

Finding of No Significant Impact

Environmental Assessment and Comprehensive Conservation Plan for Crane Meadows National Wildlife Refuge, Minnesota

An Environmental Assessment (EA) has been prepared to identify management strategies to meet the conservation goals of Crane Meadows National Wildlife Refuge (NWR). The EA examined the environmental consequences that each management alternative could have on the quality of the physical, biological, and human environment, as required by the National Environmental Policy Act of 1969 (NEPA). The EA evaluated three alternatives for the future management of Crane Meadows NWR.

The alternative selected for implementation on the refuge is *Alternative B*. This preferred alternative portrays a long-term vision for habitat restoration to near-historic benchmark conditions and increases recreation opportunities for visitors over the 15-year planning horizon. A diversity of wetland and savanna habitats are favored reinforcing historic conditions, while prairie and woodland are reduced over the long-term. This alternative includes active participation in monitoring and improving upstream water resources, calls for adherence to a well-developed prescribed fire plan, increases land acquisition and work on private lands in high priority areas, augments the existing biological inventory and monitoring program, and offers visitor services in a greater number of locations. Specific, managed hunts are offered, and opportunities for quality fishing experiences will be evaluated as new lands are acquired.

For reasons presented above and below, and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative B as the management alternative for Crane Meadows NWR is not a major Federal action which would significantly affect the quality of the human environment, within the meaning of Section 102 (2)(c) of the National Environmental Policy Act of 1969.

Additional Reasons:

- Future management actions will have a neutral or positive impact on the local economy.
- This action will not have an adverse impact on threatened or endangered species.

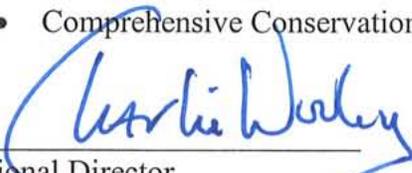
Supporting References:

- Environmental Assessment
- Comprehensive Conservation Plan

ACTING

Regional Director

Date


9/14/10

ENVIRONMENTAL ASSESSMENT FOR IMPLEMENTATION OF COMPREHENSIVE CONSERVATION PLAN FOR CRANE MEADOWS NATIONAL WILDLIFE REFUGE

Abstract: The U.S. Fish and Wildlife Service is proposing to implement a Comprehensive Conservation Plan (CCP) for Crane Meadows National Wildlife Refuge (NWR) located in central Minnesota. This Environmental Assessment (EA) considers the biological, environmental and socioeconomic effects that implementing the CCP (which is the preferred alternative in this EA), or one of three alternatives, would have on the issues and concerns identified during the planning process. The purpose of the proposed action is to establish the management direction for the Refuge for the next 15 years. The management action will be achieved by implementing a detailed set of goals, objectives, and strategies described in the CCP.

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Crane Meadows

National Wildlife Refuge

Environmental Assessment

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Chapter 1: Purpose and Need

1.1. Background

This Environmental Assessment (EA) was written as part of the planning process for the Comprehensive Conservation Plan (CCP) for Crane Meadows National Wildlife Refuge (NWR).

Crane Meadows NWR was established in 1992 to protect one of the largest, most intact wetland complexes remaining in central Minnesota (see Figure 1 on page 2). Described as a ‘sand plain wetland/upland complex’, the Refuge habitats are a unique mosaic of droughty, sandy uplands consisting of prairies, oak savannas, and mixed forests; and diverse, poorly-drained wetland habitats including sedge meadow, shallow lake, scrub-shrub, and bottomland forest communities. These habitats provide valuable respite from surrounding agricultural and developed land uses for many species of migratory birds, fish, reptiles, and other wildlife. Species present on the Refuge include several state and federally listed plants and animals such as the tubercled rein-orchid and Blanding’s turtle. Beyond the natural resource conservation innate to national wildlife refuges in the form of ecological services, habitats, and wildlife, the Crane Meadows NWR acquisition boundary also contains an array of archaeological sites and recreation opportunities.

At a landscape level, Crane Meadows NWR lies in the thin transitional zone between the continent’s central prairies and northern forests, Crane Meadows NWR’s location provides an interesting case study for the effects of global climate change as weather patterns and disturbance regimes change, biomes shift, and species distributions, phenologies, and interactions evolve. The Refuge also drains nearly 275,000 acres of upstream watershed area extending northeast to the periphery of Lake Mille Lacs, making it an important filter for the Mississippi River just 5 miles downstream.

Within the 13,540-acre area proposed for acquisition, the mix of land ownership includes the Service (just over 1,800 acres), state landholdings (approximately 900 acres), as well as hunt clubs, a diversity of agriculture interests, and numerous private residences (see Figure 2 on page 3). Land acquisition for the Refuge continues slowly as resources permit. With a local staff of two and support from Sherburne National Wildlife Refuge (the two Refuges form the Sherburne-Crane Meadows Refuge Complex), Crane Meadows maintains strong relation-

ships with conservation partners and surrounding communities through its Partners for Fish and Wildlife Program, Friends group, and a number of popular Refuge programs.

As one of the most recent additions to Minnesota’s 12 National Wildlife Refuges, it contributes to the Refuge System mission by enhancing the “...national network of lands and waters for...for fish, wildlife, and plant resources, and their habitats...”

1.2. Purpose

The purpose of the proposed action is to specify management direction for Crane Meadows National Wildlife Refuge over the next 15 years. The purpose of the Environmental Assessment is to select a management direction for the Refuge that best achieves the Refuge’s purposes, vision and goals; contributes to the mission of the National Wildlife Refuge System; is consistent with principles of sound fish and wildlife management; and addresses relevant mandates and major issues developed during scoping. The final management direction will be described in detail through a set of goals, objectives, and strategies in a Comprehensive Conservation Plan (CCP).

1.3. Need for Action

The action is needed because adequate, long-term management direction does not currently exist for the Refuge. Instead, existing management is guided by general Service policies, by interpreting the official purposes for which the Refuge was created, and by short-term management plans. The planning process must be revisited regularly to ensure that management reflects current conditions, recent scientific knowledge, and the full range of management issues. The action is also needed to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges in the United States.

This EA presents three management alternatives for the future of Crane Meadows NWR. The preferred alternative will be selected based on its ability to meet identified goals. These goals may also be considered as the primary need for action. Goals for the Refuge were developed by the planning team and encompass all aspects of Refuge management, including wildlife, habitat, and people. Each of the

