress also directed

the Secretary to identify lands and waters in the Western Hemisphere, the protection, management or acquisition of which would foster conservation of migratory nongame birds. These activities are intended to assist the Secretary in fulfilling the Secretary's responsibilities under the Migratory Bird Treaty Act and the Migratory Bird conservation Act, and provisions of the Endangered Species Act implementing the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere.

Fish and Wildlife Coordination Act (1934): Authorizes the Secretary of the Interior to assist federal, state and other agencies in development, protection, rearing and stocking fish and wildlife on federal lands, and to study effects of pollution on fish and wildlife. The Act also requires consultation with the Fish and Wildlife Service and the wildlife agency of any State wherein the waters of any stream or other water body are proposed to be impounded, diverted, channelized or otherwise controlled or modified by any federal agency, or any private agency under federal permit or license, with a view to preventing loss of, or damage to, wildlife resources in connection with such water resource projects. The Act further authorizes federal water resource agencies to acquire lands or interests in connection with water use projects specifically for mitigation and enhancement of fish and wildlife.

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

Food Security Act (1985) As Amended: Authorizes acquisition of easements in real property for a term of not less than 50 years for conservation, recreation, and wildlife purposes.

Historic Sites, Buildings and Antiquities Act (1935): Declares a national policy to preserve historic sites and objects of national significance, including those located on refuges. This Act popularly known as the Historic Sites Act, among other things, designates National Historic and Natural Landmarks under authority of this Act. As of January 1989, 31 National Wildlife Refuges contained such sites.

Land and Water Conservation Fund Act (1965): Uses the receipts from the sale of surplus federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

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

Migratory Bird Hunting and Conservation Stamp Act (1934) As Amended: Requires each waterfowl hunter 16 years of age or older to possess a valid federal hunting stamp. The "Duck Stamp Act," as this authority is commonly called, requires receipts from the sale of the stamp are deposited in a special treasury account known as the Migratory Bird Conservation Fund.

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

National Community Service Act (1990): Authorizes several programs to engage citizens of the U.S. in full- and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Several provisions are of particular interest to the U.S. Fish and Wildlife Service.

National Environmental Policy Act (1969) As Amended: Requires all federal agencies to examine the impacts upon the environment that their actions might have, to incorporate the best available environmental information, and the use of public participation in the planning and implementation of all actions. All federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documentation to facilitate sound environmental decision-making. NEPA requires the disclosure of the environmental impacts of any major federal action that affects in a significant way the quality of the human environment.

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 historic resources. As of January, 1989, 91 historic sites on National Wildlife Refuges have been placed on the National Register.

National Wildlife Refuge System Administration Act (1966): Authorizes the Secretary of the Interior to "permit the use of any area within the Refuge System for any purpose including, but not limited to, hunting, fishing, public recreation and accommodations, and access whenever he determines that such uses are compatible with the major purposes for which such areas were established." Consolidates authorities for the

various categories of areas previously established that are administered by the Secretary of the Interior for conservation of fish and wildlife, including species that are threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, etc., which are hereby designated as the National Wildlife Refuge System. Provides that the Secretary may authorize hunting and fishing to the extent practicable and consistent with state fish and wildlife laws and regulations.

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

North American Wetlands Conservation Act (1968): Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico. The Act converts the Pittman-Robertson account into a trust fund, with the interest available without appropriation through the year 2006 to carry out the programs authorized by the Act, along with an authorization for annual appropriation of $15 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act.

Available funds may be expended, upon approval of the Migratory Bird Conservation Commission, for payment of not to exceed 50 percent of the United States share of the cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands). At least 50 percent and no more than 70 percent of the funds received are to go to Canada and Mexico each year.

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.

Refuge Revenue Sharing Act (1935) As Amended: Provides for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges. Public Law 88-523 (1964) revised this Act and required that all revenues received from refuge products, such as animals, timber and minerals, or from leases or other privileges, be deposited in a special treasury account and net receipts distributed to counties for public schools and roads. Payments to counties were established as: 1) on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land; and 2) on land withdrawn from the public domain, 25 percent of net receipts and basic payments under Public Law 94-565 (31 U.S.C. 1601-1607, 90 Stat. 2662), payment in lieu of taxes on public lands.

Refuge Trespass Act (1906): Provides first federal protection for wildlife on National Wildlife Refuges. This Act made it unlawful to hunt, trap, capture, willfully disturb, or kill any bird or wild animal, or take or destroy the eggs of any such birds, on any lands of the United States set apart or reserved as refuges or breeding grounds for such birds or animals by any law, proclamation, or executive order, except under rules and regulations of the Secretary. The Act also protects government property on such lands.

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

Transfer of Certain Real Property for Wildlife Conservation Purposes Act (1948): Provides that upon determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred, without reimbursement, to the Secretary of the Interior if the land has particular value for migratory birds, or to a state agency for other wildlife conservation purposes.

Wilderness Act (1964): Directs the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems for inclusion in the National Wilderness Preservation System.

Appendix D. Divestiture Consideration

Introduction

During the Comprehensive Conservation Plan (CCP) process, Kirwin National Wildlife Refuge (Kirwin NWR) was identified as a candidate for divestiture from the National Wildlife Refuge System (Refuge System). The refuge was analyzed by the planning team, Regional Office, and the refuge manager to determine if it warranted status as a national wildlife refuge. Following the analysis, a decision was made by the Regional Office to retain Kirwin in the Refuge System.

This document utilizes region 6's newly developed divestiture model to articulate why Kirwin NWR was not recommended for divestiture.

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 if 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 Kirwin, the model proved that the refuge was not a candidate for divestiture.

The Divestiture Model—Criteria and Rules

Region 6's divestiture model was developed during a two-day workshop held December 14–15, 2004, at the U.S. Fish and Wildlife Service Regional Office in Denver. The purpose of the workshop was to standardize policy in region 6 for identifying which refuges to consider for divestiture. At this time, the model is still being tested and has not been finalized.

The model consists of a set of eight questions that must be addressed when considering a refuge for divestiture. The questions were prioritized as primary and secondary criteria for evaluation.

Primary Criteria

1. **Does the refuge achieve one or more of the NWRS goals?**

Explanation: Look beyond the purpose to see if the refuge is meeting NWRS goals. refuge purpose is forever, but may become obsolete over time (e.g., recovery of threatened and endangered species). Obsolete purpose does not necessarily mean divestiture of the refuge should be pursued.

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

Explanation: Try to understand the intent of decision makers at the time the refuge was established.

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

Explanation: The planning team that answers this question must define "substantial." Refuge context is the key consideration. Substantial is relative to species, location, and region.

Example: Flocks of migratory birds (thousands) would be considered substantial.

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

To answer "yes" on biological integrity, the answer on both 4A and 4B should be yes.

Explanation: The presence of native habitat is not enough to meet Refuge System standards; the Service is not trying to save every remnant species. Identify what has changed from presettlement habitat conditions and consider the contribution to regional biodiversity.

4B. **Does the Service have or can it reasonably acquire the right to restore the habitat?**

Biological integrity = Native habitat and contribution to regional biodiversity.

Degraded = Native vegetation exists but the value has been reduced due to nonnatives and loss of ecological functions.

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

Secondary Criteria

6. **Politics/Community—Is there such significant community interest in and support for the refuge that divesture would result in unacceptable long-term public relations?**

Explanation: Environmental education is a means to an end, not a purpose in itself; conservation must be broader than the refuge. Public use should be considered as criteria only when public use is legislated in the purpose.

7. **Jurisdiction—Do we have or can we acquire the jurisdiction to meet the refuge's purpose, Refuge System mission and goals, and prevent incompatible uses?**

8. **Other Land Manager—Can another agency or organization achieve most or all of the purposes of the refuge without the Service having to incur costs?**

Only ask this question if the answer to questions 1 and 2 are "no."

Additional Considerations

9. **Cost/Liability—Cost will never be a primary or secondary factor for divesting a refuge; cost (in itself) should not be a criterion for divesting land.**
   - If cost is a consideration for divestiture, it is because some other factor is driving the decision.
   - Cost is a piece of information that can be used to justify decision.
   - Liability is an additive to a decision to either keep or divest a refuge, but it is not a primary or secondary decision-making criteria.

Rules

The following five rules organize the responses to the above criteria questions and determine whether to consider a refuge for divestiture.

Rule 1: IF the refuge cannot meet one or more Refuge System goals, THEN it should be considered for divestiture.

Rule 2: IF the answers to questions 1 through 4 are as follows:
1. Yes — Meets a Refuge System goal, but only the education goal
2. No — Does not meet refuge purpose
3. No — Does not substantially support trust species
4. No — Does not possess biological integrity

THEN the refuge should be considered for divestiture.

Rule 3: IF the answers to questions 1 through 5 are as follows:
1. Yes — Meets a Refuge System goal, but only the education goal
2. Yes — Purpose
3. No — Trust Species
4. No — Biological Integrity
5. No — Connectivity

THEN the refuge should be considered for divestiture.

Rule 4: IF the answers to questions 1 through 6 are as follows:
1. Yes — Goal
2. Maybe — Purpose
3. No — Trust Species
4. Yes — Biological Integrity
5. No — Connectivity
6. Yes — Jurisdiction

THEN keep the refuge (positive rule).

Rule 5: IF the answers to questions 1 through 3 are as follows:
1. Yes — Goal
2. Yes — Purpose
3. Yes — Trust Species

THEN keep the refuge (positive rule).

Applying the Model to Kirwin NWR

When applied to Kirwin NWR, the divestiture model indicated that Kirwin should *not* be considered for divestiture.

This section provides a detailed and objective account of how Kirwin was evaluated using the divestiture model. In keeping with the model's format, the refuge is subject to the criteria questions until the responses represent one of the above-mentioned rules—either to keep the refuge or consider it for divestiture.

Primary Criteria

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

Kirwin NWR achieves all six of the National Wildlife Refuge System goals. The refuge meets its purpose by perpetuating migratory bird populations. Kirwin NWR conserves and restores wildlife populations and mixed-grass prairie habitat. Additionally, the refuge conserves diversity of fish, wildlife and plants including 236 bird species, 30 reptile species, 8 amphibian species, 19 fish species, 45 mammal species and over 138 plant species.

Furthermore, Kirwin NWR conserves and restores a representative ecosystem of the United States—the mixed-grass prairie. The refuge lies solidly in the mixed-grass prairie ecoregion and is dominated by the bluestem-grama association. Currently 5,000 acres of the refuge are either unplowed virgin sod or in various stages of prairie restoration. Another 1,400 acres of the refuge are slated to be restored to prairie by 2008. Adjacent to the southeast side of the refuge are over 18,000 acres of native mixed-grass prairie. Adjacent to the west side of the refuge are over 22,000 acres of native mixed-grass prairie. Currently, these two parcels of habitat do not connect. The refuge is the hinge-pin linking these two large prairie tracts. Mixed-grass prairie will be restored in critical areas of the refuge to ensure that an expansive block of over 46,000 acres of mixed-grass prairie is added to the landscape for the benefit of migratory grassland birds by 2008.

Compatible wildlife-dependent public use opportunities at Kirwin NWR ensure that the refuge fosters understanding and appreciation of fish, wildlife and plants and their conservation. In 2004, visitor use days totaled 75,000 (fishing 34,000, hunting 29,000, wildlife observation and photography 12,000). Annual events at Kirwin include Eagle Day (400 visitors), Kids Fishing Day, Eco-Meet, monthly environmental education programs, and Boy Scout/Girl Scout programs. Although noncompatible uses are permitted on the refuge, these uses have been declining in recent years. The refuge has made a concerted effort to minimize the impacts of these noncompatible uses on the habitat. Over the course of the entire 2004 summer, refuge staff saw only four water skiers and one jet skier. On Labor Day weekend, generally the last opportunity of the year to camp, only four campers were observed on the refuge. One alternative in the draft CCP calls for the prohibition of all noncompatible uses.

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

Kirwin NWR's purpose reads as follows:

> Kirwin National Wildlife Refuge ."... shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon,...the Secretary of the Interior shall have the right to assume the management and administration of such lands in behalf of the National Migratory Bird Management Program..." 16 U.S.C. 715d (Fish and Wildlife Coordination Act).

