Comprehensive Conservation Plan

Kirwin National Wildlife Refuge

December 2006

Prepared by the U.S. Fish and Wildlife Service

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Kirwin National Wildlife Refuge

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Contents

List of Figures and Tables

Figures

Tables

Summary

This is a summary of the comprehensive conservation plan (CCP) for the Kirwin National Wildlife Refuge (NWR) in Phillips County, Kansas. This plan, approved in 2005, will guide management of the refuge for the next 15 years.

The National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) requires the U.S. Fish and Wildlife Service (Service) to develop a comprehensive conservation plan by 2012 for each national wildlife refuge in the National Wildlife Refuge System (Refuge System).

The Refuge

Kirwin NWR, the first national wildlife refuge in Kansas, was established in 1954 as an overlay project on a U.S. Bureau of Reclamation (Reclamation) irrigation and flood control reservoir. Refuge staff manage activities on the land and water.

Habitat

Kirwin NWR is located in the rolling hills and narrow valley of the North Fork of the Solomon River in north-central Kansas. The refuge lies in an area where the tall-grass prairies of the east meet the short-grass plains of the west. As a result of this merging of prairies and plains, grasses and wildlife common to both habitats are found on the refuge.

Consisting of 10,778 acres, the refuge includes prairie grassland, cropland, open water, shoreline, wetlands, and wooded riparian areas (found along the banks of the river and reservoir).

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Prairie habitat at Kirwin National Wildlife Refuge.

The reservoir is fed by the North Fork of the Solomon River and Bow Creek. Both are intermittent streams which means they may dry up in periods of low precipitation. The reservoir water levels fluctuate tremendously from year to year, depending upon rain and snow runoff.

Cultural Resources

Historically, great herds of bison roamed the prairie grasslands, often followed by wolves that fed on weak and sick animals. Native Americans also resided in this area.

Ducks and geese, now attracted to the refuge in great numbers, were uncommon in this area until large reservoirs were built in the 1950s for irrigation and flood control.

Three archeological surveys have been conducted on the refuge since its establishment. A number of cultural sites have been identified on the refuge including historic Fort Kirwin, a U.S. Government fortification established in 1865, material scatters, and two prehistoric open camps.

Public Use

Each year, 40,000 to 90,000 people recreate at the refuge, depending on the water level and the fishing quality. During a typical day in hunting season, the refuge attracts about 100 people. Recreational activities such as hunting, fishing, wildlife observation, and wildlife photography can be enjoyed at the refuge.

Hunting for waterfowl, doves, pheasants, quail, turkey, prairie chickens, snipe, coots, cottontail rabbits, fox squirrels and white-tailed deer is permitted on the refuge. Fishing is offered year-round.

The Planning Process

The CCP process consisted of a series of steps including environmental analysis. Public and partner involvement were important throughout the process. Management alternatives were developed to meet the purposes, vision, and goals of the refuge. Implementation of this CCP will be monitored throughout its 15-year effective period.

Issues

Public scoping initiated in 2003, along with refuge information, indicated that there are six major issues of concern regarding refuge management.

Declining Populations of Nongame Wildlife Species

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 Plants

Invasive plants, especially Canada thistle, are impacting refuge habitats in some areas. 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 levels 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. 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 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 that near the reservoir. Tamarisk leaves are allelopathic, 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 migratory birds.

Invasive plants on the refuge are particularly troublesome for neighbors who are required by state and local laws to control invasive species on their lands and view the refuge as a source of invasive plant expansion onto their lands.

Chemicals used to control invasive plants are of concern from the standpoint of environmental contamination and negative impacts on desirable plant species.

Reservoir Water Level Fluctuations

Large fluctuations of the reservoir water levels prevent the development of submerged aquatic vegetation (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 water level fluctuations also plays a role in emergent aquatic vegetation and 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 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 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 can help improve 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, school groups) and conducting large events (e.g., Eco-Meet, 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.

THE FUTURE OF THE REFUGE

The issues, along with resource conditions, were important considerations during the development of the vision and goals for the Kirwin NWR.

THE REFUGE VISION

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.

GOALS

These goals were developed to meet the refuge vision.

Ecology Goal

The refuge will restore the native mixed-grass prairie ecosystem (e.g., prairie grasslands, wooded draws, 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.

Water Resources Goal

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

Research and Science Goal

The refuge will utilize a scientific approach with the best available information to 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.

Cultural Resources Goal

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

Public Use Goal

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

Partnership 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.

OUTCOMES OF THE PLAN

Management actions in this CCP emphasize wildlife and habitat management for migratory birds and species of conservation concern.

Habitat management for waterfowl, game species, nongame species (e.g., water birds, shorebirds, prairie grassland-nesting birds), and bird species of conservation concern will be a 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.

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. The majority of existing cropland in the uplands will be restored to prairie grassland habitat within the life of this plan.

Recreational opportunities will include wildlife-dependent and wildlife-compatible uses outlined in the Improvement Act—hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

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Observing wildlife at Kirwin National Wildlife Refuge.

Non-wildlife-dependent uses will not be allowed. These refuge uses, and the facilities that support them will be phased out within 1 year of CCP implementation. Overnight camping will be discontinued. However, several other camping opportunities exist in the local area.

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.

Fire management will be used to protect life, property, and other resources from wildfire by safely suppressing all wildfires on the refuge. Prescribed fire will be used for habitat management, as well as for protection of property through fuel reduction.

With increased funding and staffing, the refuge will 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.

1 Purpose and Need

The U.S. Fish and Wildlife Service (Service) has developed this Comprehensive Conservation Plan (CCP) to provide a foundation for the management and use of Kirwin National Wildlife Refuge (NWR) located in north-central Kansas (figure 1). This CCP is intended to serve as a working guide for management programs and actions over the next 15 years.

The National Wildlife Refuge System Administration Act, as amended by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), requires that CCPs be in place for all national wildlife refuges within 15 years of enactment (2012).

In general, a CCP serves to do the following:

- Ensure that the purpose of the refuge and mission of the National Wildlife Refuge System (Refuge System) are being fulfilled.
- Ensure that national policy direction is incorporated into refuge management.
- Ensure that opportunities are available for interested parties to participate in the development of management direction.
- Provide a systematic process for making and documenting decisions.
- Establish broad strategies for programs and activities.
- Provide a basis for evaluating accomplishments.

Agency Guidance

The Service is the principal agency responsible for conservation of our Nation's fish, wildlife, and plant resources. This responsibility is shared with other federal agencies and state and tribal governments.

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

The Service manages a diverse network of more than 540 national wildlife refuges within the Refuge System, which encompasses 95 million acres of lands and waters. Kirwin is one of four national wildlife refuges in Kansas and was the 229th national wildlife refuge established.

The mission of the National Wildlife Refuge System is to administer a 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.

Operation and management of national wildlife refuges are influenced by a wide array of laws, treaties, and executive orders (appendix A). The primary guidance comes from these laws:

- National Wildlife Refuge System Administration Act of 1966, as amended
- National Wildlife Refuge System Improvement Act of 1997

All national wildlife refuges are established with these national goals (Service Director's Order No. 132):

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

These goals help support the Refuge System mission and principles of the 1997 amendments to the National Wildlife Refuge System Administration Act. These goals serve as a foundation for stewardship of the Refuge System and define its role among various federal land systems.