Figure 1: Location of Crane Meadows NWR

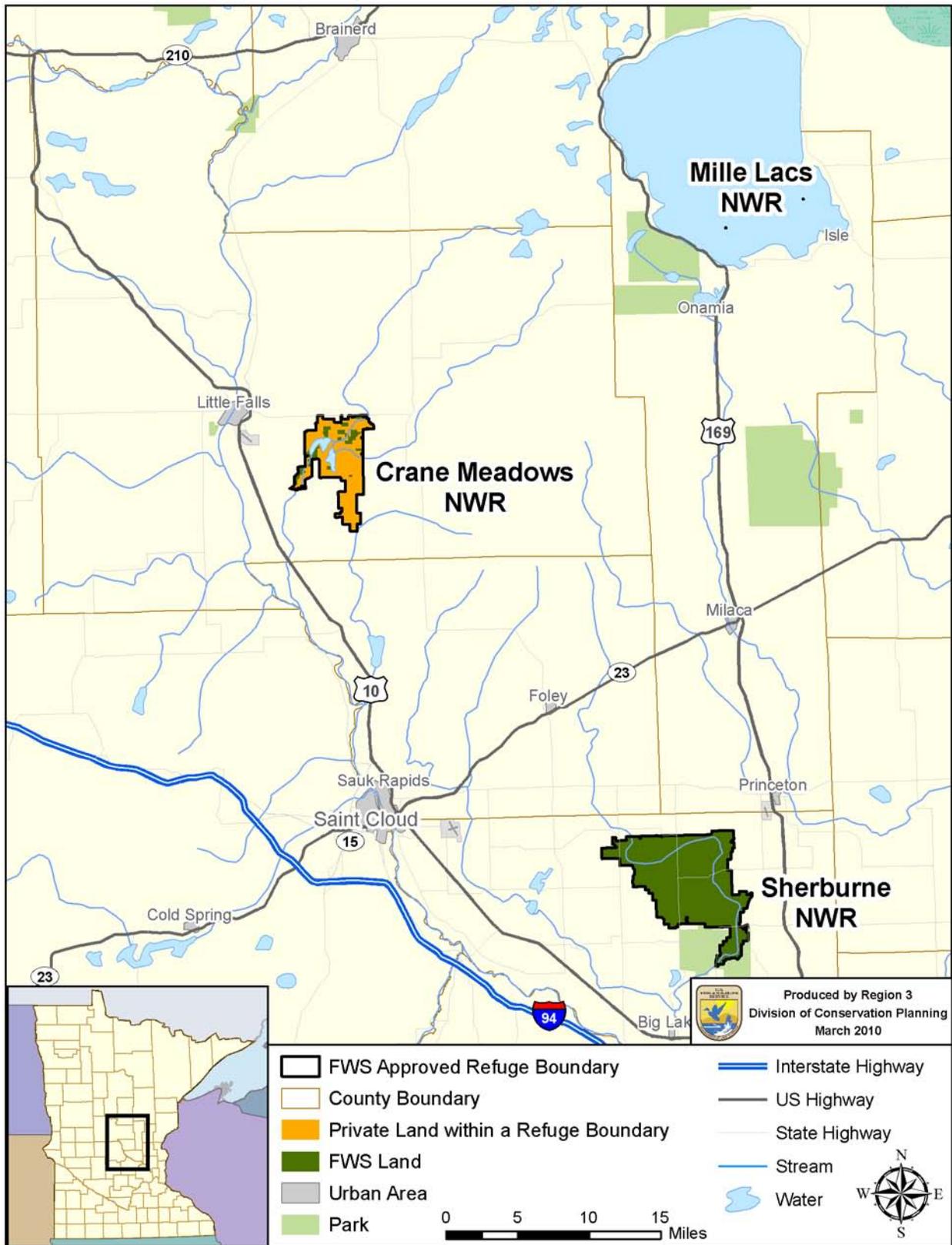
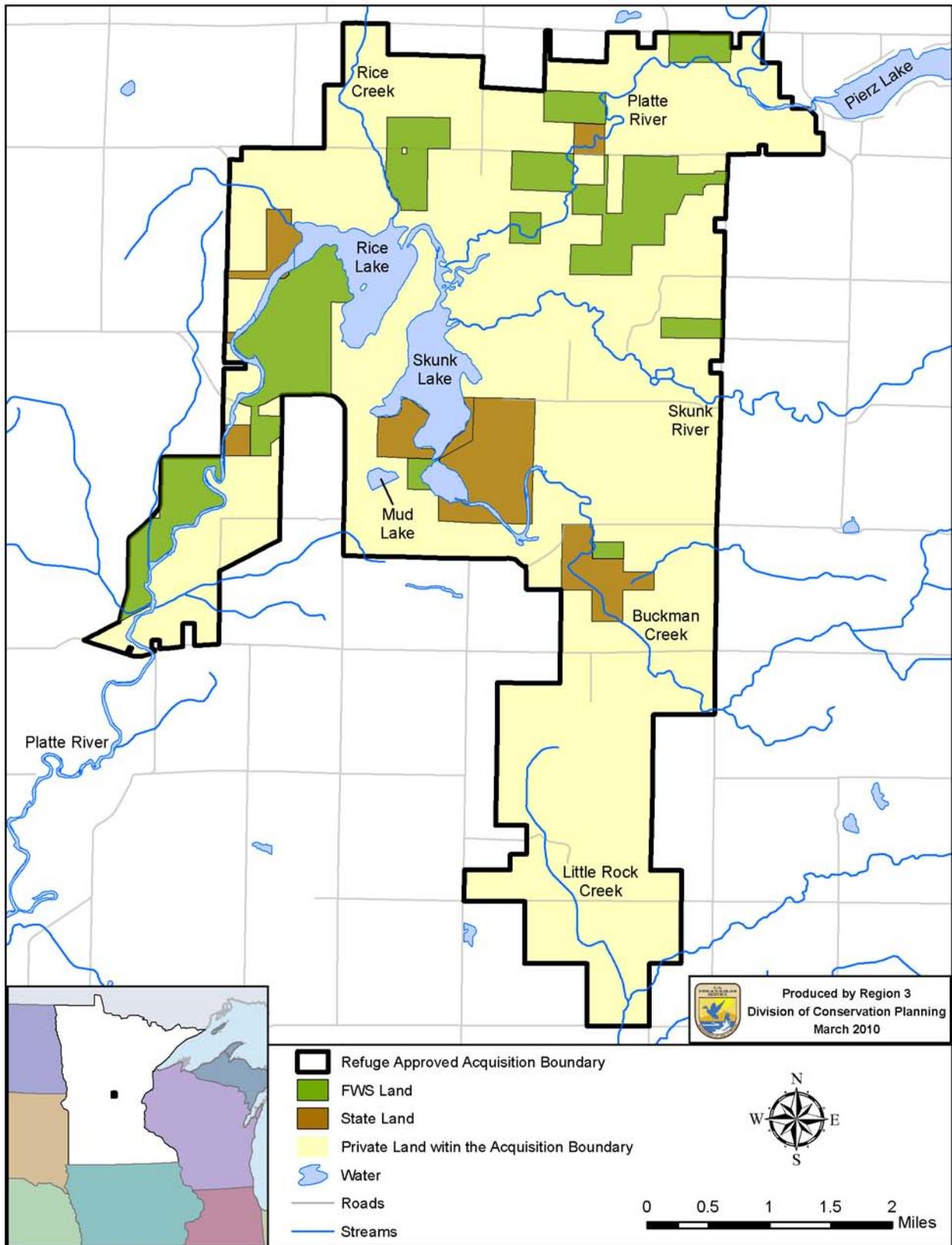


Figure 2: Land Ownership, Crane Meadows NWR



management alternatives described in this EA will be able to, at least minimally, achieve the following Refuge goals:

Wildlife

Protect, restore, and maintain native wildlife species to ensure biological diversity and abundance, with special emphasis on Service Regional Conservation Priority Species.

Habitat

Conserve a diverse mosaic of habitats both on- and off-Refuge, particularly sedge meadow, shallow lake, oak savanna, prairie, and other declining endemic habitat types, to meet the needs of native plants and wildlife with emphasis on Service Regional Conservation Priority Species. Crane Meadows NWR will remain engaged in efforts to protect and enhance water quality and natural hydrology in the watershed.

People

As an active partner in collaborative conservation, the Refuge will provide quality wildlife-dependent recreation, environmental education, and outreach to a diverse audience. These activities will preserve cultural resources and promote understanding, appreciation, and support for Crane Meadows National Wildlife Refuge, the National Wildlife Refuge System, and natural resource conservation.

1.4. Decision Framework

The Regional Director for the Midwest Region (Region 3 of the U.S Fish and Wildlife Service) will need to make two decisions based on this EA: (1) select an alternative for the Refuge, and (2) determine if the selected alternative is a major federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement (EIS). The planning team has recommended Alternative B to the Regional Director. The CCP was developed for implementation based on these recommendations.

1.5. Authority, Legal Compliance, and Compatibility

The National Wildlife Refuge System includes federal lands managed primarily to provide habitat for a diversity of fish, wildlife, and plant species. National wildlife refuges are established under many different authorities and funding sources for a variety of purposes. Crane Meadows NWR is a part of the Refuge System and the authority and purposes are derived from several federal statutes. The purposes for Crane Meadows NWR were derived from the Fish and Wildlife Act of 1956 for the con-

servation and protection of fish and wildlife resources, and from the Emergency Wetlands Resources Act of 1986 to protect one of the largest, most intact wetland complexes remaining in the state of Minnesota. Also, the mandate for Farm Service Agency (formerly Farmers Home Administration) Easements and Fee title transfers "...for conservation purposes..." is codified in 7USC2002. Finally, compatibility for all public uses on the refuge beyond the six guaranteed by the Refuge Improvement Act of 1997 (hunting, fishing, wildlife observation, photography, environmental education, and interpretation) are evaluated through Appropriate Use and Compatibility Determination policies set forth by the Service. Appendix F of the CCP contains a list of the key laws, orders, and regulations that provide a framework for the proposed action.

1.6. Scoping of the Issues

The Scoping period involves a thorough assessment of issues, concerns, opinions, thoughts, ideas, concepts, and visions for a refuge. The current process used by the Midwest Region (3) of the Fish and Wildlife Service solicits input and feedback from at least five distinct audiences. The process at Crane Meadows began with a kick-off meeting for Refuge staff (16-17 December 2008), who did an initial brainstorm of challenges, opportunities, new directions, and potential sources of conflict. Next the general public and stakeholders were notified of the planning effort commencement and a public scoping period held between 21 January and 6 March 2009 during which the Service solicited public comments. An open house was held at the Refuge to provide a forum for planning discussions on 19 February 2009. At this time local, regional, and state natural resource and other subject area specialists were also gathered for workshops to review, evaluate, and plan the biological and visitor services programs at the Refuge (23-26 March 2009). The semi-final stage of scoping took place at the regional office with a meeting on 4 May 2009. This event gives the other divisions of the FWS and upper level management in the region the opportunity to review the Refuge and the issues brought forth during initial scoping stages. Finally, a briefing statement is prepared and routed to the national FWS office in Washington D.C. for review and approval (19 May 2009).

The issues brought forth during the scoping phase of planning bring important topics to the attention of the plan's authors, and are used to inform the writing of the alternative management scenarios. One of the proposed alternatives will ulti-

mately be chosen as the future direction of the Refuge. The following section provides brief summaries of the issues raised during scoping:

1.6.1. Habitat

Issue Statement: If the integrity of this unique, relatively unaltered wetland ecosystem is to persist, it must be protected. The remaining in-tact wetland and upland habitat needs to be combined with restored adjacent areas to achieve a healthy, natural system resembling historic conditions.

Background: The relatively unaltered state of Crane Meadows NWR's wetland habitats generated a great deal of interest in habitat conservation at the Refuge. In general, public comments emphasized a desire to protect intact habitats and restore altered habitats to historic conditions. The need to safeguard specific habitat types, including prairie and oak savanna, was brought up in numerous comments. Related comments acknowledged the need for a prescribed burn program to mimic historic disturbance cycles and maintain a diversity of successional habitat stages.

1.6.2. Land Acquisition

Issue statement: The slow growth of the Refuge has proven frustrating for numerous supporters of the Refuge. Small, scattered tracts of land make habitat management less efficient, diminish the benefit to wildlife, make law enforcement more difficult, and increase the potential for conflicts with neighbors.