In keeping with the intent of the above legislation, Kirwin NWR is managed for wildlife with a special emphasis on migratory birds. *(For further discussion on migratory bird conservation, see question 3.)*

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

Kirwin NWR does provide substantial support for migratory birds such as waterfowl, grassland dependents, and bald eagles. The refuge provides feeding and resting areas for thousands of waterfowl annually. Peak numbers for waterfowl include 70,000 Canada geese, 39,000 white-fronted geese, 26,000 snow/Ross' geese, and 218,000 ducks. Great blue heron and double-crested cormorant rookeries are also present on the refuge.

Deepwater Habitat (1,300 acres)

Species of concern that use deepwater habitat include eared grebe, western grebe, American white pelican, redhead, lesser scaup, Franklin's gull, common tern, and black tern. Threatened and endangered species that use this habitat are bald eagle and least tern.

Shoreline Habitat (200 acres)

Species of concern that use shoreline habitat include eared grebe, western grebe, American white pelican, Canada goose, white-front goose, snow-Ross' goose, wood duck, mallard, northern pintail, American wigeon, redhead, lesser scaup, snowy egret, whooping crane, piping plover, snowy plover, American avocet, semipalmated sandpiper, least sandpiper, Baird's sandpiper, long-billed dowitcher, Wilson's phalarope, Franklin's gull, common tern, and black tern. Threatened and

endangered species that use this habitat are bald eagle and least tern.

Riparian Habitat (2 miles)
Species of concern that use riparian habitat include wood duck, Swainson's hawk, northern bobwhite quail, yellow-billed cuckoo, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, American tree sparrow, and Harris' sparrow. Bald eagles are a threatened species found in the riparian habitat.

Prairie Habitat (5,000 acres currently, 6,400 potentially following restoration; additionally, over 40,000 acres of prairie on private land adjacent to the refuge)
Species of concern that use prairie habitat include mallard, Swainson's hawk, northern harrier, greater prairie chicken, upland sandpiper, burrowing owl, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, chestnut-collared longspur, and Lapland longspur.

Dry Reservoir/Transition Zone Habitat (3,500 acres)
This area consists of prairie, cropland, shrub savanna, dense trees, and riparian habitats. Species of concern that use dry reservoir/transition zone habitat include Swainson's hawk, northern harrier, greater prairie chicken, yellow-billed cuckoo, short-eared owl, red-headed woodpecker, western kingbird, loggerhead shrike, Bell's vireo, Baltimore oriole, dickcissel, lark sparrow, American tree sparrow, grasshopper sparrow, Harris' sparrow, and chestnut-collared longspur.

Threatened and endangered species that use this habitat type are bald eagle and whooping crane.

Threatened and Endangered Species Summary
Up to 105 bald and golden eagles utilize the refuge from October to March every year. In normal years, least terns occur on the refuge with nesting occurring periodically. Whooping cranes annually visit the refuge during spring and fall migration.

Rule 5 Applies

According to Rule 5 of the Divestiture model, any refuge that answers "yes" to the first three questions regarding meeting Refuge System goals, fulfilling the refuge purpose, and supporting trust species does not warrant further consideration for divestiture. Therefore, Kirwin NWR is not a candidate for divestiture and should remain in the NWRS.

Other Considerations

Although Kirwin is not subject to the other criteria because it falls out of the model with the positive responses to questions 1, 2, and 3, the remaining primary criteria do provide additional support for the argument to keep Kirwin in the Refuge System and warrant a brief discussion in this summary report.

4A. Does the refuge have biological integrity? If not, is it feasible to restore the biological integrity?
4B. Does the Service have or can it reasonably acquire the right to restore the habitat?

Kirwin NWR does have biological integrity. Located within the mixed-grass prairie ecoregion, the refuge contains 5,000 acres of prairie—a combination of restored grasslands and unplowed, virgin sod. Kirwin contributes to regional biodiversity by providing feeding and resting areas for multitudes of migratory birds within the Central Flyway. Restoration of prairie habitat is ongoing and refuge staff endeavors to restore an additional 1,400 acres of prairie by 2008.

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

Kirwin NWR's contribution to landscape conservation is evidenced by its location between two fragmented tracts of native mixed-grass prairie. Over 18,000 acres of native mixed-grass prairie abut the refuge's southeast boundary and to the west of the refuge lies over 22,000 acres of native mixed-grass prairie. With its own 5,000 acres of virgin or restored prairie habitat, Kirwin NWR serves as the connecting piece between these two large patches of native mixed-grass prairie. When considered altogether, this 45,000-acre patch of prairie provides substantial habitat for migratory grassland birds.

The refuge also provides a stepping stone to the waterfowl resources of the Central Flyway by providing resting and feeding areas during migrations and during the winter for 70,000 Canada geese, 39,000 white-fronted geese, 26,000 snow/Ross' geese, and 218,000 ducks. Given Kirwin NWR's location in the relatively arid mixed-grass prairie, the deepwater, shoreline, riparian, and upland habitats provide an important stepping stone for over 230 trust species.

Appendix E. Draft Compatibility Determinations

Refuge Name: Kirwin National Wildlife Refuge; Established June 17, 1954.

Establishing and Acquisition Authority: Fish and Wildlife Coordination Act.

Refuge Purpose:

> *.".. shall be administered by him [Secretary of the Interior] directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ..." 16 U.S.C. § 664 (Fish and Wildlife Coordination Act).*

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."*

1. Description of Proposed Use: Use of Farming, Grazing, and Haying as Management Tools—Continue upland management activities such as farming, grazing, and haying that are conducted under cooperative farming or special-use permit by private individuals. Currently these economic uses are used as tools to manage habitat for wildlife.

Cropland is planted to establish seedbeds free of invasive plants for the establishment of grassland, to provide food for migratory birds, and to control invasive plant species. The farming rotation is based on a diversified crop rotation to control invasive plants and insects, and to provide for soil fertility. The crops that may be used in the rotation include, but are not limited to, corn, milo (grain sorghum), winter wheat, cane (forage sorghum), and spring grains (e.g., barley).

The Service's policy is to restrict pesticide use on National Wildlife Refuges. All cooperative farming permits do not allow insecticides and restrict the use of herbicides to those least toxic and persistent in the environment.

Availability of Resources: The needed staff time for development and administration of cooperative farming, grazing, and haying programs is stretched thin to maintain existing programs. If additional staff support were available, these programs could be expanded to use these tools more effectively and additional monitoring could be accomplished.

Additional staff (assistant refuge manager) is identified in the CCP. This position would be needed to fully accomplish certain goals of the CCP and improve existing programs.

Anticipated Impacts of the Use: Current management affects approximately 25 percent of the uplands, transition zone (dry reservoir bottom), and riparian zones. Under the draft CCP, management would place increased emphasis on managing refuge habitats for migratory birds.

Without management, general habitat conditions would gradually deteriorate due to long periods of rest. While some short-term wildlife and habitat disturbance does occur with these activities, the long-term benefits to wildlife outweigh these short-term disturbances.

No cultural resources would be impacted. No impact to endangered species should occur.

Determination: The use of haying, grazing, and farming as habitat management tools is compatible.

Stipulations Necessary to Ensure Compatibility:

- Require general and special conditions for each permit to ensure consistency with management objectives.
- Restrict farming permittees to a list of approved chemicals that are less detrimental to wildlife and the environment.
- Restrict farming permittees to a list of crops that are beneficial to migratory birds.

Justification: To maintain and enhance habitat for migratory birds, some habitat manipulation needs to occur. Prairie grassland habitat conditions would deteriorate without the use of a full range of management tools. Migratory bird nesting and feeding habitat and ecological diversity would decrease as habitat suitability for these species declines. Invasive plant species would increase and habitat diversity would decrease.

Farming provides a useful tool to control invasive plants, restore prairie grasslands, provide open areas, and improve habitat conditions for the nesting, and feeding of migratory birds. Farming facilitates wildlife observation, wildlife photography, and environmental education by attracting and concentrating wildlife in areas where they are highly visible.

Mandatory 10-year Reevaluation Date: 2015

2. Description of Proposed Use: Environmental Education and Interpretation—Continue to provide opportunities for environmental education and interpretation.

Environmental education consists of activities conducted by refuge staff. Interpretation occurs in less formal activities with refuge staff through exhibits, educational trunks, signs, and brochures.

Currently, environmental education and interpretation activities are usually conducted at the refuge office. Programs and activities are also conducted at Bluegill Point, and Knob Hill day use areas. Additional programs are conducted at schools and other locations as personnel are available.

The CCP proposes an expansion of the multi-purpose room of the refuge office. This expansion would provide enough room, displays, and educational materials to maximize the public's learning experience while visiting the refuge. The remainder of the refuge would provide excellent opportunities for environmental learning. These uses occur year-round.

The CCP proposes to continue with the above uses and add the following to improve environmental education and interpretation opportunities for visitors.

- Expand the multi-purpose room of the refuge office.
- Update and improve refuge signs.
- Update existing brochures.
- Expand and enhance environmental education through various initiatives such as educational displays, presentations, and websites that feature programs, and wildlife of the refuge.

Availability of Resources: Currently all environmental education and interpretation are conducted using available resources. Implementing new programs, activities, and facilities outlined in the CCP is tied to funding requests in the form of refuge operations needs system (RONS) and maintenance management system (MMS) projects in chapter 6.

Anticipated Impacts of Use: Minimal disturbances to wildlife and wildlife habitat would result from these uses at the current and proposed levels. Adverse impacts are minimized through careful timing and placement of activities. Some disturbance to wildlife would occur in areas frequented by visitors. There would be some minor damage to vegetation, littering, and increased maintenance. Location and time limitations placed on environmental education and interpretation activities would ensure that this activity would have only minor impacts on wildlife and would not detract from the primary purpose of the refuge.

Determination: Environmental education and interpretation are compatible.

Stipulations Necessary to Ensure Compatibility

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

Justification: Based on biological impacts described in the EA and the draft CCP, it is determined that environmental education and interpretation within the Kirwin National Wildlife Refuge would not materially interfere with or detract from the purpose for which the refuge was established.

Environmental education and interpretation are priority public uses listed in the National Wildlife Refuge System Improvement Act of 1997. By facilitation of environmental education, refuge visitors would gain knowledge and an appreciation of fish, wildlife, and their habitats, which would lead to increased public awareness

and stewardship of migratory birds, and natural resources. Increased appreciation for migratory birds, and natural resources would support and complement the Service's actions in achieving the purposes of the refuge and the mission of the National Wildlife Refuge System.

Mandatory 15-year Reevaluation Date: 2020

3. Description of Proposed Use: Wildlife Observation and Wildlife Photography—Continue to provide opportunities that support priority wildlife-dependent recreation.

Wildlife observation and wildlife photography are facilitated by two hiking trails, two pull-outs with pergollas (observation platforms), and several parking areas (that are also used in support of hunting and fishing).

The CCP proposes to continue the above uses and add the folowing to improve wildlife observation and wildlife photography:

- Hire an outdoor recreation planner.
- Hire a full-time law enforcement officer to enforce wildlife laws.
- Update and improve refuge signs.
- Update existing brochures.

Availability of Resources: Currently, the programs for wildlife observation and wildlife photography are administered using available resources. Implementing new programs, activites, and facilities outlined in the CCP are tied to funding requests in the form of RONS and MMS projects (chapter 6).

Anticipated Impacts of Use: Anticipated impacts from visitors engaged in wildlife observation and wildlife photography include minor damage to vegetation, littering, increased maintenance activity, potential conflicts with other visitors, and minor disturbances to wildlife. These activities would have only minor impacts on wildlife and would not detract from the primary purposes of the refuge. All other potential impacts are considered minor.

Determination: Wildlife observation and wildlife photography are compatible.

Stipulations Necessary to Ensure Compatibility

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

Justification: Based on the anticipated biological impacts above and in the EA, it is determined that wildlife observation and wildlife photography on the Kirwin National Wildlife Refuge would not interfere with the habitat goals and objectives or purposes for which it was established.

Mandatory 15-year Reevaluation Date: 2020

4. Description of Use: Recreational Fishing—Continue recreational fishing in accordance with state regulations.

The primary game fish are walleye, black bass, white bass, wipers, crappie, and channel catfish. Foot travel is allowed in all parts of the refuge. There are three boat ramps that are available at varying water elevations. Anglers park within the road right-of-way or designated parking areas if available.

Fishing visitations and success fluctuate according to water conditions in the reservoir, Bow Creek, and the North Fork Solomon River. The river and creek have marginal fisheries due to their seasonal flows. During the prairie's wet cycles, high water in the reservoir promotes fish spawning and vegetation provides cover. Fish populations can flourish until the reservoir returns to normal (low) water levels.