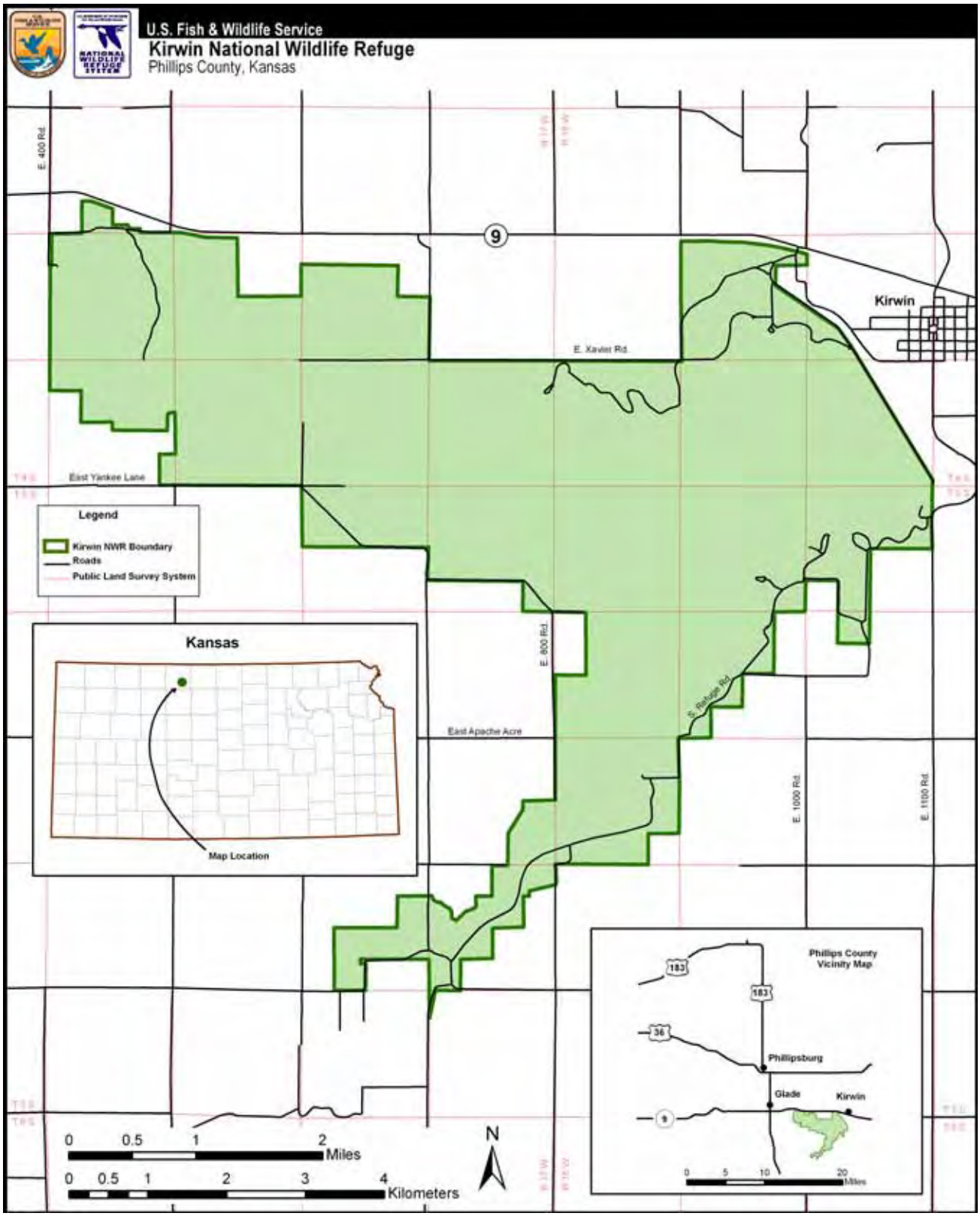

Figure 1. Vicinity map for Kirwin National Wildlife Refuge, Kansas

The Improvement Act calls for making opportunities for wildlife-dependent recreation, as long as they are compatibly managed with other purposes and do not conflict with other use. Service policy allows use if it is appropriate (appendix B).

An appropriate use

- contributes to the Refuge System mission, the refuge's major purposes, or refuge goals or objectives;
- is a priority public use (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation);
- supports the safe and effective conduct of a priority public use.

It is the policy of the federal government—in cooperation with other nations and in partnership with states, local governments, Indian tribes, and private organizations and individuals—to administer federally owned, administered, or controlled prehistoric and historic resources in a spirit of stewardship for the benefit of present and future generations.

To maintain the health of individual national wildlife refuges, and the Refuge System as a whole, managers must anticipate future conditions—to avoid adverse effects and take positive actions to conserve and protect refuge resources. Effective management also depends on knowledge of larger systems and resource relationships.

Refuge Overview

Kirwin NWR was established in 1954 to provide habitat for and facilitate the management of the Nation's migratory bird resources.

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

The refuge supports diverse wildlife habitat including grasslands, wooded riparian areas, open water, and wetlands.

Purposes of Establishment

Management is dictated, in large part, by legislation that created the refuge and defines the purposes for which the refuge was established.

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 the U.S. Bureau of 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 the U.S. 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 (USACE).

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.

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).

The refuge is managed in accordance with a Memorandum of Agreement (MOA) between Reclamation and the Service that was updated and signed in 1985 (appendix C).

Purpose and Need for Action

As directed by the Improvement Act, CCPs will be developed for all units of the Refuge System. These plans must include public involvement in their development. A CCP needs to set goals and objectives that meet the establishment purposes for the refuge, as well as contribute to the mission of the Refuge System. Wildlife has first priority in the management of national wildlife refuges.

The purpose of developing this CCP is to provide a 15-year management plan for the conservation of fish, wildlife, and plant resources and their related habitats on the refuge, while providing opportunities for compatible wildlife-dependent recreational uses.

This CCP, when fully implemented, should

- achieve refuge purposes;
- maintain and restore the ecological integrity of the refuge;
- help fulfill the Refuge System mission;
- meet other mandates.

Vision Statement

As part of the planning process, the refuge staff and planning team developed the following vision statement for the Kirwin NWR.

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.

Goals

A goal is a descriptive, broad statement of desired future conditions that conveys a purpose, but does not define measurable units. Goals will direct work at carrying out the refuge's mandates and achieving the purposes.

These goals are derived from the purposes and vision statement for the refuge to reflect the refuge's contribution to the Refuge System. The goals reflect the core mission of the Service to protect fish, wildlife, and plant resources while providing compatible opportunities for the public to appreciate and enjoy the natural environment of the region.

Ecology Goal. The refuge will restore the native mixed-grass prairie ecosystem (e.g., prairie grasslands, wooded draws, 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.

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

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The mixed-grass prairie at Kirwin National Wildlife Refuge.

Research and Science Goal. The refuge will utilize a scientific approach with the best available information to 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.

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

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

Partnership 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.

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Public use at Kirwin National Wildlife Refuge.

An Ecosystem Approach

The Service has adopted an ecosystem approach to conservation to enable it to fulfill its federal trust resource responsibility with greater efficiency and effectiveness. Through this holistic approach to resource conservation, the Service can accomplish its mission to conserve, protect, and enhance the Nation's fish and wildlife and their habitats for the continuing benefit of the American people.

Landscape-level goals have been developed within several wildlife conservation plans for North America (appendix D).