Background: With ownership of approximately 1,800 acres of the 13,540 acres approved for acquisition, land acquisition continues to be among the primary concerns for Crane Meadows NWR. Since its establishment in 1992, the Refuge has worked with willing sellers inside the approved acquisition boundary, yet land acquisition has been slow and has faced a number of challenges. Land acquisition is dependent on the willingness of owners to sell to the Service, the availability of funding, the patience of private landowners with the lengthy process, and the resistance to competition from other interested buyers. As a result, property acquisition to date has been opportunistic and piecemeal, resulting in scattered land ownership and challenges to management and law enforcement. In addition, agricultural development has increased within and bordering the Refuge acquisition boundary in recent years - specifically large-scale dairy, pork, and poultry installations. During public scoping, some people suggested that acquisition efforts focus on specific targets, such as critical habitat. Other comments indicated that the public would like to see the Refuge shift

from an opportunistic approach to land acquisition and conservation to adopting a more strategic approach that targets critical habitat.

1.6.3. Water Resources

Issue Statement: Water quality, a key factor in the health of the Rice-Skunk wetland complex, is threatened by hydrologic alteration, pollution, and sedimentation from adjacent land uses.

Background: More than 55 percent of the Refuge is comprised of wetland habitats and open water. Concerns related to water that were raised during scoping include issues of both quality and quantity. Furthermore, all open waters on the Refuge are under State management and publicly accessible, necessitating partnerships and larger collaborative efforts. Specific comments received expressed concerns about the following:

- Impacts of increasing agricultural development in the form of field drainage, center pivot irrigation, and animal installations.
- Nutrient loading, eutrophication, and the presence of other pollutants in area lakes and streams.
- Water volume fluctuations in the wetland complex, associated effects on the annual wild rice crop, and the DNR weir on the Platte River.
- Access to recreation on Rice and Skunk Lakes including potential effects on wildlife.

1.6.4. Wildlife

Issue statement: There are numerous threats to the long-term persistence of healthy wildlife populations at Crane Meadows NWR including habitat disturbance, contamination and disease, competition from exotic/invasive species, and the lack of resources for monitoring and research necessary for management.

Background: Wildlife at Crane Meadows NWR includes an abundance of birds, mammals, fish, reptiles, amphibians, invertebrates, and both state-listed and federally-listed species. Comments received during scoping related to wildlife issues included the concern that increasing visitation on the Refuge could have negative impacts on wildlife; the need to further inventory and monitor plants and animals, particularly rare or declining plant species that may be present on the Refuge; the threat of invasive species on the Refuge such as purple loosestrife, reed canary grass, phragmites, and carp; concerns about the effects of animal installations on local wildlife, such as avian transmitted diseases; depredation of crops by cranes, geese, and deer; and the potential decline of the brown trout fishery on the southern tip of the Refuge.

1.6.5. Visitor Services

Hunting

Issue Statement: Some people would like to have the opportunity to hunt on Refuge lands, others would like to see the Refuge maintained as sanctuary for wildlife. Nevertheless, the lack of a large, contiguous land base presents challenges to offering high-quality and safe hunting opportunities.

Background: Hunting was originally discussed during public meetings that led to the establishment of Crane Meadows NWR in 1992, and has remained a public expectation ever since. Currently no hunting is allowed on the Refuge because Service properties are small and scattered, boundary signage is limited, and boundaries are difficult to enforce.

Fishing

Issue Statement: Some individuals would like to see the Refuge allow shoreline fishing opportunities, and others expressed opposition to fishing from Refuge shores.

Background: Fishing from boats, as well as spear fishing are commonplace on the waters at Crane Meadows NWR because all open waters at the Refuge are managed by the State and are accessible to the public. Fishing from the shores of the Refuge, however, is not currently permitted.

Environmental Education

Issue Statement: Environmental education facilities and programming are currently limited at Crane Meadows NWR. There is interest in expanding the visitor services programming to include facilities such as an outdoor classroom and increasing staff so that the Refuge can offer environmental education programming in area schools.

Background: Education and associated interaction with area schools was the second most common topic found in public comments, after land acquisition. There is interest and potential for Crane Meadows NWR to become more active with environmental education in local communities. Paralleling this public interest, is the Service's recent initiative, "Connecting People with Nature" which has an emphasis on getting people outdoors, especially children. Nature is important to children's intellectual, emotional, social, and physical development. Recommendations were made that the Refuge establish an outdoor classroom, increase staff involvement with area schools, increase events and programs for the public, and work to better define and increase public understanding of the Refuge's identity, purpose, role in the community, and responsibilities.

Trails

Issue Statement: Motorized vehicles that are prohibited on the Refuge are permitted on the Soo Line multiple-use trail that transects the Refuge, and some people would like to see greater education and law enforcement efforts to ensure appropriate trail use.

Background: Trails received some comment from the public - particularly the Soo Line multiple-use trail which transects the acquisition boundary and allows some motorized uses not typically associated with National Wildlife Refuges.

Facilities

Issue Statement: Visitor services facilities on the Refuge are not sufficient to welcome, orient, and inform visitors.

Background: Facilities have expanded and improved over the past few years at Crane Meadows NWR, and their use continues to increase. However, some people commented that visitor use can be improved by increasing staff available to greet the public, increasing landholdings within the Refuge acquisition boundary, and augmenting existing visitor facilities. Comments advocated for a permanently staffed visitor center, increased signage and brochures, a wetland boardwalk, and additional platforms for wildlife observation and fishing.

1.6.6. Archaeological Resources

Issue Statement: There are a number of cultural resources within the Refuge acquisition boundary that are not adequately identified or protected.

Background: The Refuge and surrounding areas were active Native American sites, and host a number of historical and cultural resources. Some studies have been conducted, but more research and surveys of the area are needed to understand the scope and extent of these cultural resources.

1.6.7. Support

Issue Statement: To meet current and future management needs at the Refuge, additional support in the form of staffing and partnerships will be needed.

Background: The Refuge currently has two full-time positions: a private lands biologist/refuge operations specialist, and a maintenance worker. During public scoping, some comments urged the Service to increase staffing to provide the resources for additional programming, research, monitoring, law enforcement, and other management activities. The needs noted by the public include a full-time manager, personnel to staff a visitor center, and additional help with field activities such as prescribed

burning and habitat restoration. The importance of partnerships and the benefit of additional staffing at Crane Meadows NWR were commonly discussed topics during CCP scoping. With steadily increasing human populations and associated effects on the landscape, it has become imperative for natural resource agencies and organizations to collaborate and seek creative ways to coordinate conservation efforts. This can both reduce redundancy in conservation efforts, and increase efficiency in protecting natural landscapes. With approximately 900 acres of land within the acquisition boundary and a parallel mission, the Minnesota DNR offers a unique and important partnership opportunity. Recommendations were also made to augment the relationship with Camp Ripley north of the Refuge, whose 53,000 acres support over 600 plant species, 202 migratory birds, 51 species of mammals, and 23 species of reptiles and amphibians.

Chapter 2: Description of the Alternatives

2.1. Formulation of Alternatives

The CCP planning team developed management alternatives for the Refuge based on the issues, concerns, and opportunities raised during the CCP scoping process. The issues that are discussed came from individuals, local citizens and officials, cooperating agencies, conservation organizations, and Refuge and Regional Office staff. Summaries of the three alternatives are provided in concise narrative form in this chapter. A complete set of objectives by alternative is provided in tabular form (Table 1 beginning on page 12).

The management alternatives were developed to generally fit within the current Refuge budget, and were formulated under the assumption that a large budget increase for operations is unlikely during the life of the plan. In addition to reallocating existing fiscal and staff resources to emphasize certain aspects of management, the alternatives also consider the possibility of new private resources (volunteers, grant funds, etc.) and a modest increase to Refuge program and/or staff funding over the next 15 years.

Concerns facing the planning team related to habitats, land acquisition, water resources, wildlife, visitor services, archaeological resources, partnerships, and staffing. With the long-term, comprehensive protection of the wetland complex as the central priority, management decisions related to habitat, wildlife, and people revolved around enhancing the integrity of this unique system. Limited Service ownership of land within the Refuge acquisition boundary created sideboards for the volume and intensity of management, and encouraged an emphasis on partnerships, outreach, and effective communication with local landowners and land managers.

Habitat restoration is an important aspect of the land acquisition process at Crane Meadows NWR, and careful consideration must be given to the planning, design, and implementation of restoration efforts. Guidance is derived from an assessment of historical conditions, while considering the implications of climate change factors and effects. The resulting landscape design depicts where wetland restoration is warranted, which upland habitats are most appropriate, and helps prioritize future acquisition targets.

Disturbance regimes related to fire frequency and intensity are another key factor in the maintenance of sand plain wetland and upland habitats in central Minnesota. Fire not only determines the abundance and geographic distribution of habitats, but is essential to a number of biological processes and life cycle stages for both plants and animals on the Refuge. The team recognized the need to plan for routine prescribed burns and coordinate with other entities, both public and private, to safely and effectively implement a fire program at Crane Meadows.

Water resources, watershed health, and their relationship to local plant and animal species and the mosaic of associated habitats are essential components of Refuge management at Crane Meadows. Much of the Platte-Spunk Watershed east of the Mississippi River drains through the Refuge. All public waters are managed by the state and the grand majority of the land up-stream of the Refuge is in private ownership with a multitude of land uses. Therefore, throughout the planning process the planning team acknowledged the importance of active participation in addressing water quality and quantity issues and riparian lands protection both on- and off-Refuge.

Wildlife concerns and opportunities at Crane Meadows NWR indicate a need for additional inventory and monitoring. A more comprehensive survey of the plant and animal species on the Refuge can help identify areas of high biodiversity, inform the selection of focal species, and highlight the unique biology of this sand plain wetland-upland complex. A number of plant and animal species with federal or state protection occur at the Refuge, and additional work will be required to better understand these resources.