Availability of Resources: The fishing program is administered using available resources.

Anticipated Impacts of Use: Fishing and other human activites cause disturbance to wildlife.

Determination: Recreational fishing is compatible.

Stipulations Necessary to Ensure Compatibility

- See "Boating in support of the six priority public uses" CD for additional requirements.
- Require that fishing follow state regulations.
- Monitor vehicle use for wildlife disturbance, law enforcement violations., etc.
- Do not permit unattended boats to remain overnight.

Justification: Based on the biological impacts addressed above and in the EA, it is determined that recreational fishing would not materially interfere with the habitat goals and objectives or purposes for refuge establishment.

Fishing is a priority public use as listed in the National Wildlife Refuge System Improvement Act of 1997.

Mandatory 15-year Reevaluation Date: 2020

5. Description of Use: Recreational Hunting—Kirwin NWR allows hunting in four distinct areas.

- The western portion is only open to archery deer hunting.
- The Bow Creek area is open to waterfowl, doves, pheasants, quail, turkey, prairie chickens, snipe, coots, cottontail rabbits, fox squirrels, and archery deer hunting.
- The area between Quillback Cove and Prairie Dog Town is open to the same species as Bow Creek, except no more than six shells are allowed per hunter per day during dark goose seasons.
- The areas from Crappie Point to the dam, and the area around Knob Hill is open to the same species as Bow Creek, except that waterfowl hunting is not allowed.

Hunting pressure for upland game centers around opening weekends of pheasant and quail. Hunting pressure for waterfowl increases as waterfowl numbers increase. This varies annually depending on the weather.

Availability of Resources: The current administration of hunting programs is conducted using available resources.

Anticipated Impacts of Use: Hunting and other human activites cause disturbance to wildlife. Hunting has shown no detrimental environmental impacts to habitats or wildlife. Hunting harvests a small percentage of the populations of waterfowl and upland game species, which is in accordance with wildlife objectives and principles.

Restricting vehicle use to designated purposes, times, and established roads/trails, and parking areas minimizes habitat damage and disturbance to wildlife.

Determination: Recreational hunting is compatible.

Stipulations Necessary to Ensure Compatibility

- Only nontoxic shot is permitted on the refuge when hunting with a shotgun (waterfowl, upland game, turkey).
- Hunting must be in accordance with federal, state, and refuge specific regulations.
- Vehicle travel is limited to designated established roads/trails and parking areas.

Justification: Hunting on National Wildlife Refuges has been identified as a priority public use in the National Wildlife Refuge System Improvement Act of 1997. Hunting is a legitimate wildlife management tool that can be used to manage populations.

Based on the biological impacts anticipated above and in the EA, it is determined that recreational hunting at Kirwin NWR would not materially interfere with or detract from the purposes for which this refuge was established or its habitat goals and objectives.

One of the secondary goals of the National Wildlife Refuge System is to provide opportunities for public hunting when it is found to be compatible.

Mandatory 15-year Reevaluation Date: 2020

6. Description of Use: Boating in support of the six priority public uses—Continue to allow motorized and nonmotorized boating in support of hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

Availability of Resources: The current administration of the boating program is conducted using available resources.

Anticipated Impacts of Use: Hunting and other human activities cause disturbance to wildlife. Disturbance to migrating and wintering waterfowl will be reduced by implementing the seasonal boat closure on the reservoir north of Crappie Point.

Determination: Boating in support of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation) is compatible.

Stipulations Necessary to Ensure Compatibility

- Implement a seasonal boat closure from October 1 to April 1, on the reservoir

north of Crappie Point, when the water level is below 1,722 feet in elevation.

- Move the boat closure buoys from Railroad Flats to Grays Park and leave them there at all water levels. (This is made possible by implementing the seasonal boat closure.)
- Continue to allow motorless boats and float tubes in the area that is closed to boating (in the Solomon Arm) from August 1 to September 30.
- Continue to allow float tubes in areas open to boating.
- Continue the No Wake zone in Bow Creek.
- Continue the No Wake zone within 300 feet of all shorelines and islands.
- Boats must be equipped and operated in accordance with Kansas Boat and Water Safety Laws and appropriate federal regulations.

Justification: Based on biological impacts described in the EA and the draft CCP, it is determined that boating in support of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation) within the Kirwin NWR would not materially interfere with or detract from the purpose for which the refuge was established.

Boating is not a priority public use. However, it does facilitate the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, interpretation). By specifying areas, time of year, no wake zones, and implementing the seasonal boat closure, boating is determined to be compatible.

Mandatory 10-year Reevaluation Date: 2015

7. Description of Use: Firewood Cutting— Continue to allow the cutting of firewood in designated areas to facilitate refuge management. The main reason for allowing the cutting of firewood is to remove woody vegetation from areas where replanting and/or restoring native prairie is occurring. Other resaons include reducing fuel loading, and preventing destruction/killing of desireable live native trees in portions of riparian areas, etc.

Availability of Resources: Resources are currently available to oversee the cutting of firewood. The workload of the staff involves issuing permits, checking permits in the field, etc.

Anticipated Impacts of Use: Anticipated adverse impacts to the refuge are minimal. Temporary displacement of wildlife from the area where cutting in occurring is expected. However, the benefits to migratory grassland birds exceeds the temporary disturbance (i.e., removing trees from grasslands reduces avian predators, nest parasites, and mammalian predators on grassland birds).

Determination: Firewood cutting is compatible.

Stipulations Necessary to Ensure Compatibility

- Firewood cutting may be allowed by special use permits issued by the refuge manager.
- Firewood cutting will only be allowed in areas specified by the refuge manager.

Justification: The refuge is currently in the process of removing trees for several reasons, including prairie enhancement and restoration, eliminating invasive terrestrial plants, gaining physical access to allow for noxious weed control, etc. Using contractors to remove trees costs approximately $200 per acre, depending on how dense the trees are. Typically trees are piled and burned. Burning of the piles can sterilize the soil for a period of time.

Most of the trees are in places that were historically migratory grassland bird habitat. It is identified in the CCP that a block of 5,000 acres of prairie will be restored/enhanced. In order to accomplish this goal, removal of trees must occur.

Mandatory 10-year Reevaluation Date: 2016

Appendix F. Fire Management Program

The U.S. Fish and Wildlife Service has administrative responsibility, including fire management, on approximately 10,778 acres of National Wildlife Refuge lands, in Phillips, Kansas.

Fire: A Critical Natural Process

In ecosystems in the prairies of the Great Plains, vegetation has evolved under periodic disturbance and defoliation from bison, fire and drought. This periodic disturbance is what kept the ecosystem diverse and healthy while maintaining significant biodiversity for thousands of years. Historically, natural fire and including native American ignitions, have played an important disturbance role in many ecosystems by removing fuel accumulations, decreasing the impacts insects and diseases, stimulating regeneration, cycling critical nutrients, and providing a diversity of habitats for plant species and wildlife.

When fire is excluded on a broad scale (i.e., several decades) as it has been in many areas, the unnatural accumulation of living and dead fuel can contribute to degraded plant communities and wildlife habitats. These fuel accumulations often change fire regime characteristics, and have created a potential in many areas across the country for uncharacteristically severe wildland fires. These catastrophic wildfires often pose risks to public and firefighter safety. In addition, they threaten property and resource values such as wildlife habitat, grazing opportunities, timber, soils, water quality, and cultural resources.

Return of fire is essential for healthy vegetation and wildlife habitat in most ecosystems including grasslands and wetlands, and in woodlands and forests. When integrated back into an ecosystem, fire can help restore and maintain healthy systems and reduce the risk of wildland fires. To facilitate fire's natural role in the environment, fire must first be integrated into land and resource management plans and activities on a broad scale. Reintroduced fire can:

- Improve waterfowl habitat, wetlands and riparian areas by reducing the density or modify the species in the vegetation.
- Improve deer and elk habitat, especially in areas with shortages such as winter habitat and on spring and fall transitional ranges.
- Sustain biological diversity;
- Improve access in woodlands and shrublands.
- Improve soil fertility.
- Improve the quality and amount of livestock forage.
- Improve growth in immature woodlands by reducing density.
- Remove excessive build-up of fuels.
- Reduce susceptibility of plants to insects and disease caused by moisture and nutrient stress.
- Improve water yield for off-site activities and communities 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 utilize the appropriate management response for all wildland fires 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 essential 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 upon values to be protected, costs, and land and resource management objectives,
- FMPs and activities are based upon 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 resources management plans (e.g., the Comprehensive Conservation Plan). Fire Management Plans 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 Kirwin Refuge will protect life, property, and other resources from wildfire by safely suppressing all wildfires. Prescribed fire and manual and/or mechanical fuel treatments will be utilized in an ecosystem management context for habitat management, and to protect both federal and private property. Fuel reduction activities will be applied where needed, especially in areas with a higher proportion of residences that may be considered "Wildland Urban Interface" (WUI) areas.

All aspects of the fire management program would be conducted in a manner consistent with applicable laws, policies, and regulations. The station will maintain a Fire Management Plan and implement the Plan to accomplish resource management objectives. Prescribed fire and manual and/or mechanical fuels treatments will be applied in a scientific way under selected weather and environmental conditions, on approximately 500 to 2,000, over a 5-year average, for native and restored prairie habitat, to accomplish habitat management objectives.

Fire Management Goal:

Restore and enhance fire as an ecosystem process within prairie habitats. The return and maintenance of fire is essential for wildlife habitat in these ecosystems.

Fire Management Objective:

Fire is an important management tool that can be utilized to accomplish habitat management objectives. If not used properly, fire is also a tool that can quickly damage or destroy natural resources, equipment, building and property, and hurt or kill those that work with it. Prescribed fire and manual and/or mechanical fuels treatments will be used to reduce hazardous fuels and on refuge lands to reduce the intensity and severity of wildland fires. Special attention will be given to Wildland Urban Interface areas, both on Service-owned and adjacent lands, in order to reduce the risk of wildfires to communities and improvements.

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/or mechanical means, timing, and monitoring are all found in a more detailed list, in a step-down Fire Management Plan.

All management actions would use prescribed fire and manual and/or mechanical means to restore and maintain desired habitat conditions and control nonnative vegetation and the spread of woody vegetation within the diverse ecosystem habitats. The prescribed fire program will be outlined in the Fire Management Plan for the refuge. Detailed Prescribed Burn Plans will be developed which describe the following:

- burn units and their predominant vegetation;
- the primary objectives for the units;
- acceptable range of results;
- site preparation requirements;
- weather requirements;
- safety considerations and measures to protect sensitive features;
- burn-day activities;
- communications and coordination for burns;
- ignition techniques;
- smoke management procedures; and
- post-burn monitoring.

Prescribed fire temporarily reduces air quality by reducing visibility and releasing several components through combustion. The four major components are carbon monoxide, carbon dioxide, hydrocarbons, and particulates. Varying amounts of particulate content are generated in different types of fuels (e.g., wildlife habitat improvement burns vs. fuel reduction burns). The refuge will meet the Clean Air Act emission standards by adhering to the Kansas State Implementation Plan requirements during all prescribed fire activities.

Fire Management Organization, Contacts and Cooperation:

Qualified fire management technical oversight and support for the refuge will be established by the Region using the Fire Management District approach. Under this approach, an appropriate fire management staffing organization will be determined by established modeling systems based on the fire management workload of a group of refuges and possibly even that of interagency partners. (Fire management workload consists of historical wildfire suppression activities and historical and planned fuels treatment workload.) Depending on budgets, fire management staffing and support equipment may be located on the station or at other refuges in the district and shared between all units. Wherever possible, fire management activities will be conducted in a coordinated and collaborative manner with federal and nonfederal partners.

With the signature of this CCP, a new Fire Management Plan would be developed for the Kirwin NWR, as stand-alone Fire Management Plan, a Fire Management Plan with two or three refuges (i.e., three refuges in the fire management district), or as an interagency Fire Management Plan.

Appendix G. Species List

This appendix shows the scientific and common names of vertebrates and plants known to occur on Kirwin NWR. Bold indicates species that have been recorded as nesting. Information on fish, amphibians, and reptiles was obtained from Kansas Department of Wildlife and Parks (refuge files dated 01/30/2003).