An ecosystem approach to fish and wildlife conservation means protecting or restoring function, structure, and species composition of an ecosystem, while providing for its sustainable socioeconomic use. Key to implementing this approach is recognizing that partnerships are an essential part of a diverse management plan.

The Service has adopted watersheds as the basic building blocks for implementing ecosystem conservation. Kirwin NWR is located in the Platte Kansas Rivers ecosystem, which includes the states of Colorado, Kansas, Nebraska, and Wyoming. This ecosystem is depicted in figure 2.

Three primary geographic sub-units exist within the Platte Kansas Rivers 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 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).

"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 habitat and wildlife goals and objectives for the refuge will contribute to meeting the goals for the Platte Kansas Rivers ecosystem.

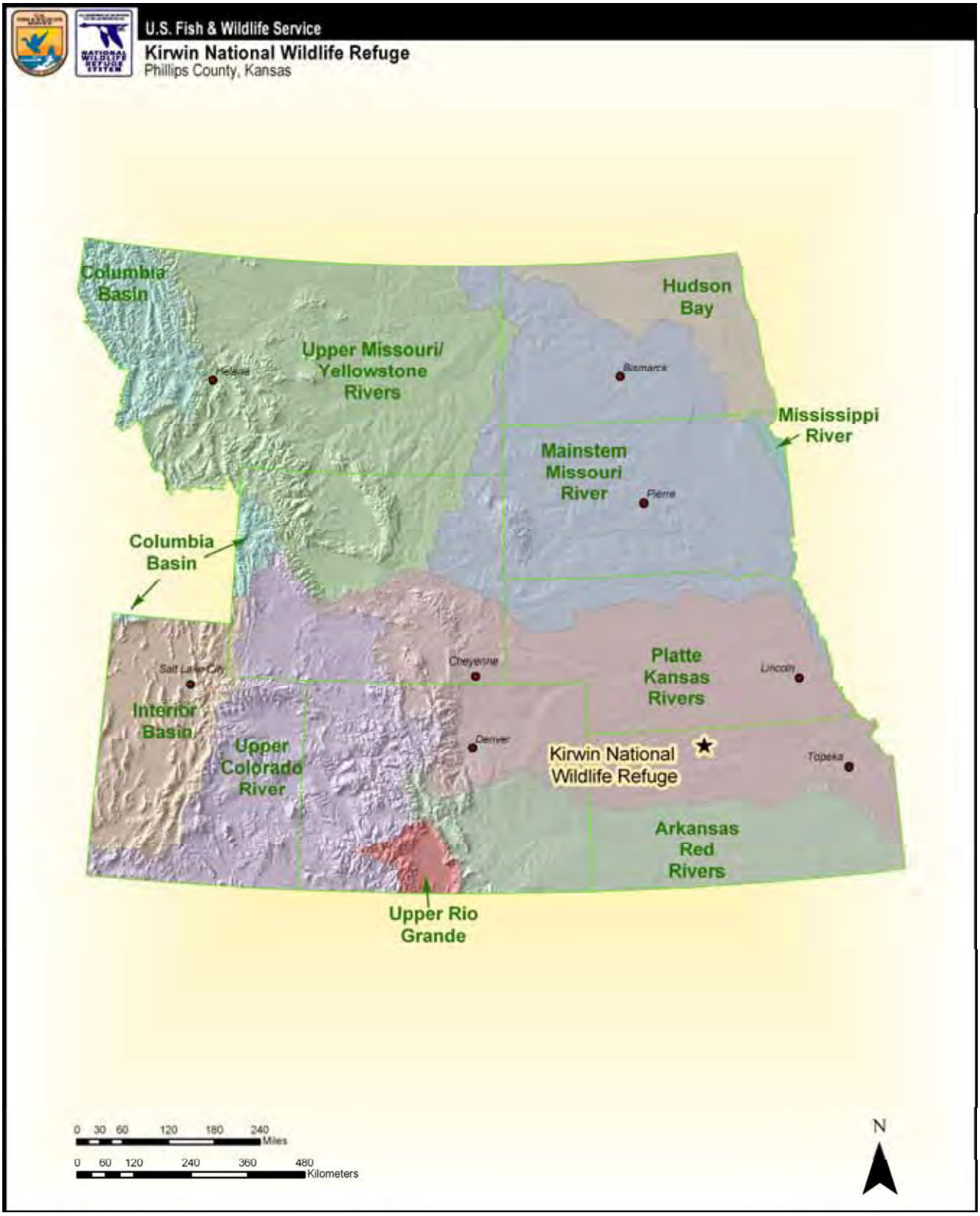

Figure 2. Platte Kansas Rivers ecosystem

2 Planning Process

The Improvement Act directs the Service to manage refuges in accordance with an approved CCP.

This section describes the planning process and issues specific to Kirwin NWR.

The Process

The Service is following the planning steps listed below to determine the future management of the refuge, in a thorough manner that meets requirements of the National Environmental Policy Act (NEPA) and Service policy.

The CCP process consists of a series of steps that are displayed sequentially; however, CCP planning, along with NEPA analysis and documentation, occur simultaneously. Although public involvement is listed as part of two steps, the Service will take public input at any point in the planning process.

- Preplan—form a planning team, review available data, organize efforts.
- Initiate public involvement and scoping—gather public input on issues.
- Develop draft vision and goal statements.
- Develop and analyze draft alternatives, including a proposed action—includes developing draft objectives.
- Prepare documentation of the NEPA analysis, including the draft plan (proposed action alternative).
- Conduct internal review (Service, federal, state, and tribal partners) and gather public input on draft document.
- Analyze and respond to public comments.
- Select one of the alternatives, which becomes the CCP.
- Make revisions as necessary and prepare the final CCP.
- Approve and implement the CCP.
- Monitor and evaluate actions and results.

The planning team for this CCP (appendix E) has carried out the process and prepared this CCP.

Coordination with the public, local groups, and other agencies has been essential in developing a realistic, meaningful plan.

Appendix F (environmental compliance) contains the "Environmental Action Statement" and "Finding of No Significant Impact" for this CCP.

Step-Down Management Plans

This CCP is a broad umbrella plan that provides general concepts and specific ecology, water resources, research and science, cultural resources, refuge operations, public use, and partnership objectives. The purpose of step-down management plans is to provide greater detail than what is in this CCP to managers and employees who will implement the strategies described in this CCP.

Step-down management plans describe strategies, procedures, methods, and tasks for specific resources or functions. Often these plans require their own compatibility determinations, environmental assessments (EAs), or other justification before they can be implemented.

The preparation and execution of these plans is dependent on funding and the availability of staff or technical expertise. Additional step-down plans will need to be developed, revised, or amended as a result of this CCP (table 1). Plans will be completed or revised, as needed, within 2 years of funding and necessary staff becoming available.

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Planning team at work.

Table 1. 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	2016
Hunting	1998	Incorporated in next revision of visitor services plan
Habitat Management	1997, 2001	2011
Fire Management	2002	2007
Cultural Resource Management	none	2014

Plan Revision

Plans are dynamic- management strategies need to be reviewed and updated periodically. This CCP will be reviewed at least annually to determine if it requires any revisions.

Monitoring and evaluation will determine whether management activities are achieving the refuge purposes, vision, and goals. When significant new information becomes available, ecological conditions change, major refuge expansions occur, or other needs are identified, this CCP can be revised.

Revision will occur, at a minimum, every 15 years. If the plan requires a major revision, the CCP process starts anew. Plan revisions require NEPA compliance. The public will continue to be informed of, and involved with, any revision to this CCP.