Hunting and fishing on the Refuge are additional issues given careful consideration during the planning process. As primary public uses of the NWRS, and due to local interest and advocacy, the planning team thoroughly weighed the costs and benefits of offering these recreational activities. There has been a desire to offer hunting at Crane Meadows NWR since its inception, yet among the numerous elements required to implement a quality hunt program are adequate land area, visitor facilities, and staffing, which have remained below levels necessary to offer quality hunting opportunities. Fishing is currently allowed on all local public waters, and

the Refuge's decision to open bank fishing requires similar consideration and resources to those of hunting. These and other changes related to visitor services, including the enhancement of wildlife observation, photography, environmental education, and interpretation, were thoroughly examined and considered during the planning process.

Archaeological and cultural resources are abundant at the Refuge, but are not completely understood and documented. The planning team recognized that further work will need to be done as additional cultural resources come under Service ownership and management. The Service has a dedicated responsibility to the protection and preservation of all historic and cultural resources located within its boundaries.

Support for the Refuge is a topic that garnered a great deal of attention during the planning process. State partners, particularly the Minnesota Department of Natural Resources and the Minnesota Department of Defense, possess substantial landholdings in the vicinity of the Refuge, and offer important opportunities for collaboration and cooperation. Staffing is also an issue central to the future of the Refuge, and has a substantial impact on the level of management. A thorough assessment was done to identify key human resource needs on the Refuge under each proposed management alternative.

2.2. Elements Common to All Alternatives

2.2.1. Coordination with State Natural Resource Agencies

In accordance with the National Wildlife Refuge Administration Act as amended by the 1997 Refuge Improvement Act, the Service will, "...ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the states in which the units of the System are located." During Refuge planning and management implementation, Crane Meadows will coordinate its objectives and activities with the Minnesota DNR. The Refuge will also consider known populations of state-listed species in management actions under every alternative. A complete list of federally and state-listed species, and other species of conservation concern can be found in Appendix D of the CCP.

2.2.2. Archaeological and Cultural Resources

The consequences of each alternative in terms of cultural resources are the same. Lands administered by the Service come under federal cultural resources laws (and executive orders and regula-

tions), in addition to policies and procedures established by the Department of the Interior and the Service to implement the laws. Cultural resources on these lands receive protection and consideration that would not normally apply to private or local and state government lands.

Nevertheless, undertakings accomplished on the Refuge have the potential to impact cultural resources. The presence of cultural resources including historic properties cannot stop a federal undertaking, the laws require only that adverse impacts on historic properties be considered before irrevocable damage occurs.

The Refuge Manager will, during early planning, provide the Regional Historic Preservation Officer (RHPO) a description and location of all undertakings (projects, activities, routine maintenance, and operations that affect ground and structures, and requests for permitted uses); and of alternatives being considered. The RHPO will analyze these undertakings for their potential to affect historic properties and enter into consultation with the State Historic Preservation Officer (SHPO) and other parties as appropriate. The Refuge Manager will notify the public and local government officials to identify their concerns about potential impacts by the undertaking; this notification will be at least equal to the public notification accomplished for NEPA and compatibility.

2.2.3. Law Enforcement

The Refuge is responsible for protecting the resources within its boundaries and for providing a safe environment for people. The Refuge law enforcement program is a critical tool in protecting trust resources, wildlife habitat, public facilities, employees, and the visiting public. To provide this essential service, the Refuge will share regional resources and cooperate with other law enforcement authorities. Working with local police authorities, state conservation officers, and law enforcement officers from other NWRs the Refuge can meet these important responsibilities.

2.2.4. Environmental Justice

Executive Order 12398 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies,

and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment. Considerations made regarding adherence to this legislation will not vary between alternatives proposed in this Environmental Assessment.

2.3. Summary of Individual Alternatives

The following sections describe the current management (no action) alternative and two additional alternatives drafted by the planning team to address the issues raised during scoping, to meet the charge outlined by the Service mission, and to address the establishing purposes of the Refuge. The narratives summarize individual management issues and themes by alternative, and Table 1 beginning on page 12 provides a complete list of the objectives proposed under each alternative. Chapter 4 of this environmental assessment describes the consequences that would likely result from the actions proposed under each alternative.

2.3.1. Alternative A (Current Management Direction)

Opportunistic Land Protection, Active Habitat Restoration, and Concentrated Visitor Services

The first alternative (A) for the future management of Crane Meadows NWR depicts a continuation of current Refuge management, or a 'no action' scenario, as required by NEPA. In the case of Crane Meadows, land acquisition is minimal, conservation work on private lands is extensive, and both occur opportunistically. As land is acquired quality habitats are maintained, degraded habitats are improved or restored, and all habitat types have relative equal priority for acquisition and restoration. There is an active prescribed fire program on the Refuge. There is minimal involvement with local water resources which are all under the jurisdiction of the state. Wildlife management is minimal, and monitoring efforts follow existing, broader state and federal efforts. Visitor use is concentrated on a single Refuge tract, the Headquarters Unit, and consists of wildlife observation, photography, hiking, cross-country skiing, and snowshoeing as seasons and trail conditions allow. No hunting or fishing is permitted. There are half a dozen annual programs, supported by an active Refuge Friends Group and local volunteers. Staff is limited to two positions: refuge wildlife specialist and maintenance.

2.3.2. Alternative B (Preferred Alternative)

Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services

The second alternative (B) outlines a long-term vision for habitat restoration to near-historic benchmark conditions and increases recreation opportunities for visitors over the 15-year planning horizon. Geographically-explicit historic vegetation and ecological data is used to identify desired quantities and distribution of individual habitat types for all lands, public or private, within Refuge acquisition boundary. A diverse array of wetland and upland savanna habitats are favored reinforcing historic conditions, while existing prairie and woodland acreages are reduced over the long-term. This alternative includes active participation in water monitoring efforts, improvement of upstream water resources that affect the Refuge, and calls for adaptive disturbance rotations based on a well-developed prescribed fire plan. Land acquisition and private lands work increases, both targeting high priority areas. Biological inventory and monitoring increase for wildlife species of conservation concern, guilds of birds, native plants, and invasive species. Visitor services are offered at a greater number of locations. In addition to increasing facilities on the Headquarters Unit, new facilities or signage are provided along Highway 27 on the northern boundary of the Refuge, along the county-maintained Soo Line Recreational Trail which transects the Refuge, and on the Sedge Meadow Unit in the northeast portion of the Refuge. Specific, managed hunts are offered, and opportunities for quality fishing experiences will be evaluated both on existing Service lands and as new lands are acquired. These changes and new visitor opportunities are likely to result in increased visitation to the Refuge, increased attendance in Refuge programs and events, and increased participation in Friends Group and volunteer roles. This alternative also calls for full staffing at Crane Meadows according to the Service's 2008 staffing model, including four positions: refuge wildlife specialist, biologist, administrative assistant, and maintenance.

2.3.3. Alternative C

High Involvement in Watershed Improvement

The third alternative (C) retains many of the concepts and objectives from alternative B, but increases the emphasis given to water resources both on-Refuge and in the watershed upstream of the wetland complex. This alternative more directly addresses the principal establishing Refuge purpose, for '... the conservation of the wetlands of the Nation...', and seeks to maximize efforts to understand, protect, and conserve the water resources

that affect the Refuge's unique wetland complex. Using alternative B as a base, alternative C restores additional wetland and upland acres up-watershed of the Refuge, expands water resource monitoring and improvement activities throughout the east half of the Platte-Spunk watershed, targets a limited quantity of additional land adjacent to the existing Refuge boundary with critical water resource value for acquisition, increases and directs private lands work to priority aquatic and riparian areas upstream of the Refuge, emphasizes fishing as a primary recreation opportunity watershed-wide, directs additional education and interpretation efforts to water resource topics, and prioritizes partnerships, outreach opportunities, and volunteerism that occur within, or directly affect the Refuge's watershed.

2.4. Alternatives Considered but Not Developed

During the alternatives development stage of the CCP process, the planning team considered a number of ideas for potential management alternatives before pursuing those described in this document.

2.4.1. Transfer of Management Responsibility

One option included placing complete management of Service properties in the hands of the Minnesota DNR. There are a number of Service field stations that have memorandums of understanding (MOUs) with state resource agencies to transfer management responsibilities, making local conservation management more efficient and consistent. These decisions are often made because of the adjacency of state lands to Service properties, or in cases where Service landholdings are located at a great distance from their management headquarters. With Minnesota DNR ownership of over 900 acres in the Refuge acquisition boundary, and parallel missions, this scenario with the state DNR was discussed during early CCP planning stages, but not further pursued. Similarly, brief mention was given to the possibility of working with state partners to assume management of the state landholdings with the acquisition boundary. However, because neither agency currently owns a major percentage of the total possible acquisition acres (see Figure 2 on page 3), and because of the discrepancy between existing recreation opportunity provision across the two agencies, it was decidedly more prudent to wait until additional acquisition occurs and a clear majority of ownership is established before entertaining these possibilities.

2.4.2. Landscape-level Green Infrastructure

During the Refuge Planning Workshop in March of 2009, a fourth 'green infrastructure' theme was added to the proposed management alternatives. The basic premise of this alternative was to more directly focus management on the larger, landscape-level conservation perspective. Initial concepts emphasized collaboration/partnerships, larger-scale geospatial analyses of land cover and the conservation estate, concrete objectives for enhancing climate change resiliency and adaptability in the form of wildlife corridors, using elements of biogeographic theory and carrying capacity for Refuge design and expansion, drafting a blueprint for establishing connectivity with other National Wildlife Refuges in the System, and other such provisions. Though an important step in management scope and philosophy, the resources required to implement such an alternative far exceed those present, or even realistic to propose at a Refuge with a staff of 2 individuals and a land base of less than 2,000 acres. The alternative was eliminated during the alternatives workshop in September of 2009. However, some of these concepts were incorporated into Chapter 3 (Refuge Background) of the CCP.