Birds follow the American Ornithologists' Union Committee on Classification and Nomenclature (American Ornithologists' Union 1998, 2000, 2002, 2003).

Common Name	Scientific Name
Amphibians	
Bullfrog	*Rana catesbeiana*
Great plains narrow-mouthed frog	*Gastrophryne olivacea*
Great plains toad	*Bufo cognatus*
Northern cricket frog	*Acris crepitans*
Plains leopard frog	*Rana blairi*
Plains spadefoot	*Scaphiopus bombifrons*
Rocky mountain toad	*Bufo woodhousii*
Tiger salamander	*Ambystoma tigrinum*
Birds	
American avocet	*Recurvirostra Americana*
American black duck	*Anas rubripes*
American bittern	*Botaurus lentiginosus*
American coot	*Fulica Americana*
American crow	*Corvus brachyrhynchos*
American golden plover	*Pluvialis dominica*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American pipit	*Anthus rubescens*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
American tree sparrow	*Spizella arborea*
American white pelican	*Pelecanus erythrorhynchos*
American widgeon	*Anas Americana*
Baird's sandpiper	*Calidris bairdii*
Bald eagle	*Haliaeetus leucocephalus*
Baltimore oriole	*Icterus galbula*
Bank swallow	*Riparia riparia*
Barn owl	*Tyto alba*
Barn swallow	*Hirundo rustica*
Barred owl	*Strix varia*
Bell's vireo	*Vireo bellii*
Belted kingfisher	*Ceryle alcyon*
Bullock's oriole	*Icterus bullockii*
Black-and-white warbler	*Mniotilta varia*
Black-bellied plover	*Pluvialis squatarola*
Black-billed cuckoo	*Coccyzus erythropthalmus*
Black-billed magpie	*Pica hudsonia*
Black-capped chickadee	*Poecile atricapillus*
Black-crowned night-heron	*Nycticorax nycticorax*
Black-headed grosbeak	*Pheucticus melanocephalus*
Black-necked stilt	*Himantopus mexicanus*
Black-throated gray warbler	*Dendroica nigrescens*
Blackpoll warbler	*Dendroica striata*
Black tern	*Chlidonias niger*
Blue grosbeak	*Passerina caerulea*
Blue jay	*Cyanocitta cristata*
Blue-winged teal	*Anas discors*
Bobolink	*Dolichonyx oryzivorus*
Bonaparte's gull	*Larus Philadelphia*
Brewer's blackbird	*Euphagus cyanocephalus*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
Brown creeper	*Certhia Americana*
Brown thrasher	*Toxostoma rufum*
Bufflehead	*Bucephala albeola*
Burrowing owl	*Athene cunicularia*
Canada goose	*Branta Canadensis*
Canvasback	*Aythya valisineria*
Caspian tern	*Sterna caspia*
Cattle egret	*Bubulcus ibis*
Cedar waxwing	*Bombycilla cedrorum*
Chestnut-collared longspur	*Calcarius ornatus*
Chimney swift	*Chaetura pelagica*
Chipping sparrow	*Spizella passerina*

Cinnamon teal	*Anas cyanoptera*
Clay-colored sparrow	*Spizella pallida*
Cliff swallow	*Petrochelidon pyrrhonota*
Common goldeneye	*Bucephala clangula*
Common grackle	*Quiscalus quiscula*
Common loon	*Gavia immer*
Common merganser	*Mergus merganser*
Common nighthawk	*Chordeiles minor*
Common redpoll	*Carduelis flammea*
Common snipe	*Gallinago gallinago*
Common tern	*Sterna hirundo*
Common yellowthroat	*Geothlypis trichas*
Cooper's hawk	*Accipiter cooperii*
Dark-eyed junco	*Junco hyemalis*
Dickcissel	*Spiza Americana*
Double-crested cormorant	*Phalacrocorax auritus*
Downy woodpecker	*Picoides pubescens*
Dunlin	*Calidris alpina*
Eared grebe	*Podiceps nigricollis*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus tyrannus*
Eastern meadowlark	*Sturnella magna*
Eastern phoebe	*Sayornis phoebe*
Eastern screech owl	*Megascops asio*
Eastern towhee	*Pipilo erythrophthalmus*
Eastern wood-pewee	*Contopus virens*
European starling	*Sturnus vulgaris*
Ferruginous hawk	*Buteo regalis*
Field sparrow	*Spizella pusilla*
Forster's tern	*Sterna forsteri*
Franklin's gull	*Larus pipixcan*
Gadwall	*Anas strepera*
Glaucous gull	*Larus hyperboreus*
Golden-crowned kinglet	*Regulus satrapa*
Golden eagle	*Aquila chrysaetos*
Grasshopper sparrow	*Ammodramus savannarum*
Gray catbird	*Dumetella carolinensis*
Greater prairie chicken	*Tympanuchus cupido*
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great egret	*Ardea alba*
Great horned owl	*Bubo virginianus*
Greater scaup	*Aythya marila*
Greater yellowlegs	*Tringa melanoleuca*
Greater white-fronted goose	*Anser albifronus*
Green-winged teal	*Anas crecca*
Green heron	*Butorides virescens*
Hairy woodpecker	*Picoides villosus*
Harris' sparrow	*Zonotrichia querula*
Hermit thrush	*Catharus guttatus*
Herring gull	*Larus argentatus*
Hooded merganser	*Lophodytes cucullatus*
Horned grebe	*Podiceps auritus*
Horned lark	*Eremophila alpestris*
House finch	*Carpodacus mexicanus*
House sparrow	*Passer domesticus*
House wren	***Troglodytes aedon***
Hudsonian godwit	*Limosa haemastica*
Indigo bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferus*
Lapland longspur	*Calcarius lapponicus*
Lark bunting	*Calamospiza melanocorys*
Lark sparrow	*Chondestes grammacus*
Lazuli bunting	*Passerina amoena*
Least bittern	*Ixobrychus exilis*
Least flycatcher	*Empidonax minimus*
Least sandpiper	*Calidris minutilla*
Least tern	*Sterna antillarum*
Lesser scaup	*Aythya affinis*
Lesser yellowlegs	*Tringa flavipes*
Lincoln's sparrow	*Melospiza lincolnii*
Little blue heron	*Egretta caerulea*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed dowitcher	*Limnodromus scolopaceus*
Long-billed curlew	*Numenius americanus*
MacGillivray's Warbler	*Oporornis tolmiei*
Magnolia warbler	*Dendrocia magnolia*
Mallard	*Anas platyrhynchos*
Marbled godwit	*Limosa fedoa*
Merlin	*Falco columbarius*
Mississippi kite	*Ictinia mississippiensis*
Mountain bluebird	*Sialia currucoides*
Mourning dove	*Zenaida macroura*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*
Northern goshawk	*Accipiter gentiles*
Northern harrier	*Circus cyaneus*
Northern mockingbird	*Minus polyglottos*

Northern pintail	*Anas acuta*
Northern rough-winged swallow	*Stelgidopterys serripennis*
Northern shoveler	*Anas clypeata*
Northern waterthrush	*Seiurus noveboracensis*
Orange-crowned warbler	*Vermivora celata*
Orchard oriole	*Icterus spurius*
Osprey	*Pandion haliaetus*
Ovenbird	*Seiurus aurocapilla*
Peregrine falcon	*Falco peregrinus*
Pied-billed grebe	*Podilymbus podiceps*
Pine siskin	*Carduelis pinus*
Piping plover	*Charadrius melodus*
Plumbeous vireo	*Vireo plumbeus*
Prairie falcon	*Falco mexicanus*
Purple martin	*Progne subis*
Prairie warbler	*Dendroica discolor*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-eyed vireo	*Vireo olivaceus*
Redhead	*Aythya Americana*
Red-breasted nuthatch	*Sitta canadensis*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoenicens*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Ring-necked pheasant	*Phasianus colchicus*
Rock pigeon	*Columba livia*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Ross's goose	*Chen rossii*
Rough-legged hawk	*Buteo lagopus*
Ruby-crowned kinglet	*Regulus calendula*
Ruddy duck	*Oxyura jamaicensis*
Ruddy turnstone	*Arenaria interpres*
Sanderling	*Calidris alba*
Sandhill crane	*Grus Canadensis*
Scissor-tailed flycatcher	*Tyrannus forficatus*
Scott's oriole	*Icterus parisorum*
Semipalmated plover	*Charadrius semipalmatus*
Semipalmated sandpiper	*Calidris pusilla*
Sharp-shinned hawk	*Accipiter striatus*
Short-eared owl	*Asio flammeus*
Snow goose	*Chen caerulescens*
Snowy egret	*Egretta thula*
Snowy owl	*Bubo scandiacus*
Snowy plover	*Charadrius alexandrinus*
Song sparrow	*Melospiza melodia*
Sora	*Porzana carolina*
Spotted sandpiper	*Actitis macularia*
Spotted towhee	*Pipilo maculates*
Stilt sandpiper	*Calidris himantopus*
Swainson's Hawk	*Buteo swainsoni*
Swainson's thrush	*Catharus ustulatus*
Tennessee warbler	*Vermivora peregrine*
Townsend's warbler	*Dendroica townsendi*
Trumpeter swan	*Cygnus buccinator*
Tundra swan	*Cygnus columbianus*
Turkey vulture	*Cathartes aura*
Upland sandpiper	*Bartramia longicauda*
Veery	*Catharus fuscescens*
Vesper sparrow	*Pooecetes gramineus*
Virginia rail	*Rallus limicola*
Warbling vireo	*Vireo gilvus*
Western grebe	*Aechmophorus occidentalis*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Western sandpiper	*Calidris mauri*
White-breasted nuthatch	*Sitta carolinensis*
White-crowned sparrow	*Zonotrichia leucophrys*
White-faced ibis	*Plegadis chihi*
White-rumped sandpiper	*Calidris fuscicollis*
White-throated sparrow	*Zonotrichia albicollis*
Whooping crane	*Grus Americana*
Wild turkey	*Meleagris gallopavo*
Willet	*Catoptrophorus semipalmatus*
Willow flycatcher	*Empidonax traillii*
Wilson's phalarope	*Phalaropus tricolor*
Winter wren	*Troglodytes troglodytes*
Wood duck	*Aix sponsa*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-breasted chat	*Icteria virens*
Yellow-crowned night hereon	*Nyctanassa violacea*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Yellow-rumped warbler	*Dendroica coronata*
Yellow-throated vireo	*Vireo flavifrons*
Yellow warbler	*Dendroica petechia*