Public Involvement

The NEPA process was used by the Service to engage the public in refuge planning, while determining whether the proposed action for management of the refuge would have significant effects.

"Scoping" is the term for requesting input from the public, in this case, regarding management of a refuge. The primary thrust for the planning process is to provide a forum for ideas and issues to be shared, reviewed, and evaluated among agency staff and the public.

Comments were reviewed to identify issues and public concerns about, or advocacies for, future management of the refuge. These issues are addressed in the EA and draft CCP, other plans, and decision documents.

Public scoping was initiated in a "Notice of Intent" published in the Federal Register (March 21, 2003), announcing the Service's intent to gather information necessary to prepare a CCP and associated environmental document for Kirwin NWR. Open houses were held in May 2003.

The Service provided a 30-day review period for the draft CCP and EA, during which the public submitted comments. A summary of the public involvement, including a summary of the comments and the Service's responses, is in appendix G.

Planning Issues

The public scoping meetings, written comments, and refuge information indicated that there are six major issues of concern regarding refuge management.

Declining Populations of Nongame Wildlife Species

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.

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Invasive plants on the refuge are particularly troublesome for neighbors who are required by state and local laws to control invasive species on their lands and view the refuge as a source of invasive plant expansion onto their lands.

Chemicals used to control invasive plants are of concern from the standpoint of environmental contamination and negative impacts on desirable plant species.

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Develop Habitat Management Plan that Allows Refuge Staff to Achieve and Monitor 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 can help improve 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, school groups) and conducting large events (e.g., Eco-Meet, 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.

3 Refuge Description

The Kirwin NWR is located west of the town of Kirwin in Phillips County, north-central Kansas.

To get to the refuge, visitors approaching from the south must turn north onto Highway 183 at Hays, Kansas and travel 55 miles to Glade. Those approaching from the north can reach Glade by driving 5 miles south of Phillipsburg on Highway 183. From Glade, turn east onto Highway 9 and travel 6 miles to the refuge entrance.

The 10,778-acre refuge includes Kirwin Reservoir and bordering areas in southeast Phillips County (figure 3).

This chapter describes the current physical and socioeconomic environment of the refuge:

- Physical resources
- Ecology
- Cultural resources
- Special management areas and designations
- Visitor services
- Socioeconomic setting

Physical Resources

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

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 for Kansas.

The refuge encompasses portions of the North Fork Solomon River and Bow Creek. These rivers drain an area of 889,248 ac above the reservoir (Reclamation 2002). The flood plain varies in width from 600–2,640 ft (Leonard 1952), and the gradient of the North Fork Solomon River channel is about 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 37.5° F in January to 92.2° F in July. The mean monthly minimum temperature ranges from 11.6° F in January to 64.0° F in July.

Average annual precipitation is 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.

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).

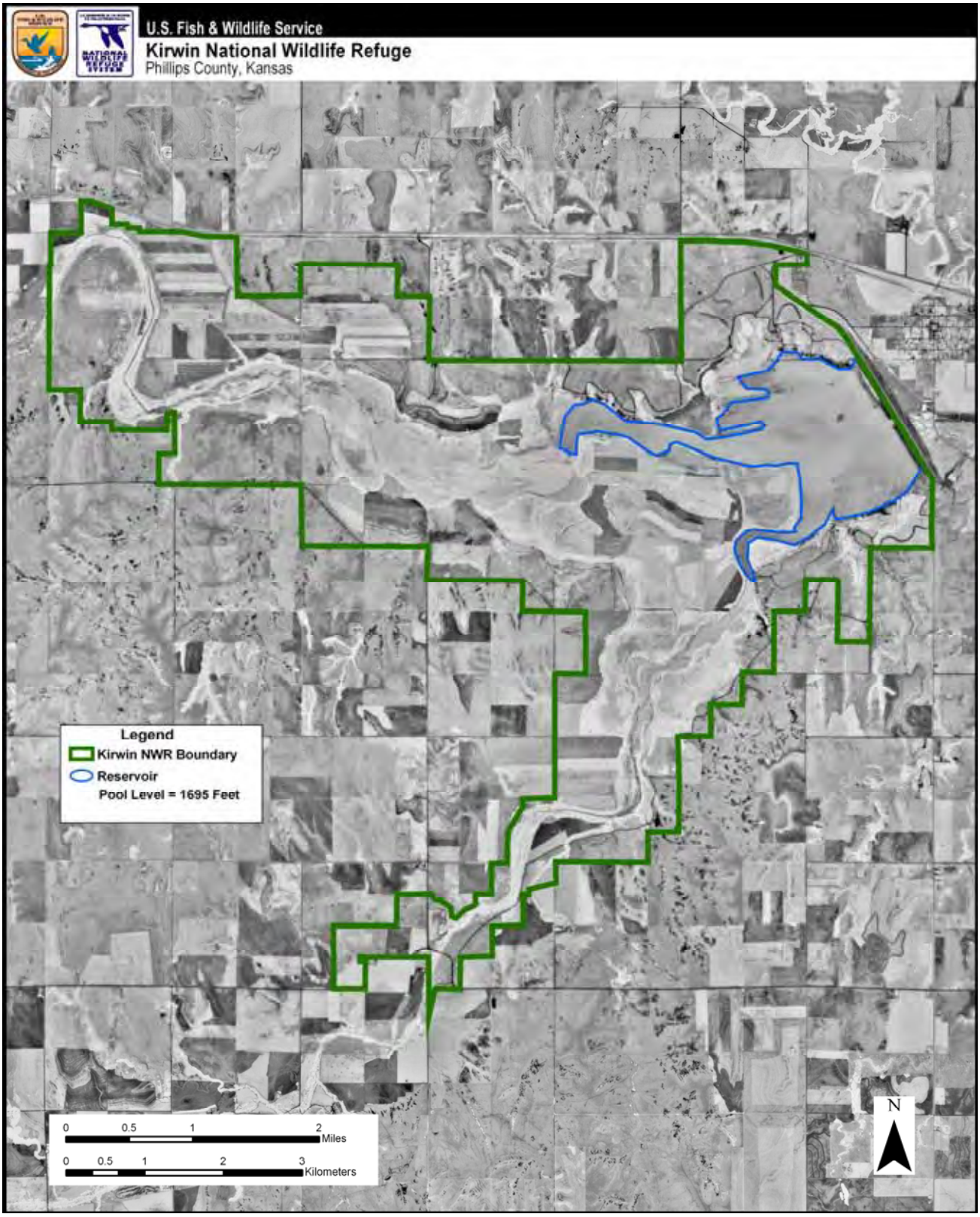

Figure 3. Base map for Kirwin National Wildlife Refuge, Kansas

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 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 < 10 ft (Kansas Department of Agriculture 2002–2004).

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 30–90 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 170 ft/day with an average transmissivity of 2,600 ft/day (Phillips 1980). Well yields vary from 10–500 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 11.5 ft/mi in western Phillips County to about 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 the reservoir has resulted in a corresponding reduction in storage volume 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 4) (Reclamation 2002).