2.5. Comparison of Management Alternatives

Table 1 beginning on page 12 provides a complete list of the management objectives, adjacent in space, to facilitate a more direct and thorough comparison of the three proposed alternatives.

Table 1: Objectives by Alternative, Crane Meadows NWR

Management Consideration	Alternative A: Current Management Direction (No Action)	Alternative B: Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services (Preferred Alternative)	Alternative C: High Involvement in Watershed Improvement
<p>Goal 1: Conserve a diverse mosaic of habitats both on- and off-Refuge, particularly sedge meadow, shallow lake, oak savanna, prairie, and other declining endemic habitat types, to meet the needs of native plants and wildlife with emphasis on Service Regional Conservation Priority Species. Crane Meadows NWR will remain engaged in efforts to protect and enhance water quality and natural hydrology in the watershed.</p>			
<p>Refuge Habitat</p>			
<p>Wetlands Total Acquisition Boundary Acres = 7,329 Total Service-owned Acres = 1,041</p>	<p>Maintain existing wetland habitat, and restore disturbed, altered, or degraded wetland areas where feasible within five years of acquisition.</p>	<p>Same as Alternative A, plus: Over the long term (100-plus years) within the full Refuge acquisition boundary, maintain existing and restore drained or degraded wetland habitats in suitable areas to the desired benchmark conditions (see Table 16 on page 83 of the CCP) to achieve a minimum of 8,000 acres (approximately 60 percent of the Refuge) in a mosaic of wetland habitats with the approximate desired acreages targets displayed in Table 17 on page 84 of the CCP. Also, see Figure 30 on page 85 of the CCP.</p>	<p>Same as Alternative B, plus: Over the life of the plan, coordinate with other agencies to restore a total of 2,000 wetland acres up-watershed.</p>
<p>Upland Prairie Total Acquisition Boundary Acres = 911 Total Service-owned Acres = 379</p>	<p>Seed all newly acquired disturbed, altered, or degraded upland areas to tallgrass prairie using local ecotype seed within five years of acquisition.</p>	<p>Seed all newly acquired disturbed, altered, or degraded upland areas to prairie (as a transition step for Southern Dry Savanna restoration) using local ecotype seed characteristic of savanna within five years of acquisition. Restore 20 percent (approximately 75 acres) of Service-owned upland prairie habitat to southern dry savanna. Within 3 years of plan approval identify the highest quality Service-owned upland prairie habitat to retain (see Figure 31 on page 88 for a map of existing upland prairies on the Refuge.) Work in these areas to improve vegetation structure and composition to desired benchmark habitat conditions (see Table 16 on page 83 of the CCP) and develop quality prairie seed source areas. Over the long term (100-plus years) within the full Refuge acquisition boundary, maintain a minimum of 4 percent (approximately 500 acres) upland prairie habitat at desired benchmark habitat conditions (see Table 16 on page 83 of the CCP), transitioning the remaining 3 percent (approximately 400 acres) to southern dry savanna. (see Figure 31 on page 88 of the CCP)</p>	<p>Same as Alternative B, plus: Over the life of the plan, coordinate with other agencies to restore a total of 1,000 upland prairie acres up-watershed.</p>

Table 1: Objectives by Alternative, Crane Meadows NWR

Management Consideration	Alternative A: Current Management Direction (No Action)	Alternative B: Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services (Preferred Alternative)	Alternative C: High Involvement in Watershed Improvement
<p>Southern Dry Savanna (Oak and Jack Pine) Total Acquisition Boundary Acres = 185 Total Service-owned Acres = 5</p>	<p>Maintain existing oak savanna habitat on Service-owned lands and on future acquisitions.</p>	<p>Over the life of the plan, begin restoring southern dry savanna habitat to desired benchmark conditions (see Table 16 on page 83 of the CCP) on 30 percent (approximately 210 acres) of the total Service-owned land. This acreage will come from suitable existing upland prairie (approximately 75 acres) and oak woodland (approximately 135 acres) habitats.</p> <p>Over the long term (100-150 years) within the full Refuge acquisition boundary, establish and maintain a minimum of 35 percent (approximately 4,700 acres) southern dry savanna habitat (see Table 16 on page 83 of the CCP for desired benchmark conditions). Existing oak savanna will be retained (~200 acres), and restoration will occur on existing upland prairies (~400 acres), oak woodlands (~1,550 acres), conifer forests and plantations (~300 acres), and agricultural areas (~2,250 acres). (see Figure 31 on page 88 of the CCP)</p>	<p>Same as Alternative B.</p>
<p>Oak Woodland Total Acquisition Boundary Acres = 1,854 Total Service-owned Acres = 268</p>	<p>No direct management.</p>	<p>Within 3 years of plan approval identify the highest quality Service-owned oak woodland habitat to retain (see Table 16 on page 83 of the CCP for desired benchmark conditions and Figure 31 on page 88 of the CCP for a map of existing oak woodlands). Begin thinning 50 percent of those stands, outside the highest quality oak woodlands selected to be retained, to the desired basal area (ranging from 5 to 50 square feet/acre) and species composition for southern dry savanna habitat.</p> <p>Over the long term (100-plus years) within the full Refuge acquisition boundary, reduce coverage of oak woodland to 2 percent (approximately 300 acres), transitioning approximately 1,600 acres to southern dry savanna. (see Figure 31 on page 88 of the CCP)</p>	<p>Same as Alternative B.</p>

Table 1: Objectives by Alternative, Crane Meadows NWR

Management Consideration	Alternative A: Current Management Direction (No Action)	Alternative B: Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services (Preferred Alternative)	Alternative C: High Involvement in Watershed Improvement
Other Habitat Management Variables			
Water Resource Monitoring, Management, and Watershed Conservation	No involvement with state management of waters.	Within 5 years of plan approval, begin regular monitoring of the 5 major streams passing through the Refuge acquisition boundary. Work with partners to improve water quality with the long-term goal of removing all Refuge waters from state impaired waters lists.	Same as Alternative B, plus: Work up-watershed of the Refuge to expand the water monitoring program; identify the major sources of water pollution; educate landowners on water resource issues, best management practices, and available conservation programs; assist with conservation projects in areas that affect sensitive water resources; and improve the overall water quality entering the wetland complex.
Prescribed Fire	Use fire on Refuge units to reduce hazardous fuel loads, reduce woody encroachment, and rejuvenate and restore prairie and oak savanna habitat.	Implement and monitor a rotational prescribed burn program over the life of the plan that supports the fire dependent vegetation communities on the Refuge and reduces hazardous fuel loads according to historic guidelines in Table 18 on page 92 of the CCP.	Same as Alternative B.
Land Acquisition	Continue opportunistic land acquisition as willing sellers and funding allow.	Within 3 years of plan approval, update the land acquisition priority map created for the environmental assessment that established the Refuge (see Figure 32 on page 93 of the CCP); over the life of the plan, increase efforts to make land acquisitions from willing landowners in high priority areas.	Same as Alternative B, plus: Identify up to 1,354 acres of land (10 percent of the existing approved acquisition acreage) adjacent to the Refuge with high water conservation value for acquisition.
Partners Program and FSA Easements	Opportunistically assist private landowners with habitat restoration of wetlands, oak savannas, and upland prairies through the Partners program, and periodically inspect FSA easements for violations.	Over the life of the plan, conduct a minimum of 100 habitat improvement projects through the Partners program within Morrison County, specifically targeting areas within, and up-watershed of the Refuge acquisition boundary. Ensure compliance of all properties with FSA easements (annual monitoring) and Partners program volunteer agreements (5-year monitoring cycle).	Within 5 years of plan approval, define land protection priorities based on water resources up-watershed of the Refuge, and over the life of the plan conduct 200 habitat improvement projects in high priority zones. Ensure compliance of all properties with FSA easements (annual monitoring) and Partners program volunteer agreements (monitor on a 5-year cycle).

Table 1: Objectives by Alternative, Crane Meadows NWR

Management Consideration	Alternative A: Current Management Direction (No Action)	Alternative B: Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services (Preferred Alternative)	Alternative C: High Involvement in Watershed Improvement
Goal 2: Protect, restore, and maintain native wildlife species to ensure biological diversity and abundance, with special emphasis on Service Regional Conservation Priority Species.			
Wildlife – Animals			
Federal and state Threatened and Endangered Species and / or Regional Species of Conservation Priority	Participate in larger state and federal wildlife population monitoring efforts for species of conservation concern.	Same as Alternative A, plus: Within 5 years of plan approval, develop and implement monitoring programs for the Bald Eagle and Blanding’s turtle.	Same as Alternative B.
Migratory Birds	Participate in larger state and federal wildlife population monitoring efforts, including: <ul style="list-style-type: none"> ■ Annual Crane Unison Call Surveys ■ Annual Midwest Crane Counts ■ Weekly/Biweekly Waterfowl Surveys ■ Weekly Bald Eagle Surveys ■ Annual Mourning Dove Surveys ■ Annual Woodcock Surveys ■ Annual Nest Boxes (Bluebird, Wood Duck, and Purple Martin) 	Same as Alternative A, plus: Over the life of the plan, conduct periodic monitoring of marshbirds, songbirds, and other migratory bird species.	Same as Alternative B.
Wildlife – Plants			
Native plant species	No active monitoring or management.	Within 5 years of plan approval, collaborate with the Minnesota DNR and other partners to conduct baseline inventories of plant species on the Refuge.	Same as Alternative B.