Fishes	
Black bullhead	*Ictalurus melas*
Black crappie	*Pomoxis nigromaculatus*
Bluegill	*Lepomis macrochirus*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Creek chub	*Semotilus atromaculatus*
Flathead catfish	*Pylodictis olivaris*
Freshwater drum	*Aplodinotus grunniens*
Gizzard shad	*Dorosoma cepedianum*
Green sunfish	*Lepomis cyanellus*
Largemouth bass	*Micropterus salmoides*
Orangespotted sunfish	*Lepomis humilis*
Red shiner	*Cyprinella lutrensis*
River carpsucker	*Carpiodes carpio*
Sand shiner	*Notropis stramineus*
Walleye	*Stizostedion vitreum*
White crappie	*Pomoxis annularis*
White base	*Morone chrysops*
Wiper	*Morone chrysops XM. Saxatilis*
Mammals	
American beaver	*Castor canadensis*
American porcupine	*Erethizon dorsatum*
American badger	*Taxidea taxus*
Big brown bat	*Eptesicus fuscus*
Black-tailed jackrabbit	*Lepus californicus*
Black-tailed prairie dog	*Cynomys ludovicianus*
Bobcat	*Felis rufus*
Brasilian free-tailed bat	*Tadarida brasiliensis*
Common muskrat	*Ondatra zibethicus*
Common raccoon	*Procyon lotor*
Coyote	*Canis latrans*
Deer mouse	*Peromyscus maniculatus*
Desert cottontail	*Sylvilagus audubonii*
Eastern cottontail	*Sylvilagus floridanus*
Eastern mole	*Scalopus aquaticus*
Eastern spotted skunk	*Spilogale putorius*
Eastern wood rat	*Peromyscus gossypinus*
Evening bat	*Nycticeius humeralis*
Fox squirrel	*Sciurus niger*
Franklin's ground squirrel	*Spermophilus frankinii*
Gray fox	*Urocyon cinereoargenteus*
Hispid cotton rat	*Sigmodon hispidus*
Hispid pocket mouse	*Chaetodipus hispidus*
Hoary bat	*Lasiurus cinereus*
Keen's bat	*Myotis keenii*
Least shrew	*Cryptotis parva*
Long-tailed weasel	*Mustela frenata*
Mule deer	*Odocoileus hemionus*
Northern grasshopper mouse	*Onychomys leucogaster*
Plains harvest mouse	*Reithrodontomys montanus*
Plains pocket gopher	*Geomys bursarius*
Plains pocket mouse	*Perognathus flavescens*
Prairie vole	*Microtus ochrogaster*
Ord's kangaroo rat	*Dipodomys ordii*
Red bat	*Lasiurus borealis*
Red fox	*Vulpes vulpes*
Short-tailed shrew	*Blarina brevicauda*
Silky pocket mouse	*Perognathus flavus*
Silver-haired bat	*Lasionycteris noctivagans*
Small-footed bat	*Myotis leibii*
Striped Skunk	*Mephitis mephitis*
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
Virginia opossum	*Didelphis virginiana*
Western harvest mouse	*Reithrodontomys megalotis*
White-footed mouse	*Peromyscus leucopus*
White-tailed deer	*Odocoileus virginianus*
Plants	
Grasses	
Big bluestem	*Andropogon gerardii*
Blue grama	*Bouteloua gracilis*
Buffalograss	*Buchloe dactyloides*
Canada wildrye	*Elymus canadensis*
Fall Panicum	*Digitaria cognatum.*
Foxtail barley	*Hordeum jubatum*
Green needlegrass	*Stipa viridula*
Hairy grama	*Bouteloua hirsuta*
Indiangrass	*Sorghastrum nutans*
Junegrass	*Koeleria macrantha*
Little bluestem	*Andropogon scoparius*
Marsh muhly	*Muhlenbergia racemosa*
Porcupine grass	*Stipa spartea*
Prairie cordgrass	*Spartina pectinata*
Prairie three-awn	*Aristida oligantha*
Purple lovegrass	*Eragrostis spectabilis*
Scribners Panicum	*Panicum oligosanthes*

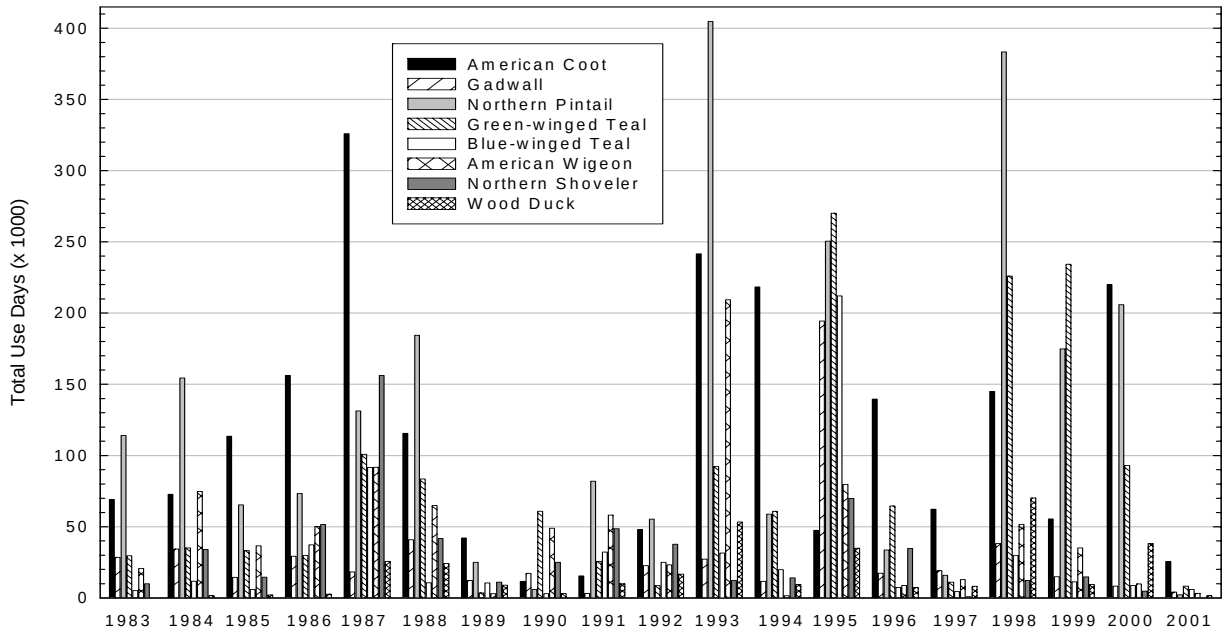
Side-oats grama	*Bouteloua curtipendula*
Slender Wheatgrass	*Elymus trachycaulus*
Switchgrass	*Panicum virgatum*
Tall dropseed	*Sporobolus asper*
Virginia wildrye	*Elymus virginicus*
Western wheatgrass	*Agropyron smithii*
Forbs	
American germander	*Teucrium canadense*
American vetch	*Vicia americana*
Bee balm	*Monarda fistulosa*
Blackeyed Susan	*Rudbeckia hirta*
Blue lettuce	*Lactuca oblongifolia*
Blue sage	*Salvia azurea*
Blue vervain	*Verbena hastata*
Blue-eyed grass	*Sisyrinchum campestre*
Boneset	*Eupatorium perfoliatum*
Bracted spiderwort	*Tradescantia bracteata*
Buckbrush	*Symphoricarpos occidentalis*
Canada goldenrod	*Solidago canadensis*
Canada milkvetch	*Astragalus canadensis*
Canada tickclover	*Desmodium canadense*
Clammy ground cherry	*Physalis heterphylla*
Common milkweed	*Asclepias syriaca*
Common sunflower	*Heliathus annuus*
Compass plant	*Silphium laciniatum*
Coralberry	*Symphoricarpos orbiculatus*
Croton	*Croton texensis.*
Cudweed sagewort	*Artemesia ludoviciana*
Cup plant	*Silphium perfoliatum*
Curlycup gumweed	*Grindelia squarrosa*
Daisy fleabane	*Erigeron strgosus*
Dandelion hawks-beard	*Crepis runcinata*
Deer vetch	*Lotus purshianus*
False boneset	*Brickellia eupatoroides*
False boneset	*Kuhnia eupatoriodes*
False sunflower	*Heliopsis helianthoides*
Field pussytoes	*Antennaria neglecta*
Fox glove beard toungue	*Penstemon digitalis*
Grass-leaved goldenrod	*Solidago graminifolia*
Green sage	*Artemisia*
Ground plum	*Astragalus crassicarpus*
Hairy goldaster	*Chrysopsis villosa*
Hairy pucoon	*Lithospermum caroliniense*
Heath aster	*Aster ericoides*
Hemp dogbane	*Apocynum cannabinum*
Hoary vervain	*Verbena stricta*
Illinois bundleflower	*Desmanthus illinoiensis*
Illinois tick clover	*Desmodium illinoensis*
Indian hemp dogbane	*Apocynum cannabinum*
Indigo bush	*Amorpha fruticosa*
Jerusalem artichoke	*Helianthus tuberose*
Leadplant	*Amorpha canescens*
Lemon scurfpea	*Psoralidium lanceolatum*
Longbeard hawkweed	*Hieracium longipilum*
Marble-seeded Borage	*Onosmodium molle*
Maximillian sunflower	*Helianthus maximilliani*
Missouri goldenrod	*Solidago missouriensis*
Mountain mint	*Pycnanthemum virginianum*
Narrowleaf pucoon	*L.incisum*
New England aster	*Aster novae-angliae*
Norwegian cinquefoil	*Potentilla norvegica*
Panicled aster	*Aster simplex*
Philadelphia fleabane	*Erigeron philadelphicus*
Pink poppy mallow	*Callirhoe alcaeoides*
Plains sunflower	*Helianthus petiolaris*
Plains yellow primrose	*Calylophus serrulatus*
Prairie cinquefoil	*Potentilla arguta*
Prairie coreopsis	*Coreopsis tinctoria*
Prairie goldenrod	*Solidago missouriensis*
Prairie larkspur	*Delphinium virescens*
Prairie ragwort	*Senecio plattensis*
Prairie violet	*Viola pedatifida*
Prairie wild rose	*Rosa arkansana*
Prickly poppy	*Argemone plyanthemos*
Purple coneflower	*Echinacea angustifolia*
Purple poppy mallow	*Callirhoe involucrata*
Purple prairie clover	*Dalea purpureum*
Redroot New Jersey tea	*Ceanothus herbaceous*
Rigid goldenrod	*Solidago rigida*
Rosinweed	*Silphium integrifolium*
Rough blazingstar	*Liatris punctata*
Rough rattlesnake-root	*Prenanathes aspera*
Round head lespedeza	*Lespedeza capitata*
Rush skeleton plant	*Lygodesmia juncea*
Sand lovegrass	*Eragrostis trichoides*
Sawtooth sunflower	*Helianthus grosseratus*
Scarlet globemallow	*Spharalcea coccinea*

Sensitive brier	*Schrankia nuttallii*
Shell-leaf penstemon	*Penstemon grandiflorus*
Short green milkweed	*Asclepias viridiflora*
Showy partridge pea	*Cassia chamaecrista*
Silky prairie clover	*Dalea villosa*
Silver-leaf scurf pea	*Psoralea argophylla*
Slender-leaf scurf pea	*Psoralea tenuiflora*
Spider milkweed	*Asclepias viridis*
Stiff goldenrod	*S. rigida*
Stiff sunflower	*Helianthus rigidus*
Tall thistle	*Cirsium altissimum*
Thick-spike gayfeather	*Liatris pycnostachya*
Thimbleweed	*Anemone cylindrica*
Upright prairie coneflower	*Ratibiada columnifera*
Venus' looking glass	*Tridanis perfoliata*
Violet wood sorel	*Oxalis violacea*
Virginia ground cherry	*Physallis virginiana*
Wavyleaf thistle	*Cirsium undulatum*
Western ironweed	*Vernonia fasciculata*
Western wild lettuce	*Lactuca ludoviciana*
Western yarrow	*Achillea millefolium*
White prarie clover	*Dalea candida*
Whorled milkweed	*Asclepias verticillata*
Wild four-O-clock	*Mirabilis nyctaginea*
Wild lettuce	*Lactuca canadensis*
Wild licorice	*Glycyrrhizia lepidota*
Wild onion	*Allium canadense*
Willowleaf aster	*Aster praealtus*
Wooly plantain	*Plantago patagonica*
Wetland emergents	
Duley rush	*Juncus dudleyyi*
Fescue sedge	*Carex brevior*
Fox sedge	*Carex vulpinoidea*
Gravid sedge	*Carex gravida*
Interior rush	*Juncus interior*
Marsh smartweed	*Polygonum coccineum*
Pale smartweed	*Polygonum lapathifolium*
Self heal	*Prunella vulgaris*
Wedgelead fog-fruit	*Lippia cuneifolia*