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 of 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

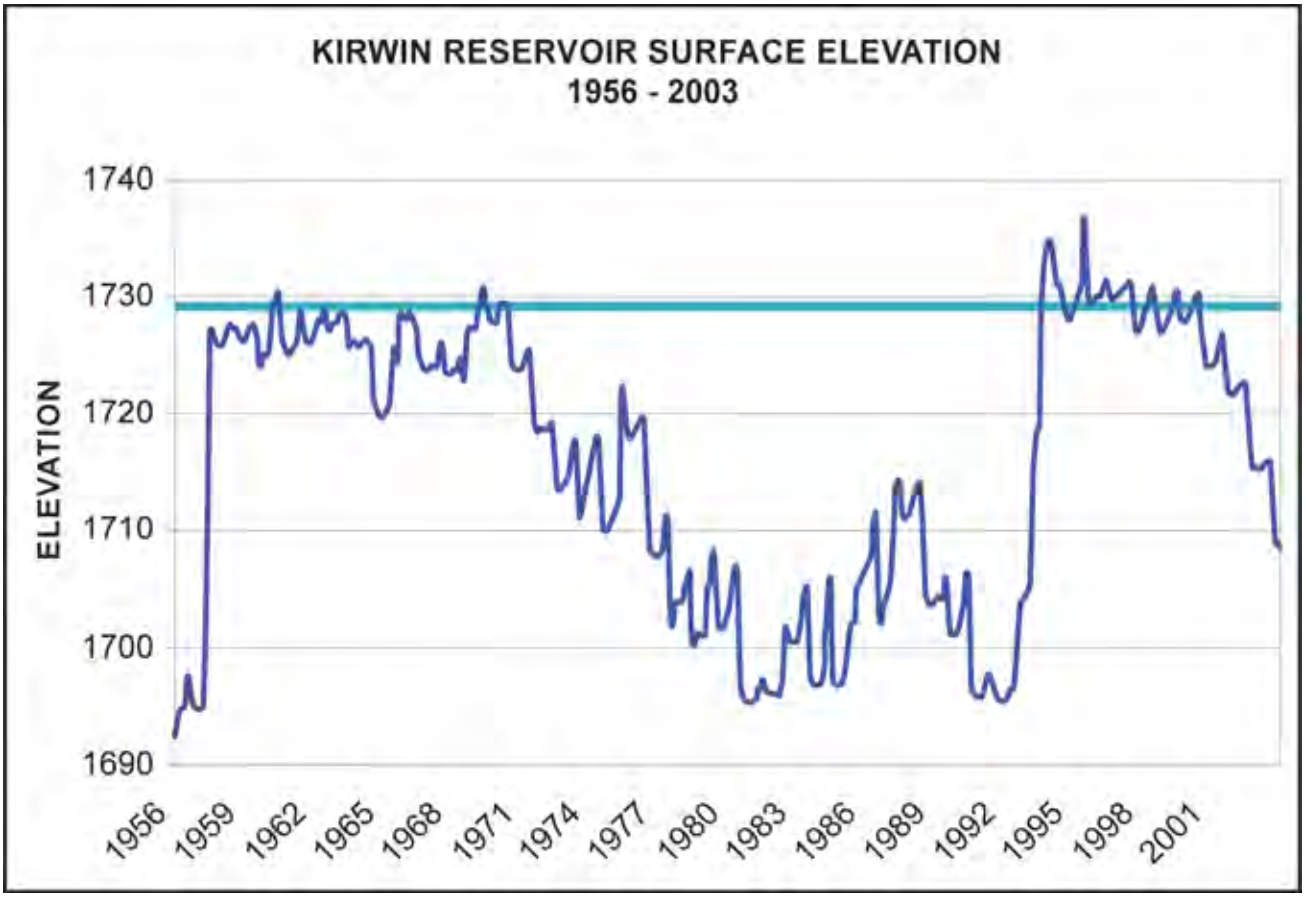

Figure 4. Kirwin Reservoir surface elevation, 1956–2003

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.

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 1900s, 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 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 mixed-grass 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 70 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 H.

Habitat

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 (figure 5). 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 5,000 ac at conservation pool (1,731 ft elevation) to 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.

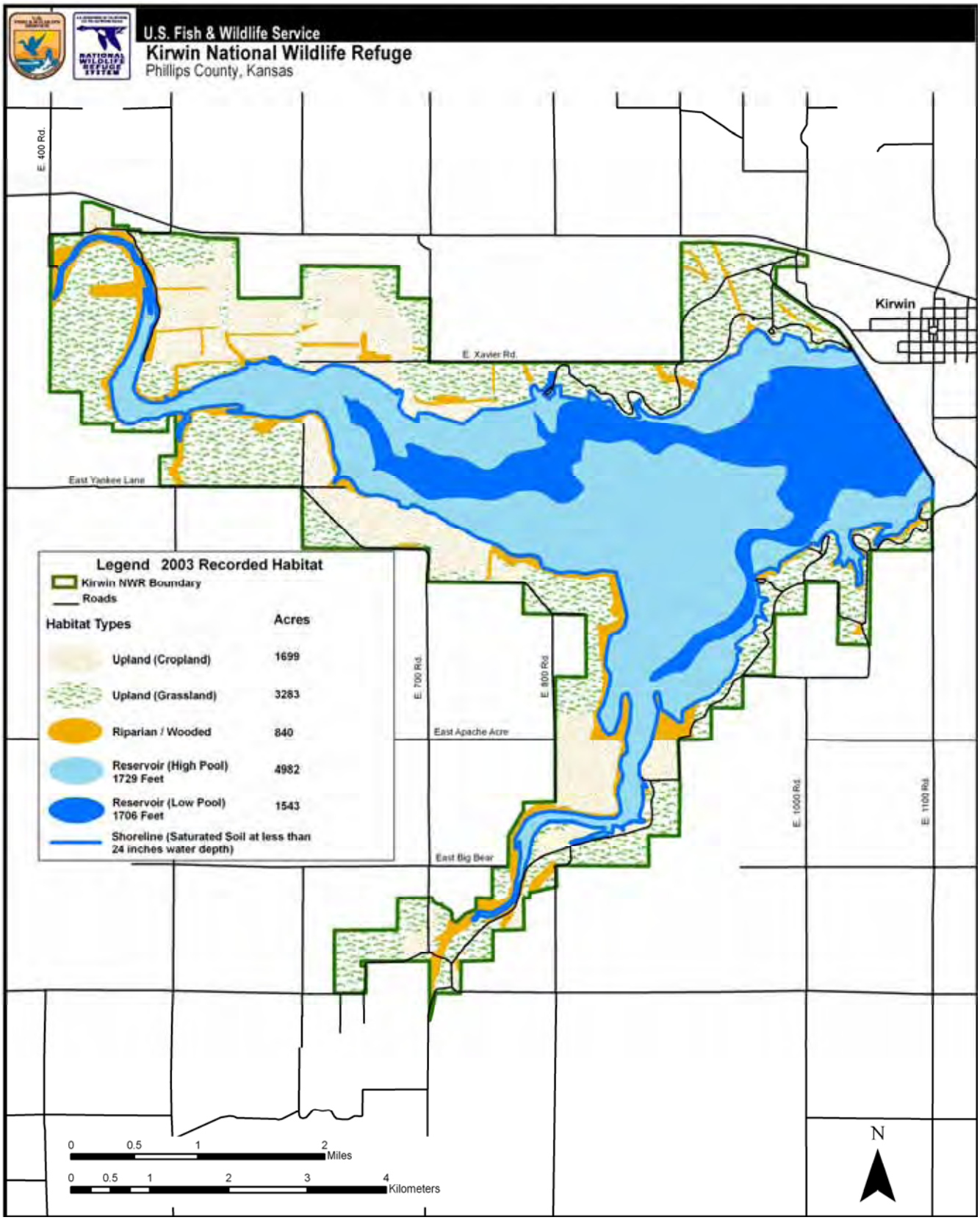

Figure 5. Existing habitat conditions at Kirwin National Wildlife Refuge, Kansas

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 SAV (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 9.5–11.3 ft in the first group of four cores to 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 = 4.6–10.0 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 < 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 224–670 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 exist 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, for 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 diverse 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.