Table 1: Objectives by Alternative, Crane Meadows NWR

Management Consideration	Alternative A: Current Management Direction (No Action)	Alternative B: Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services (Preferred Alternative)	Alternative C: High Involvement in Watershed Improvement
Invasive / Exotic Plant Species	Follow invasive species trends in the local area, management action as needed.	Within 5 years of plan approval, conduct a comprehensive survey to assess the extent of invasive plant species on Service-owned Refuge lands. Within 10 years no more than 10 percent of acquired Refuge lands will be affected by invasive plant species. Potential concerns at the time of writing include the following species: <ul style="list-style-type: none"> ■ Purple loosestrife ■ Buckthorn ■ Cattail ■ Siberian elm ■ Phragmites ■ Box elder ■ Eurasian water milfoil ■ Black locust ■ Spotted knapweed ■ Common tansy ■ Leafy spurge ■ Japanese knotweed ■ Aspen ■ Hairy vetch ■ Crown vetch ■ Canada thistle 	Same as Alternative B, plus: Keep informed of annual invasive/exotic plant species trends in the watershed, assisting with control efforts where possible.
Wild Rice	Keep informed of the wild rice trends in the wetland complex.	Same as Alternative A, plus: Assist with monitoring and documenting wild rice trends through routine Service aerial imagery vegetation surveys.	Same as Alternative B.
Goal 3: As an active partner in collaborative conservation, the Refuge will provide quality wildlife-dependent recreation, environmental education, and outreach to a diverse audience. These activities will preserve cultural resources and promote understanding, appreciation, and support for Crane Meadows National Wildlife Refuge, the National Wildlife Refuge System, and natural resource conservation.			
People – Visitor Services			
Welcoming and Orienting Visitors	Maintain existing welcoming and orienting resources including the Platte River kiosk, two Refuge brochures (general and fire program), a bird checklist, and the Refuge website.	Bring all Refuge literature, web resources, kiosks, and directional signage into compliance with new Service standards within 10 years of plan approval, and expand welcoming and orienting facilities per Table 20 on page 97 (see Figure 33 on page 98 of the CCP).	Same as Alternative B, plus: Add water resource and watershed topics to welcoming and orienting resources on the Headquarters Unit within 5 years, and on the Sedge Meadows Units within 15 years.

Table 1: Objectives by Alternative, Crane Meadows NWR

Management Consideration	Alternative A: Current Management Direction (No Action)	Alternative B: Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services (Preferred Alternative)	Alternative C: High Involvement in Watershed Improvement
Hunting	Continue to post and enforce boundaries prohibiting hunting on the Refuge.	Within 5 years of plan approval, work with partners to open managed white-tailed deer and turkey hunts on specified Refuge units for hunters with disabilities and for youth hunters.	Same as Alternative B.
Fishing	Continue to post and enforce boundaries prohibiting bank fishing on the Refuge.	Within 3 years, evaluate the potential to establish seasonal bank fishing opportunities on the Platte River West Unit; over the life of the plan evaluate the potential for new bank fishing opportunities as additional properties are acquired.	Promote and expand fishing programs on- and off-Refuge.
Wildlife Observation and Photography	Offer wildlife observation and photography opportunities along the 3.7-mile Platte River Trail (Headquarters Unit) seven days a week during daylight hours.	Over the life of the plan, maintain existing wildlife observation and photography infrastructure and opportunities, and expand and promote opportunities along the Soo Line Trail corridor and on the Sedge Meadow Unit to correspond to a 20 percent increase in Refuge visitation from 2009 levels (see welcoming and orienting for additional details).	Same as Alternative B, plus: Increase wildlife observation and photography opportunities in the watershed through new programs, partnerships, and the development of a watershed trail.
Environmental Education and Interpretation	Maintain Refuge environmental education and interpretation provision and participation at 2009 levels (approximately 500 people/year). In addition to self-directed learning, this includes staff-directed programs/activities listed below, talks, publications, audio-visual media, signs, and exhibits that convey key habitat, wildlife, and other natural resource messages to visitors. <ul style="list-style-type: none"> ■ Habitat Day ■ Platte River Cleanup Day ■ Winter Backyard Birdfeeding ■ Spring and Fall Birding Tours ■ Morrison County Water Festival ■ Pheasant Forever Youth Days (Sherburne and Anoka Counties) 	Increase Refuge environmental education and interpretation provision from 2009 levels. Specifically, increase participation in programs by 20 percent within 15 years, and establish new interpretive displays that convey key habitat, wildlife, and other natural resource messages to visitors on the following Refuge units: Headquarters, Highway 27, Sedge Meadow, Platte River West, and Soo Line East (see welcoming and orienting for additional information).	Same as Alternative B, plus: With 5 years of plan approval, develop an educational curriculum and interpretational materials covering a diversity of water-related topics such as the hydrologic cycle, the importance of wetlands, water quality, wild rice, and watershed health.

Table 1: Objectives by Alternative, Crane Meadows NWR

Management Consideration	Alternative A: Current Management Direction (No Action)	Alternative B: Habitat Restoration to Pre-settlement Benchmark Conditions and Increased Provision of Visitors Services (Preferred Alternative)	Alternative C: High Involvement in Watershed Improvement
Outreach and Partnerships	Maintain relationships with current partners described in “Partnerships” on page 78 and existing outreach activities described in “Visitor Services” on page 76.	Same as Alternative A, plus: Maintain relationships with current partners (“Partnerships” on page 78) and existing outreach activities (“Visitor Services” on page 76), and identify and participate in at least 10 new outreach opportunities or community activities over the life of the plan to increase collaboration, improve the public understanding of Crane Meadows NWR and the Refuge System, and reinforce the importance of natural resource conservation.	Same as Alternative B, plus: Increase outreach to residents of the watershed, and interaction with water resource agencies and organizations over the life of the plan.
Cultural Resource Management	Over the life of the plan, protect all cultural, historic, and archaeological resources on the Refuge.	Same as Alternative A.	Same as Alternative A.
Goal 3: As an active partner in collaborative conservation, the Refuge will provide quality wildlife-dependent recreation, environmental education, and outreach to a diverse audience. These activities will preserve cultural resources and promote understanding, appreciation, and support for Crane Meadows National Wildlife Refuge, the National Wildlife Refuge System, and natural resource conservation.			
People – Refuge Support			
Volunteers and Refuge Friends Group	Maintain current volunteerism and Friends Group membership at 2009 levels (approximately 100 and 85 people respectively), and continue providing opportunities to support the Refuge.	Over the life of the plan, increase Friends group membership by 10 percent, increase the 3-year moving average of annual service hours contributed by volunteers an average of 1 percent per year, and increase volunteer opportunities related to resource monitoring, environmental education, partnership development, land protection, and visitor services.	Same as Alternative B, plus: Target residents and communities within the watershed for volunteer recruitment, and endorse projects watershed-wide.
Law Enforcement	Work with local police authorities, state conservation officers, and law enforcement officers from other NWRs to ensure visitor safety and resource protection. Work to minimize the potential for incidents, violations, and other illegal activities on the Refuge.	Same as Alternative A.	Same as Alternative A.
Staffing	Staffing at the Refuge will include one FTE wildlife refuge specialist provided by Sherburne NWR, and one FTE maintenance position.	Increase staffing from the existing two positions to the four positions projected by the 2008 Region 3 staffing model to accomplish the work set forth by the CCP:	Same as Alternative B.

Chapter 3: Refuge Environment

3.1. Introduction

Crane Meadows NWR was established in 1992 to protect one of the largest, most intact wetland complexes remaining in central Minnesota. Described as a 'sand plain wetland/upland complex', the Refuge habitats are a unique mosaic of droughty, sandy uplands consisting of prairies, oak savannas, and mixed forests; and diverse, poorly-drained wetland habitats including sedge meadow, shallow lake, scrub-shrub, and bottomland forest communities. These habitats provide valuable respite from surrounding agricultural and developed land uses for many species of migratory birds, fish, reptiles, and other wildlife. Species present on the Refuge include a number of state and federally listed plants and animals such as the tubercled rein-orchid and Blanding's turtle.

Within the 13,540-acre area proposed for acquisition encompassing the wetland system, the mix of land ownership includes the Service (just over 1,800 acres), state landholdings (approximately 900 acres), as well as hunt clubs, a diversity of agriculture interests, and private residences.

The Refuge environment is outlined in this chapter; for greater detail, please see Chapter 3 of the CCP.

3.1.1. Other Units Administered

3.1.1.1. Farm Services Administration Conservation Easements

The Sherburne-Crane Meadows National Wildlife Refuge Complex is responsible for the FSA easements in six Minnesota counties: Benton, Isanti, Kanabec, Mille Lacs, Morrison, and Pine. Of these counties, Crane Meadows NWR staff is responsible for the oversight and management of the 21 easements in Morrison County, including a total of 1,683.2 acres (see Figure 3 on page 16 of the CCP).

3.2. The Local Conservation Landscape

The Minnesota DNR is the single largest player in the conservation landscape of Minnesota. There are also a number of other constituent groups that contribute to the conservation estate of the area surrounding Crane Meadows NWR. The following section uses Figure 4 on page 17 and Figure 5 on page 18 to describe the conservation lands within the

acquisition boundary, those within 5-and 10-mile buffers of the acquisition boundary, and the large conservation landholdings in the broader landscape.

More detail is provided in Chapter 3 of the CCP.