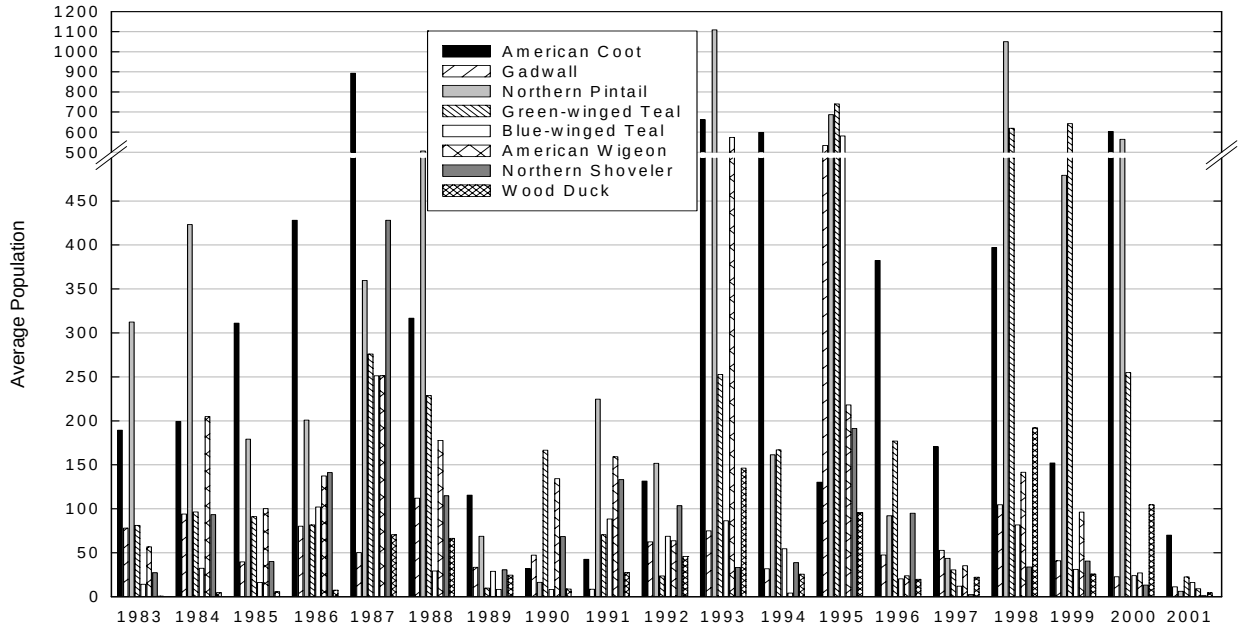
Reptiles	
Brown snake	*Storeria dekayi*
Bull snake	*Pituophis melanoleucus*
Coachwhip	*Masticophis flagellum*
Common garter snake	*Thamnophis sirtalis*
Common kingsnake	*Lampropeltis getula*
Eastern fence lizard	*Sceloporus undulates*
Eastern hog-nosed snake	*Heterodon platirhinos*
Five-lined skink	*Eumeces fasciatus*
Great plains skink	*Eumeces faciatus*
Lesser earless lizard	*Holbrookia maculate*
Lined snake	*Tropidoclonion lineatum*
Milk snake	*Lampropeltis triangulum*
Northern water snake	*Nerodia sipedon*
Plains blackhead snake	*Tantilla nigriceps*
Plains garter snake	*Thamnophis radix*
Prairie rattle snake	*Crotalus viridis*
Rat snake	*Elaphe obsolete*
Ringneck snake	*Diadophis punctatus*
Slender glass lizard	*Ophisaurus attenuatus*
Texas horned lizard	*Phrynosoma cornutum*
Western hog-nosed snake	*Heterodon nasicus*
Western ribbon snake	*Thamnophis proximus*
Yellow-bellied racer	*Coluber constrictor*
Turtles	
Alligator snapping turtle	*Macroclemys temmincki*
Common snapping turtle	*Chelydra serpentine*
Ornate box turtle	*Terrapene ornata*
Smooth soft-shelled turtle	*Apalone mutica*
Spiny soft-shelled turtle	*Apalone spinifera*
Western painted turtle	*Chrysemys picta*
Yellow mud turtle	*Kinosternon flavescens*

Appendix H. Graphs

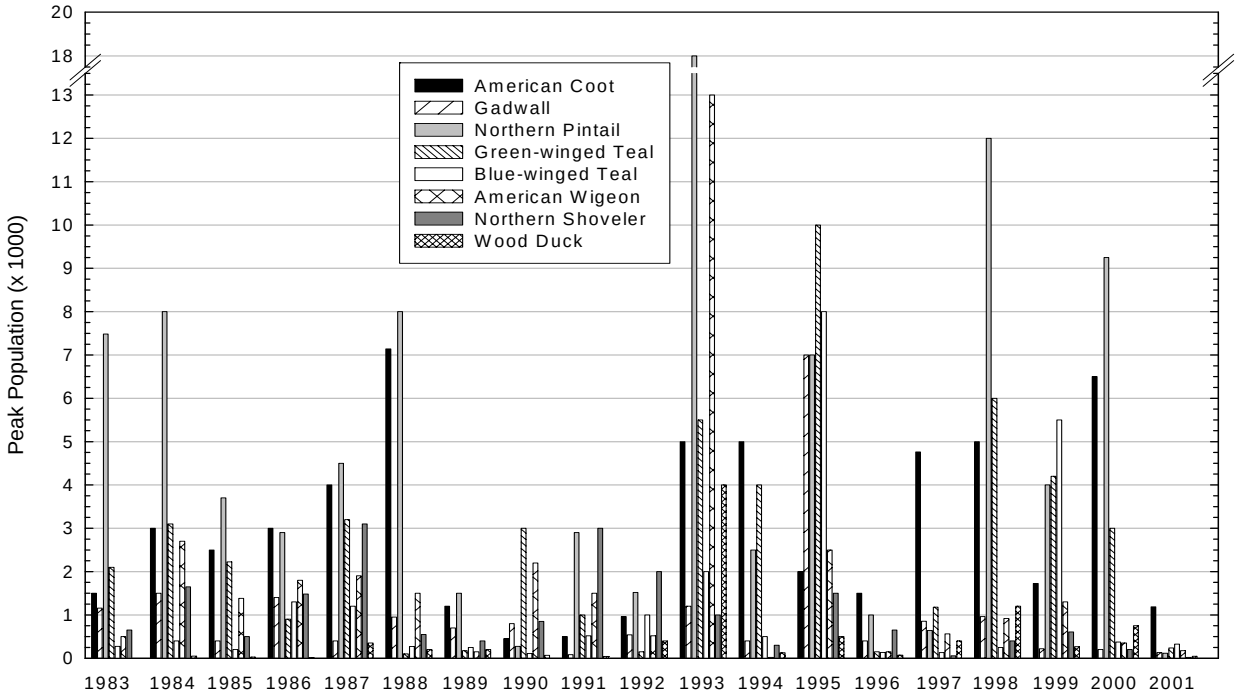
This appendix displays graphs showing total annual use days, average annual populations, and peak populations, respectively for the following waterfowl groups: American coot and dabbling ducks excluding mallard (a–c), diving ducks (d–f), Canada goose and mallard (g–i), and white-fronted goose and snow goose (j–l) using Kirwin National Wildlife Refuge between 1983 and 2001.



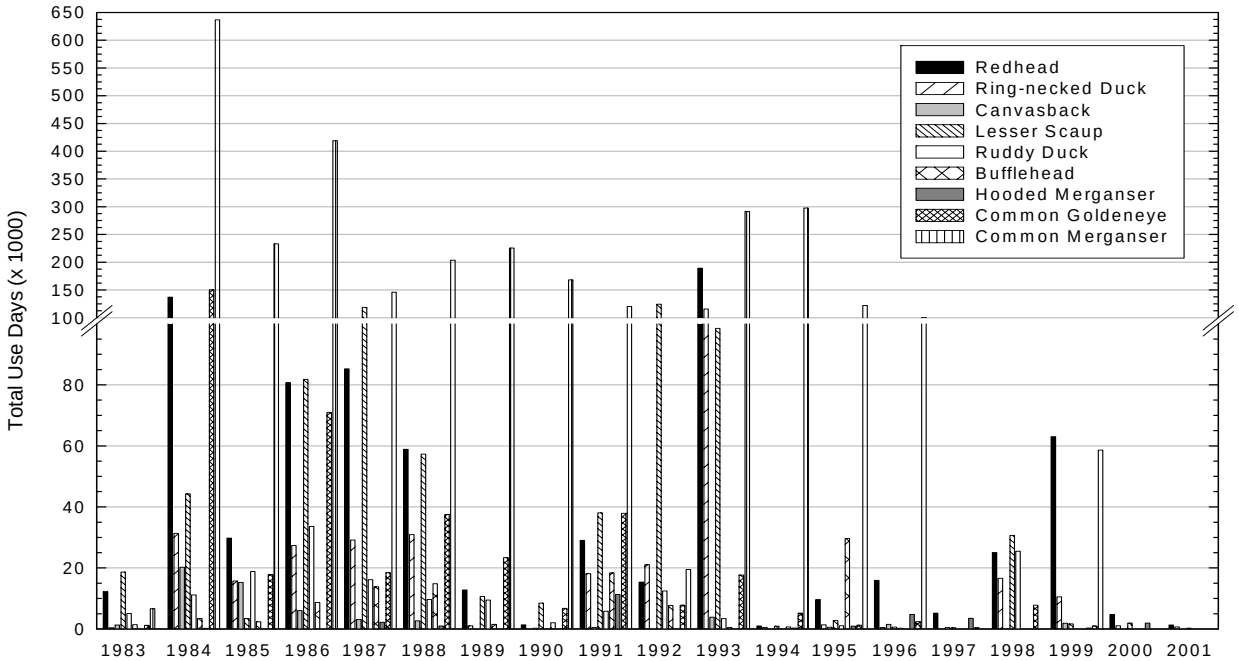
(a)



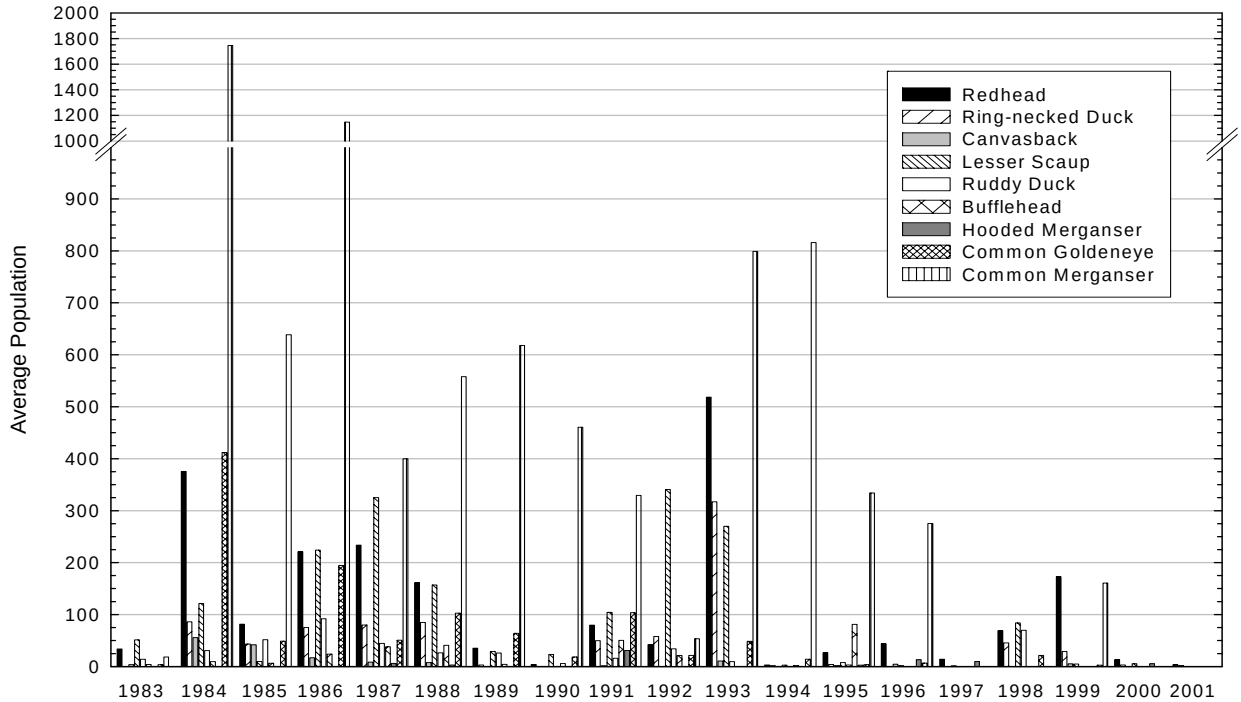
(b)


Peak Population (x 1000)
American Coot
Gadwall
Northern Pintail
Green-winged Teal
Blue-winged Teal
American Wigeon
Northern Shoveler
Wood Duck
0
1
2
3
4
5
6
7
8
9
10
11
12
13
18
20
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