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. Breeding Bird Survey (BBS) data for region 6 of the Service exhibited stable population trends for the black-capped chickadee, mourning dove, northern cardinal, common yellowthroat, red-winged blackbird, and brown-headed cowbird, 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.

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Prairie wildflowers—echinacea.

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 0.89 mile per square mile.

The refuge encompasses about 7,000 ac of uplands at conservation pool. Prairie grasslands dominate this acreage, but the refuge staff reports that only about 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 50–100 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. 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 I.

The current refuge bird list includes 234 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. 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 J).

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.

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 is 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.

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 1999–2002. The survey was done under a cooperative agreement with 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.

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 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:

- To assist in the preservation of examples of all significant natural ecosystems for comparison with those influenced by man.
- To provide educational and research areas for scientists to study the ecology, successional trends, and other aspects of the natural environment.
- 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.

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.

During the planning process for this CCP, refuge staff discovered that the area of the refuge designated as a research natural area 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 research natural area designation.

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.

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 wildlife photography can be enjoyed at Kirwin NWR.

Hunting

In the fall, hunting is a major attraction 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.

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, 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

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Bird watching is popular on many national wildlife refuges, including Kirwin.

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

Seven 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 seven kiosks and other sites to provide refuge-specific information to visitors. Periodically, information addressing migratory birds, wildlife habitat and management is also 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, Girl Scouts, and school groups. Staff have also taught environmental classes at camps.

Socioeconomic Setting

This section characterizes current socioeconomic conditions in Phillips County, Kansas.

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.

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Interpretive displays at refuge headquarters.

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 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.

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

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 450 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.

Full employment at Kirwin NWR is 7.5 permanent full time employees (FTEs). Current employment is 3.0 FTEs. Kirwin NWR had a budget of $234,140 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 wildlife 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, to support wildlife-dependent recreation, are also 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 (60–70 percent) live in Phillips County and vicinity (Mowry 2005). Most destination visitors come for the weekend and stay approximately 2–3 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 66–75 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.

4 Management Direction

The management direction in this chapter meets the purposes, vision, and goals of the refuge. Objectives and strategies to carry out the goals will provide for ecosystem and resource needs and public use.

- A goal is a descriptive, broad statement of desired future conditions that conveys a purpose, but does not define measurable units.
- An objective is a concise statement of
  - what is to be achieved;
  - how much is to be achieved;
  - when and where it is to be achieved;
  - who is responsible to achieve it.
- Strategies are ways to achieve an objective.
- Rationale for each objective includes background information, assumptions, and technical details used to formulate the objective. The rationale provides context to enhance comprehension and facilitate evaluations.

Development of refuge goals and objectives involved multiple sources of information:

- a review and interpretation of national plans
- a biological assessment of the refuge
- a review of existing scientific literature
- an evaluation of habitat conditions
- the personal knowledge of planning team participants

Management Summary

The Service will continue to manage the refuge in accordance with the MOA between Reclamation and the Service (appendix C). The MOA may be updated and revised during the life of this plan. The current MOA (1985) between Reclamation and the Service will remain in effect until an updated agreement is signed by both parties.

Management actions emphasize wildlife and habitat management for migratory birds and species of conservation concern.

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.

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. The majority of existing cropland in the uplands will be restored to prairie grassland habitat within the life of this plan.

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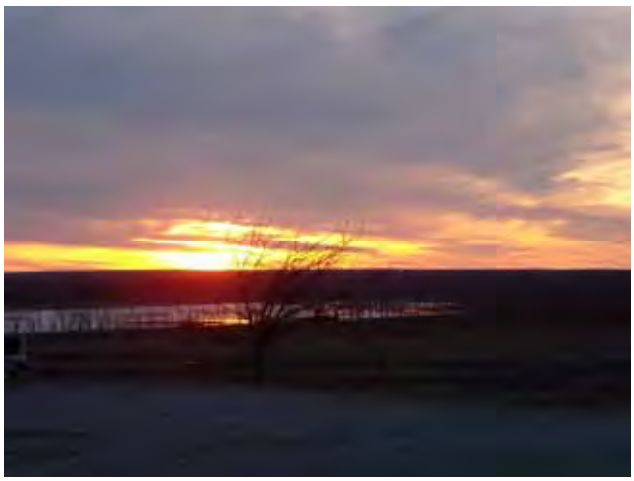
Food crops on the refuge.

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



USFWS

Sunset over Kirwin Reservoir.

upriver one mile and will occur from Grays Park west.

Wildlife-dependent recreation will be emphasized and promoted, with hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation receiving priority attention.

Non-wildlife-dependent uses will not be allowed. These refuge uses, and the facilities that support them will be phased out within 1 year of CCP implementation. Overnight camping will be discontinued. However, several other camping opportunities exist in the local area.

Restrooms that do not support wildlife-dependent recreation will be closed and removed or relocated, changing the number of restrooms on the refuge from six to four. Restrooms in good condition will be relocated and used on the refuge, or transferred to another national wildlife refuge.

The existing hunting program will continue with minimal modifications. Increased efforts to improve the quality of the hunting program will be implemented. The archery deer only hunting unit will be expanded to include the Solomon River bottom.

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 any one of these criteria, it will be seasonally and/or permanently closed. If roads are closed, parking areas will be adjusted to facilitate pedestrian access.

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. The refuge will clear and maintain foot paths to the reservoir to allow fishing access. Ice fishing will continue to be allowed. Under low water conditions (elevation <1,722 feet), a seasonal boat closure will be implemented on the majority of the 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. The Service will work with others to install a boat ramp at Crappie Point to allow access to Bow Creek.

Efforts to provide wildlife observation, wildlife photography, environmental education, and interpretation opportunities will be expanded where feasible.

The refuge manager may issue Special Use Permits for various activities, which do not materially detract from refuge purposes, such as university research and Boy Scout safety training.

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 seek voluntary assistance from KDWP to help with the fishery in Kirwin Reservoir. A new MOA between the Service and KDWP needs to be developed due to the 1954 MOA being voided by the 1966 National Wildlife Refuge System Administration Act to comply with Service laws, policies and regulations.

The refuge will manage its wildland fire program according to the steps outlines in appendix H.

The section 7 biological evaluation for threatened and endangered species can be found in appendix K.

MANAGEMENT DIRECTION

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 (see figure 6).

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.