3.3. Ecological Context

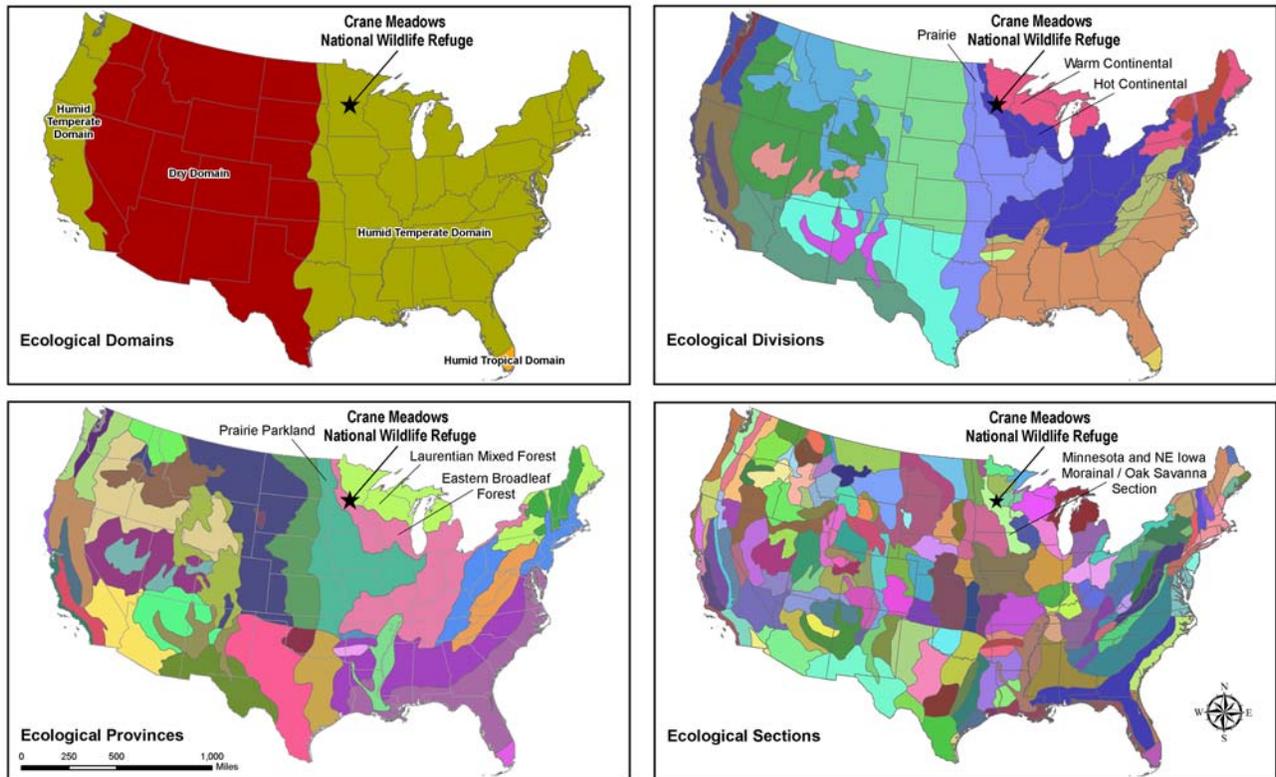
From largest to smallest spatial extent in the National Hierarchy of Ecological Units, which delimits geographic areas of different biological and physical potential, Crane Meadows NWR lies in the Humid Temperate Domain, the Hot Continental Division, Eastern Broadleaf Forest Province, the Minnesota and Northeast Iowa Morainal/Oak Savanna Section, the Anoka Sand Plain Subsection, and the Agram Sand Plain Landtype Association (Bailey 1980, 1995; Cleland, et al. 1997).

The Humid Temperate Domain (see Figure 3 on page 20) encompasses the non-arid mid-latitude land masses from 30 to 60 degrees north latitude. This division is characterized by hot summers and cool winters, with a growing season of 3-6 months, varying with latitude. It is also dominated by tall broadleaf trees with canopy cover in the summer and a leafless, dormant winter period (Bailey 1995).

The Eastern Broadleaf Forest (Continental) Province (see Figure 3 on page 20) marks the transition zone between open grasslands to the west and the mixed forests to the east, covering approximately 270,000 square miles of the nation. The Minnesota portion of this province encompasses nearly 12 million acres and is characterized by a precipitation that is approximately equal to the rate of evapotranspiration, an annual precipitation range from 24 - 35 inches northwest to southeast, and a normal annual temperature that varies from 38 degrees- 46 degrees Fahrenheit northwest to southeast.

The Minnesota and Northeast Iowa Morainal/Oak Savanna Section (see Figure 3 on page 20) is a mosaic of morainal, till, and outwash plain areas 30 to 500 feet thick resulting from past glacial activity. In general, poor drainage is associated with the section, leading to an abundance of fluvial systems but relatively few open water and wetland features. However, terminal moraines in the northern reaches near Crane Meadows NWR have led to an abundance of surface waters, wetlands, and undeveloped drainage networks. The landscape is domi-

Figure 3: Ecological Context, Crane Meadows NWR



nated by prairie, savanna, and oak and aspen woodlands; and patches of forest along rivers, streams, and lakes.

The Anoka Sand Plain Subsection (Figure 4 on page 21) is nearly 1.2 million acres of broad, flat, sandy lake plain deposited by Gransburg sublobe meltwater from the Des Moines lobe of receding Pleistocene glaciers. The vegetation communities consisted of aspen woodlands, oak barrens, prairie and savanna openings, dry prairies, and brushlands on the droughty uplands, with bogs, fens, wet prairies, emergent marshes, shrub swamps, and bottomland forest in low-lying areas. Trees characteristic to this subsection include bur oak, northern pin oak, and jack pine (Kratz and Jensen 1983). Bottomland forest formed along the Mississippi, and upland prairie formed in areas with enough moisture to sustain a diversity of prairie grasses.

Crane Meadows NWR falls completely with the Agram Sand Plain Landtype Association (LTA), one of 291 LTAs in Minnesota defined primarily by their soil complexes and vegetation communities (see Figure 4). The description of the LTA portrays a rolling glacially-formed outwash plain, sandy soils

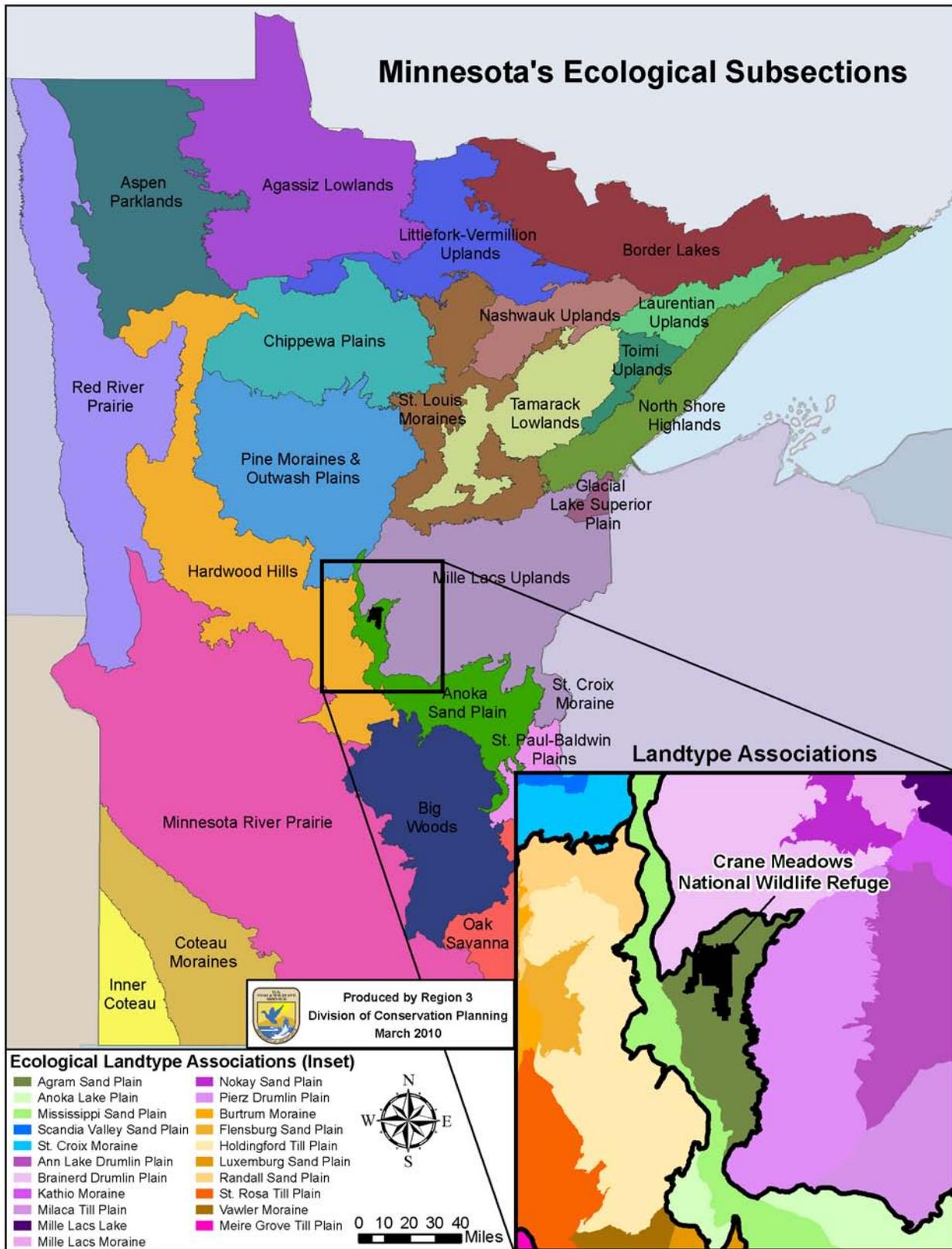
with a coarse loamy surface mantle, and a pre-settlement vegetation mixture of oak savannas, wet prairies, and brush prairies.