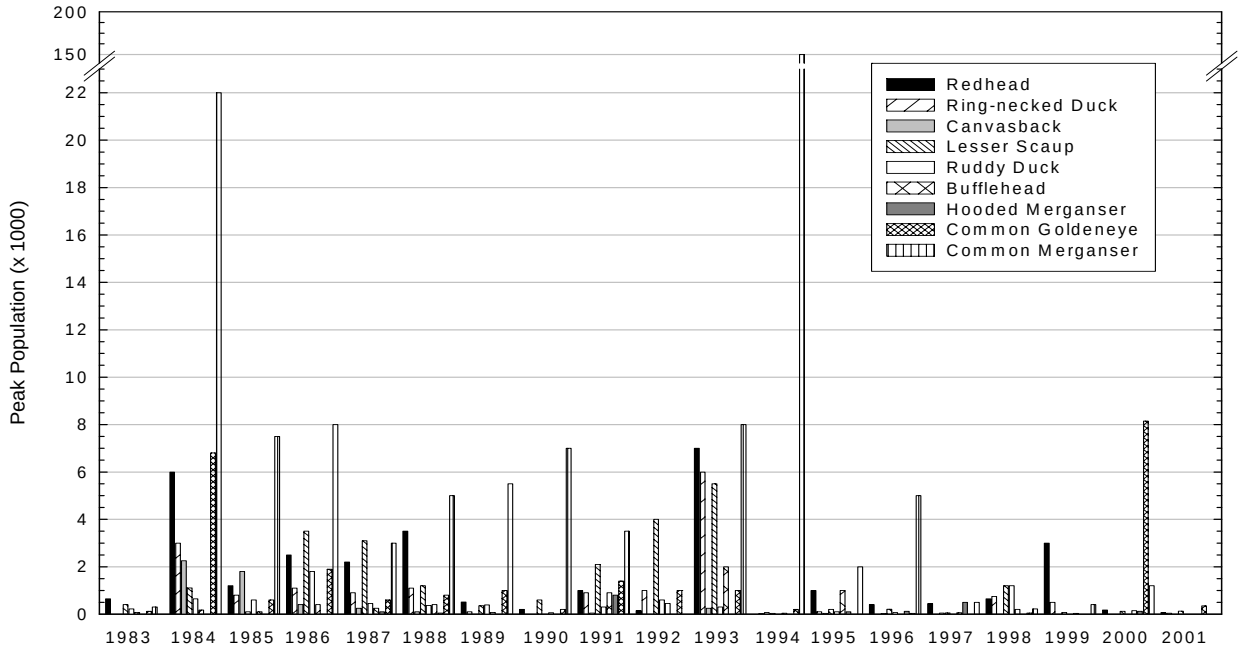
(c)


Total Use Days (x 1000)
Redhead
Ring-necked Duck
Canvasback
Lesser Scaup
Ruddy Duck
Bufflehead
Hooded Merganser
Common Goldeneye
Common Merganser
0
20
40
60
80
100
150
200
250
300
350
400
450
500
550
600
650
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

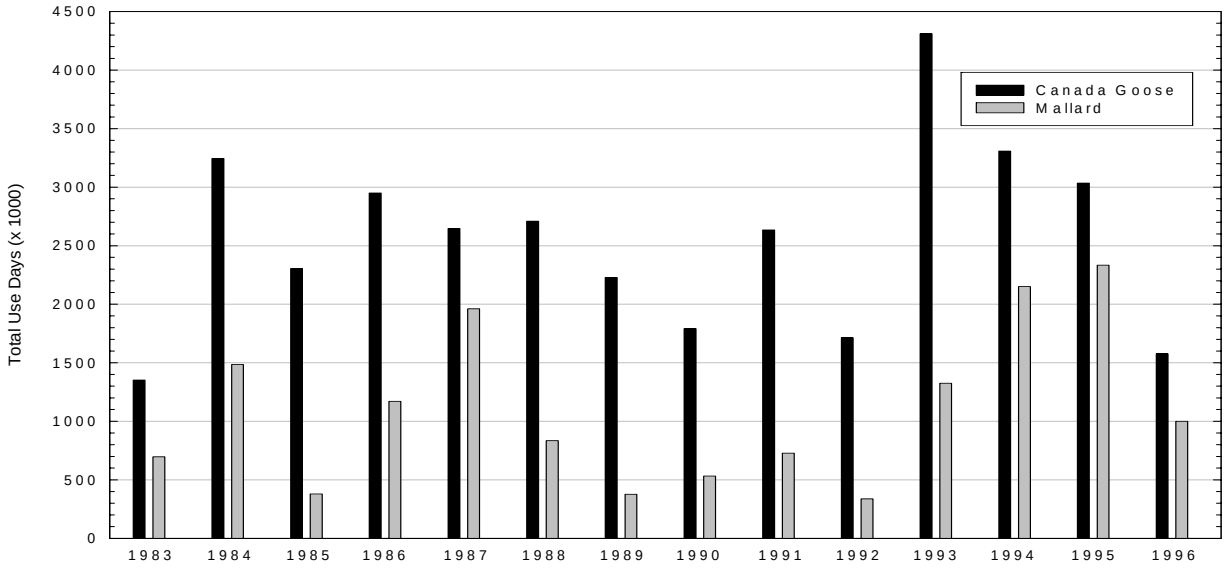
(d)


Average Population
2000
1800
1600
1400
1200
1000
900
800
700
600
500
400
300
200
100
0
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Redhead
Ring-necked Duck
Canvasback
Lesser Scaup
Ruddy Duck
Bufflehead
Hooded Merganser
Common Goldeneye
Common Merganser

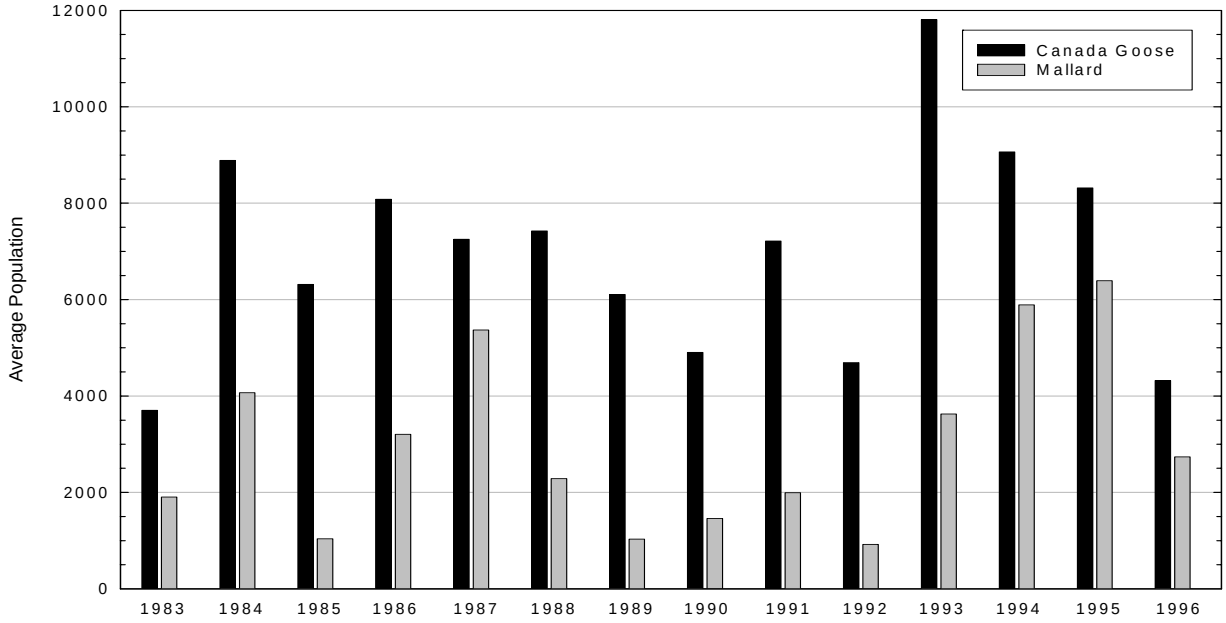
(e)


Peak Population (x 1000)
200
150
22
20
18
16
14
12
10
8
6
4
2
0
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Redhead
Ring-necked Duck
Canvasback
Lesser Scaup
Ruddy Duck
Bufflehead
Hooded Merganser
Common Goldeneye
Common Merganser

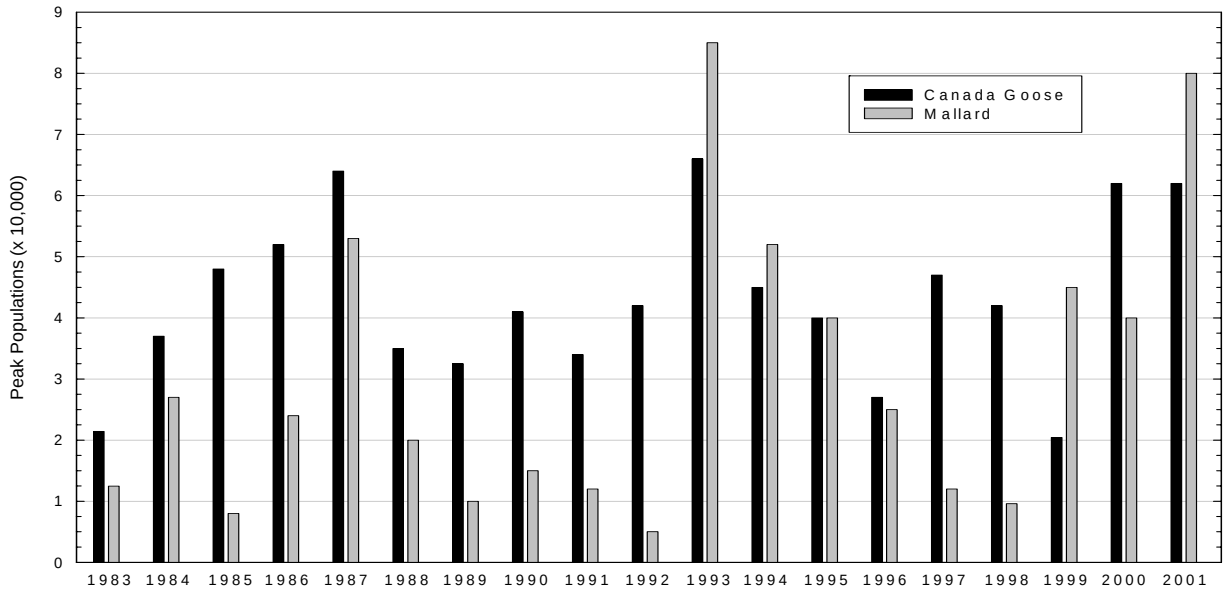
(f)


Total Use Days (x 1000)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
Canada Goose
Mallard

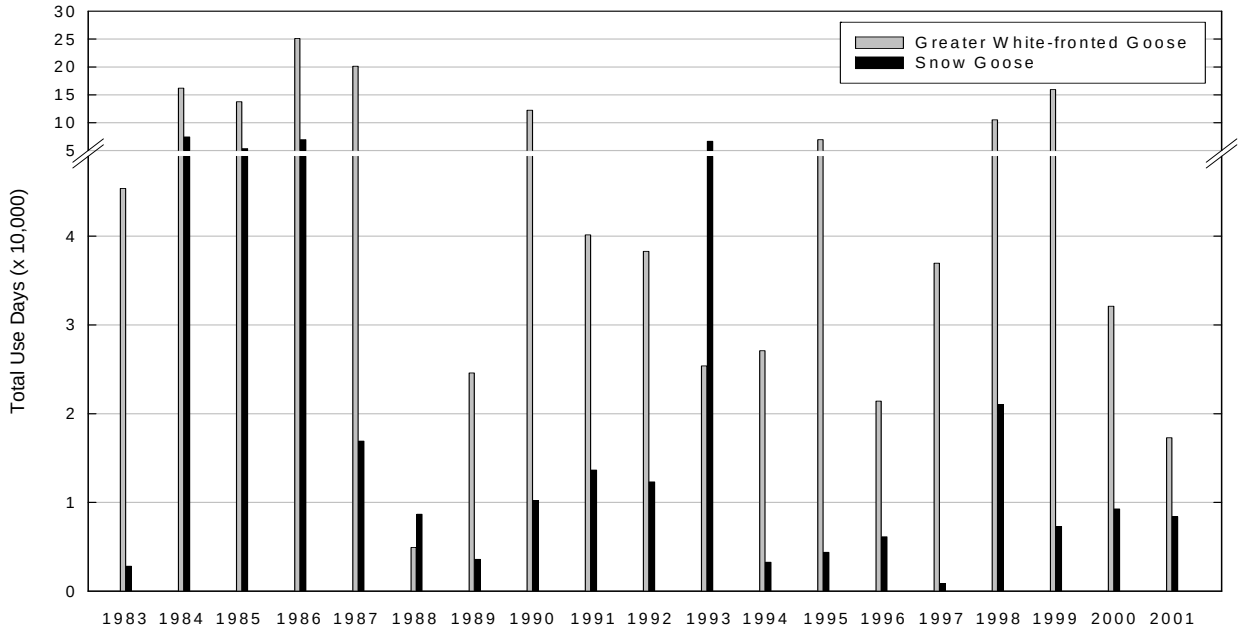
(g)