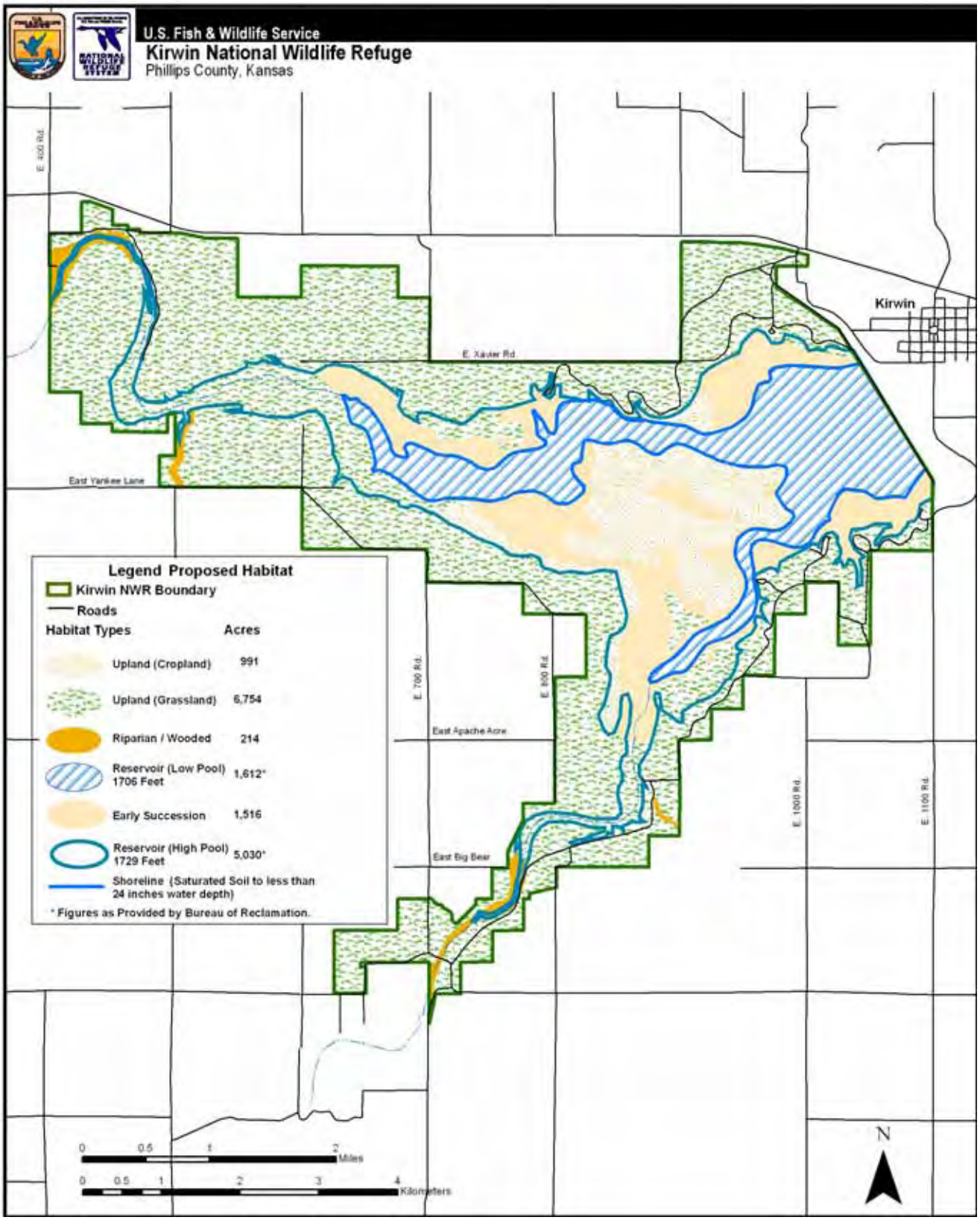


Figure 6. Expected habitat conditions at Kirwin National Wildlife Refuge, Kansas

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:

- At water levels <1,722 ft, 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).
- Maintain Bow Creek to boating year-round from Crappie Point upstream (south of Crappie Point).
- Continue to 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.

The objectives and strategies for the shoreline habitat are the same as those of the deepwater (reservoir) habitat.

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 methods such as 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 (Service 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.

– Remove all trees from grasslands (native and nonnative).

USFWS

Prairie wildflowers

– 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 7). 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.

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).

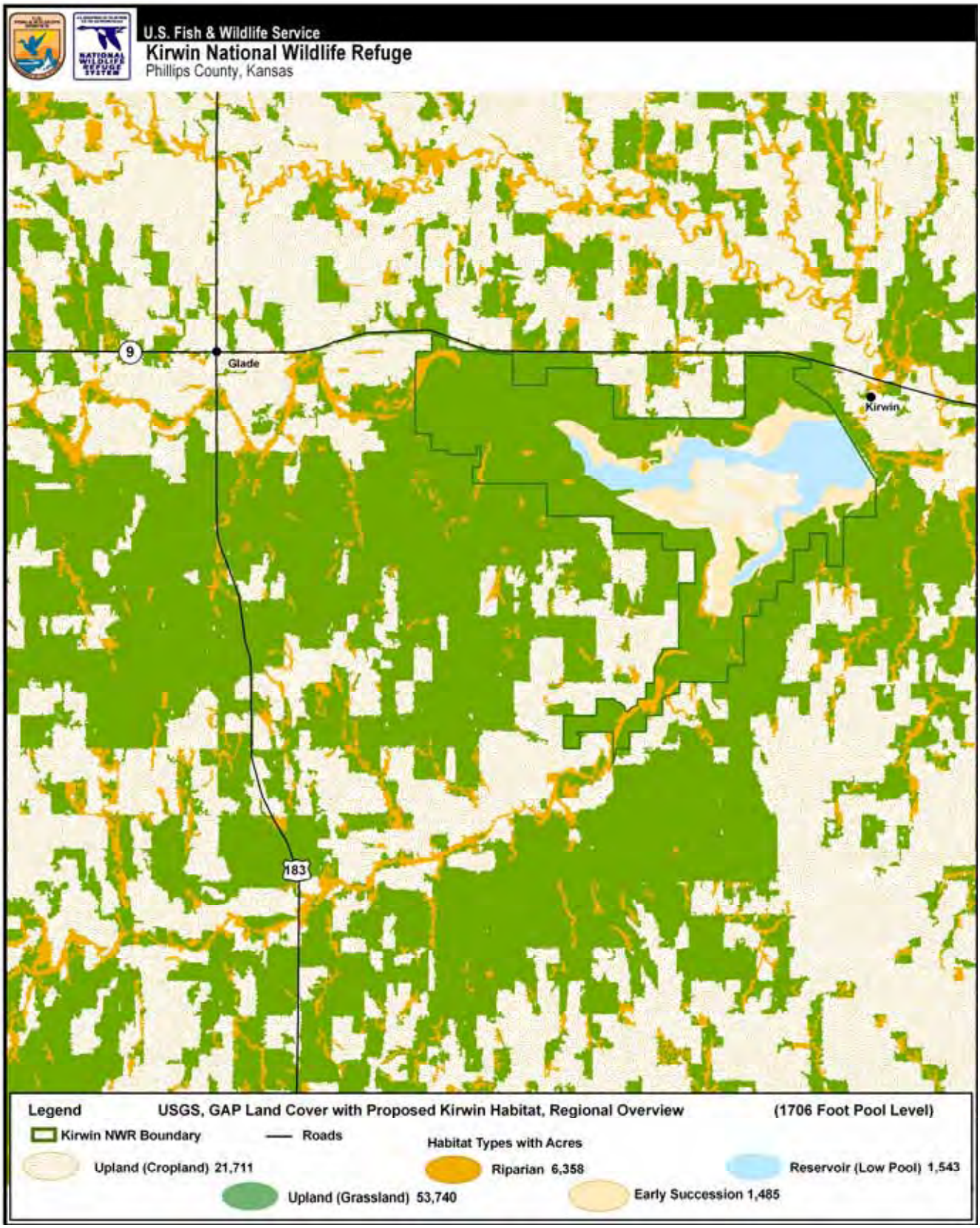


Figure 7. Regional overview

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 whooping 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 (Service 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 human disturbance 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 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

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

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, wildlife 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 compatibility determination (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 C.