Average Population
12000
10000
8000
6000
4000
2000
0
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
Canada Goose
Mallard

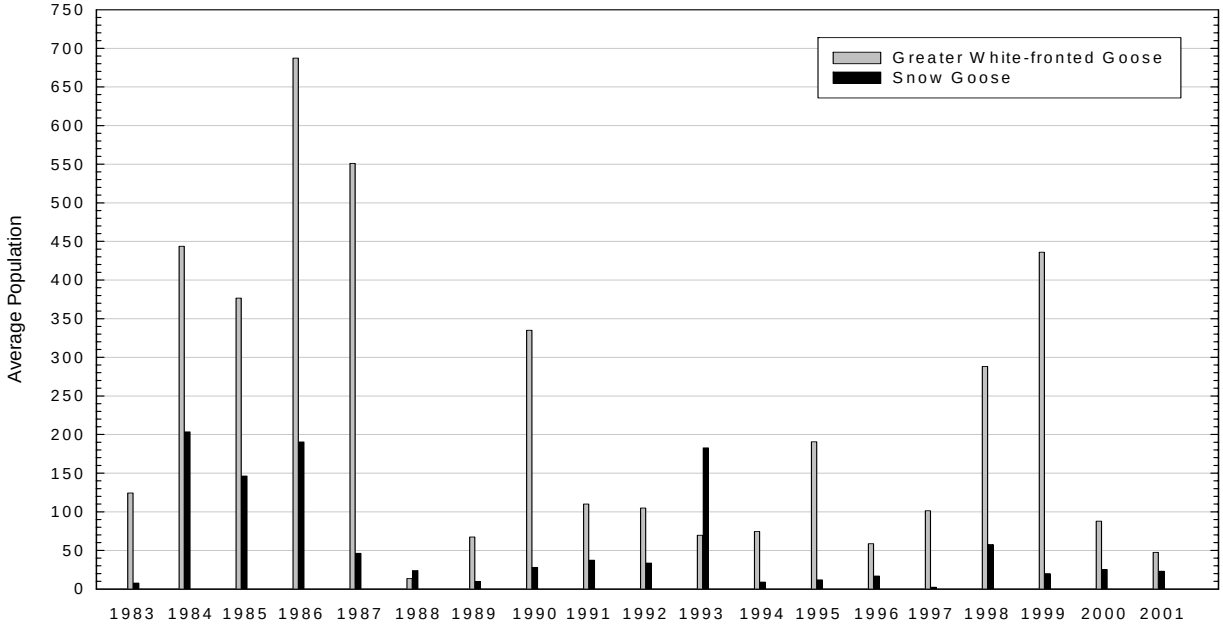
(h)


Canada Goose
Mallard
Peak Populations (x 10,000)
0
1
2
3
4
5
6
7
8
9
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

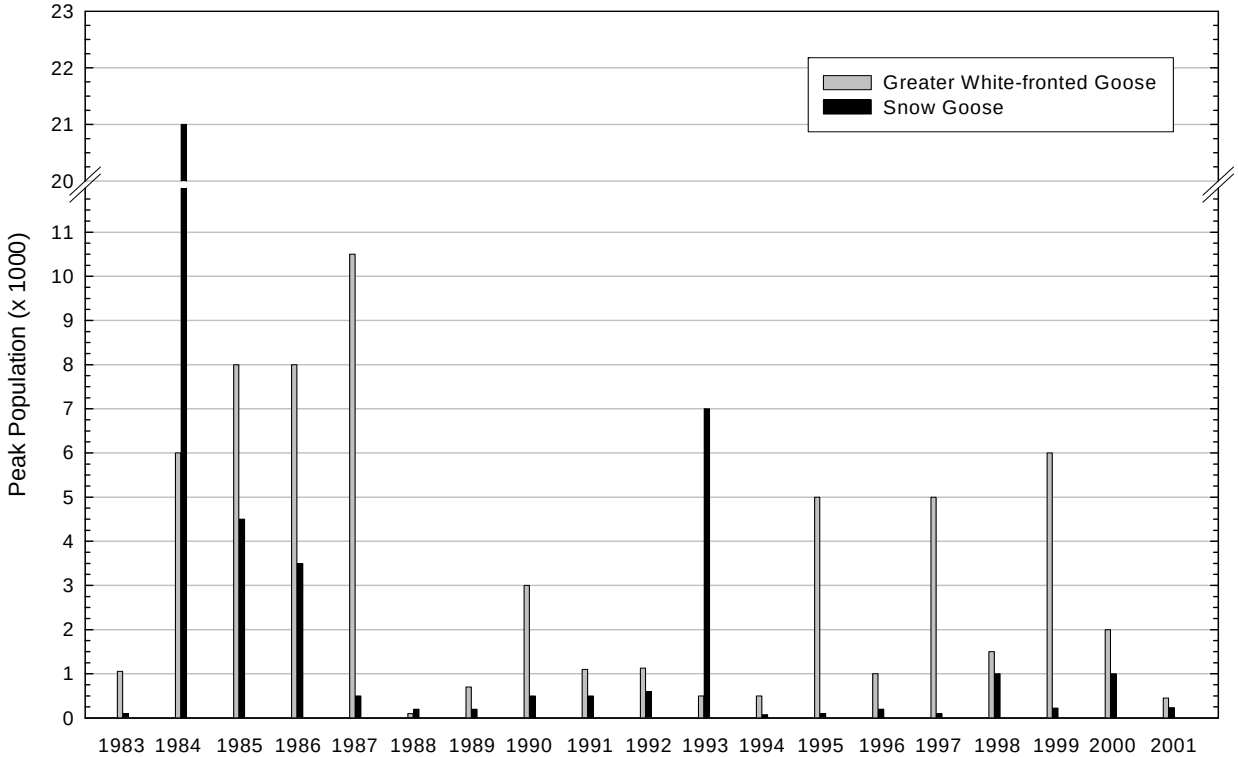
(i)


Greater White-fronted Goose
Snow Goose
Total Use Days (x 10,000)
0
1
2
3
4
5
10
15
20
25
30
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

(j)


Average Population
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
Greater White-fronted Goose
Snow Goose
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

(k)


Peak Population (x 1000)
23
22
21
20
11
10
9
8
7
6
5
4
3
2
1
0
Greater White-fronted Goose
Snow Goose
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

(l)

Appendix I. Section 7 Biological Evaluation

Intra-Service Section 7 consultation will be completed prior to final approval of the comprehensive conservation plan.

Appendix J. Mailing List

Federal Officials

U.S. Senator Pat Roberts
- Dodge City, KS office—Debbie Pugh
- Wichita, KS office—Karin Wisdom
- Topeka, KS office—Gilda Lintz
- Prairie Village, KS office—Chad Tenpenny

U.S. Senator Sam Brownback
- Topeka, KS office
- Overland Park, KS office—Shawn Cowing
- Garden City, KS office—Dennis Mesa
- Pittsburg, KS office—Anne Emerson
- Wichita, KS office—Chuck Alderson, Jamie Woodworth

U.S. Congressman Jerry Moran
- Hutchinson, KS office
- Hays, KS office

Federal Agencies

U.S. Army Corps of Engineers
- Kansas City District, Kansas City, MO
- Harlan County Lake, Republican City, NE

U.S. Bureau of Reclamation
- Grand Island, NE—Jill Manring
- Grand Island, NE—Gil Gyllenborg
- Grand Island, NE—Alice Johns
- Billings, MT—Jaralyn Beek

U.S. Fish and Wildlife Service
- Ecological Services, Manhattan, KS
- Ecological Services, Grand Island, NE
- Flint Hills National Wildlife Refuge, Harford, KS
- Marais des Cygnes National Wildlife Refuge, Pleasanton, KS
- Quivira National Wildlife Refuge, Stafford, KS
- Great Plains Nature Center, Wichita, KS

U.S. Geological Survey
- Biological Resources Division, Fort Collins, CO
- Northern Prairie Wildlife Research Center, Jamestown, ND

Tribal Officials

- Prairie Band Potawatomi Nation, Mayetta, KS
- Pawnee Tribe, Pawnee, OK

State Officials

Kansas Governor Kathleen Sebelius, Topeka, KS
Kansas State Senator Janice Lee, Kensington, KS
Kansas State Representative John Faber, Brewster, KS
Kansas State Representative Dan Johnson, Hays, KS
Kansas State Representative Laura McClure, Osborne, KS

State Agencies

Kansas Department of Wildlife and Parks
- Office of the Secretary, Topeka, KS—Mike Hayden
- Region 1 Office, Hays, KS—Bruce Taggart
- Region 1 Office, Hays, KS—Steve Price
- Region 1 Office, Hays, KS—Mark Shaw
- Area Conservation Officer, Kirwin, KS—Larry Stone

Universities, Schools, and Libraries

Fort Hays State University Division of Biology, Hays, KS
Kansas State University Division of Biology, Manhattan, KS
Eastern Heights High School, Agra, KS
Northern Valley High School, Almena, KS
Osborne High School, Osborne, KS
Hill City High School, Hill City, KS
Hays High School, Hays, KS
West Smith County High School, Kensington, KS
Logan High School, Logan, KS
Natoma High School, Natoma, KS
Palco High School, Palco, KS
Phillipsburg High School, Phillipsburg, KS
Plainville High School, Plainville, KS
Smith Center High School, Smith Center, KS
Stockton High School, Stockton, KS
Norton Community High School, Norton, KS

Local Governments
Mayor of Agra, KS—Scott Bretton
Mayor of Glade, KS—Willa Chestnut
Mayor of Kirwin, KS—Tracy Atchison
Mayor of Logan, KS—Jerry Gosha
Mayor of Long Island, KS—Tim Hammond
Mayor of Phillipsburg, KS—Doug Driggs
Mayor of Prairie View, KS—John Kats
Mayor of Speed, KS—Denise Lyon
Phillips County Commissioners
Phillips County Extension Office

Organizations
American Bass Anglers
- Fort Collins, CO
- Abilene, KS
- Ceresco, NE

Blue Valley Bass Club, Seward, NE
Boothill Bass Club, Spearville, KS
Burroughs Audubon of Greater Kansas City, Overland Park, KS
Coronado Area Council/BSA, Salina, KS
Douglas County Bassmasters, Boone, IA
Friends of Kirwin Lake, Phillipsburg, KS
Front Range Bassmasters, Colorado Springs, CO
Heartland His and Hers Bass Circuit, Omaha, NE
Kansas Audubon Society, Lawrence, KS
Kansas Bass Anglers Association, Junction City, KS
Liberal Bassmaster Bass Club, Liberal, KS
Lincoln County Bassmasters, North Platte, NE
Lions Club
- Phillipsburg, KS
- Kirwin, KS
- Kensington, KS
- Smith Center, KS
- Agra, KS
- Stockton, KS

McPherson Bassmasters, Lindsborg, KS
Midwest Bass Anglers, Weeping Water, NE
Mile High Bass Pioneers, Longmont, CO
National Audubon Society, Manhattan, KS
National Wild Turkey Federation, Phillipsburg, KS
Northern Colorado Bass Club, Johnstown, CO
Omaha Bass Club, Omaha, NE
Phillips County Chamber of Commerce, Phillipsburg, KS
Pikes Peak Bassmasters, Security, CO
Rotary Club, Phillipsburg, KS
Sarpy County Bassmasters, Bellevue, NE
Solomon Valley Birdwatcher's, Agra, KS
Southern Colorado Bass Club, Pueblo, CO
Southwest Anglers, Hugoton, KS
Southwest Anglers, Liberal, KS
Trophy Teams Association, Colorado Springs, CO
Wildlife Society, Manhattan, KS

Newspapers
Hays Daily News, Hays, KS
Hill City Times, Hill City, KS
Norton Daily Telegram, Norton, KS
Osborne County Farmer, Osborne, KS
Phillips County Advocate, Phillipsburg, KS
Phillips County Review, Phillipsburg, KS
Plainville Times, Plainville, KS
Smith County Pioneer, Smith Center, KS
Stockton Sentinel, Stockton, KS
The Logan Republican, Logan, KS

Radio Stations
KKAN_KQMA

Individuals
83 persons

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