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 (see figure 8).

Hunting

Additional hunting opportunities may be considered during the development of a visitor services plan (table 1). The public will be included in the development of the visitor services plan.

Objective 1: Until the new visitor services step-down management plan is completed (table 1), maintain most of 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 (figure 8) 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 (Service 1996).

Areas closed to hunting and/or 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.

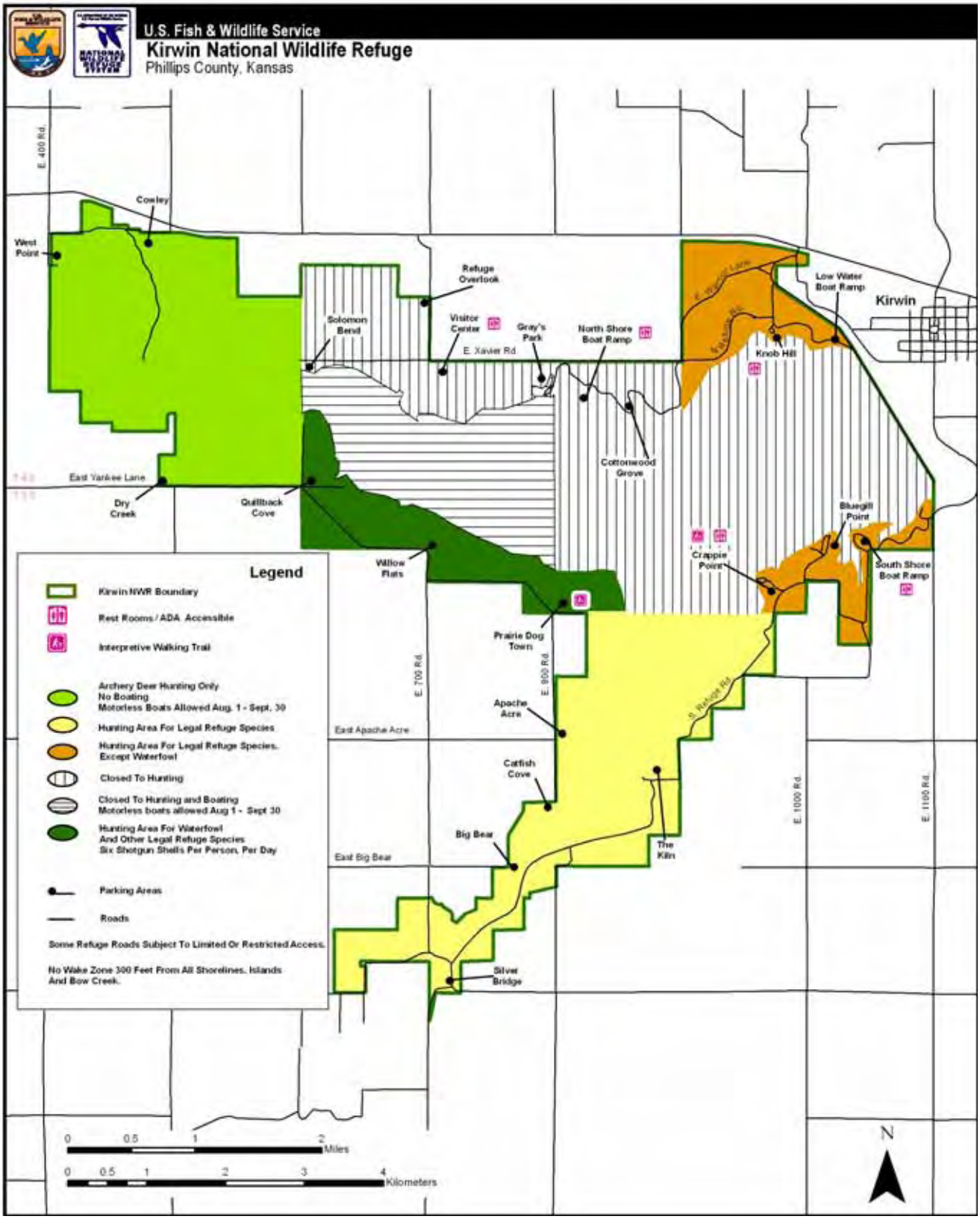


Figure 8. Public use at Kirwin National Wildlife Refuge, Kansas

Strategies:

- Hire a park ranger (refuge law enforcement officer).
- Continue archery-only deer hunting in the western part of the refuge.
- Increase archery-only deer hunting unit to include the Solomon River bottom.
- Implement a limited quota draw system for archery deer permits.
- Require all archery deer stands, blinds, etc., to be labeled with the hunter's name.
- 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: Simplify the existing hunting plan as much as possible, until the new visitor services step-down management plan is completed (table 1).

Rationale:

Kirwin has a fairly complicated hunting plan which creates problems for new and veteran hunters of the refuge. National wildlife refuges strive for the simplest hunting plans on refuges to make refuges user friendly and reduce law enforcement workloads and violations.

Strategies:

- Change the six shell zone regulations to state that no more than six shotgun shells per person per day are allowed during all hunting seasons.
- During times when there is no water in the reservoir bottom west of a line between Quillback Cove and Solomon Bend, open the dry reservoir bottom to archery deer hunting. The area will be re-evaluated for hunting compatibility with refuge purposes if water is present in the area.

Objective 3: 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 4: 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 ethical 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 5: 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 use and will continue to be supported.

Strategies:

– Continue to allow motorized and nonmotorized boating in designated areas and at designated times to support 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.

– Clear and maintain foot paths to the reservoir for fishing access.

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 (Service 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.

– At water levels <1,722 ft, 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, Wildlife Photography, Interpretation, and Environmental Education

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

Rationale:

These are compatible 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). Camping is available in the local area.

Strategies:

- Discontinue volleyball, power/speed boating, water/jet skiing (personal water craft), camping, swimming, horseback riding, basketball, tournament fishing, and power and speed boating.
- 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.

USFWS

Bluebird box.

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 that do not support wildlife-dependent recreation.

Strategies:

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

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.

Strategies:

– Work with others to install a boat ramp at Crappie Point to allow access to Bow Creek.

– Extend the low water boat ramp to facilitate easier launching and retrieving during low water conditions.

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.

Monitoring and Evaluation

Habitat management on refuges is an ongoing process and the Service recommends that planning be conducted within the context of adaptive resource management (Service 1995b, 1996A).

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 step-down management plans (described in chapter 2).

Personnel and Funding

The personnel and funding needed to carry out this CCP are described below.

Personnel

Current, the refuge has a staff of three full-time employees to manage the refuge. 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 2 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. The proposed positions are also included in the database for refuge operations needs (appendix L).

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.

FUNDING

Funding to implement this CCP is derived from three sources:

- The refuge operations needs system (RONS) includes requests made to the Congress for funding and staffing above the existing base budget needed to administer programs and carry out projects.
- The maintenance management system (MMS) is a database that documents the maintenance and replacement needs for existing equipment, buildings, roads, fences, and other property (appendix M).
- Cost estimates are developed for projects needed to implement this CCP, which are not yet reflected in the RONS or MMS.

Table 2. 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