3.4. Current Land Use / Land Cover

According to work done by the University of Minnesota and the Minnesota Pollution Control Agency, Morrison County's 1,124 square miles are less than 6 percent developed, and agriculture is the dominant land use comprising approximately 37 percent of the county. Additionally, over a quarter of the county is forested (29 percent) and another quarter is some form of grass/shrub/wetland (26 percent) cover type. Open water comprises just over 2 percent of the county (University of Minnesota 2007).

The 21-class land cover dataset developed by the Multi-Resolution Land Characteristics Consortium using 2001 Landsat imagery* can be used to understand the geographic distribution of land use in the area around the Refuge (USGS 2003). Using a 10-mile buffer, 67.7 percent of the land use surrounding the Refuge is row crops or pasture, forests make up another 14 percent, herbaceous wetlands 7 percent, grasslands another 3 percent, and open water is just under 2 percent. Developed or urban areas com-

Figure 4: Minnesota Ecological Subsections and Landtype Associations



prise just over 5 percent of the 10-mile peripheral zone, including the towns of Little Falls, Pierz, Royalton, and Rice, parts of the Camp Ripley National Guard Training Center, and major roadways. Figure 5 on page 23 and Table 2 on page 24 portray and summarize these data.

The land use proportions change in an analysis of the land only within Crane Meadows NWR's acquisition boundary. Agriculture is still a major component at approximately 33 percent, but is surpassed as the largest cover type by herbaceous wetlands (36 percent). Roads become the only distinguishable developed areas, and natural cover types increase slightly in proportion; forest is over 18 percent, and open water and grassland are around 5 percent each (see Figure 6 on page 25 and Table 2 on page 24).

3.5. Socioeconomic Setting

A more detailed description of Crane Meadows NWR's socioeconomic setting is included in Chapter 3: Refuge Environment and Current Management, in the CCP.

According to the 2000 Census, Morrison County's 2000 population was 31,712, indicating a 6.6 percent increase over the 1990 population of 29,604, and a 27.8 percent increase over the 1900 population of 22,891.

The average age of the county residents is 36.9 years, with 6.6 percent of the population under 5 years of age, and 15.6 percent over 65. The county is of relatively homogenous ethnicity, with non-white minorities accounting for less than 3 percent of the population.

According to the 2000 Census, of the available working population in Morrison County 16 years or older (16,043), 62.9 percent are employed, 3.8 percent unemployed, and 33.1 percent are not in the labor force. The average income for all types of households in Morrison County is \$37,047, but increases to \$45,451 if counting only families generating income. According to 2000 data, 7.5 percent of the population lives below poverty level, slightly above the state average of 5.1 percent.

According to 2000 data, 25.7 percent of the population over 3 years of age is enrolled in school at some level. Education levels are lower than the state averages; 79.7 percent are high school graduates as compared to 87.9 state-wide, and 12.6 percent have bachelor's degrees compared to the state average of 27.4 (U.S. Census Bureau 2009).

3.6. Climate

The climate of east-central Minnesota is classified as 'sub-humid continental' and is characterized by significant variations in seasonal temperatures. More detail is provided in Chapter 3 of the CCP.

For all of Morrison County the average temperature during the winter months is approximately 12 degrees Fahrenheit with an average daily minimum of 1 degree. Summer temperatures average 68 degrees Fahrenheit with a maximum daily average of 81 degrees. Annual precipitation in Morrison County is well distributed throughout the growing season. Approximately 17.1 inches, or 65 percent of the total annual precipitation, occurs from May through September. The annual average precipitation in Little Falls is 26.3 inches. Snowfall persists from October through April and occasionally falls in May. The average annual snowfall in Little Falls is 50.4 inches, and snow usually persists on the ground all winter.

3.7. Air Quality

According to the Minnesota Pollution Control Agency's (PCA) 2009 report to the legislature, Minnesota air quality is "generally good and has been improving for most pollutants (MPCA 2009a, pg.1)." Partially because it cannot as easily be regulated, non-point sources are by far the greatest overall contributors to air pollution emissions. These emissions come from highway vehicles (38 percent), off-highway equipment (18 percent), or other small, non-point stationary sources (34 percent). Point source pollution by major facilities only contributes 10 percent of the total state emissions (MPCAa 2009).

To monitor the sources of air pollution, the EPA maintains composite databases of air pollution emissions estimates derived from state and local regulatory agencies, industry, and EPA records. The National Emission Inventory (NEI) contains emissions data from 2002 divided into two groups: criteria air pollutants and hazardous air pollutants. In 2002, the total quantity of criteria pollutants emitted yearly by these facilities was approximately 1,555 tons. Morrison County ranks it at 36 of 87 Minnesota counties with 0.28 percent of the state's total point source emissions. The total quantity emitted by the state in 2002 from all sources was 40,009 tons (EPA 20). The county ranks number 22 of 87 Minnesota counties in the quantity of hazardous air pollutants emitted at 1.14 percent of the state total (EPA 2009).

More detail is included in Chapter 3 of the CCP.

Figure 5: Land Cover Within a 10-mile Radius of Crane Meadows NWR

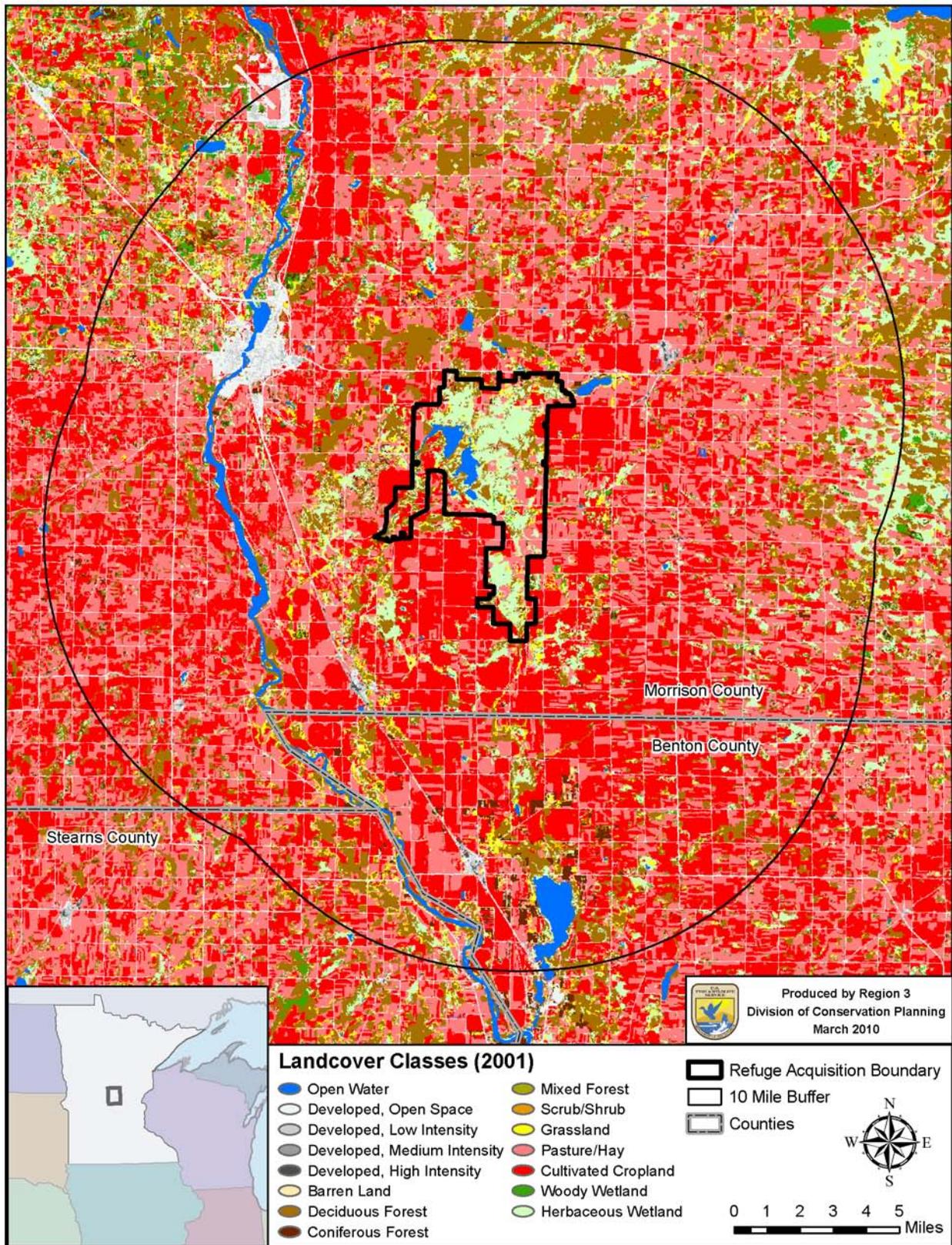


Table 2: Land Cover Types in the Vicinity of Crane Meadows NWR

Cover Type	Percent	
	10 Miles	Acquisition Boundary
Open Water	1.7	5.1
Developed, Open Space	4.7	1.7
Developed, Low Intensity	0.5	-
Developed, Medium Intensity	0.1	-
Developed, High Intensity	-	-
Barren Land	-	-
Deciduous Forest	12.8	17.6
Coniferous Forest	1.3	0.9
Mixed Forest	-	-
Scrub/Shrub	0.2	0.1
Grassland	2.8	4.5
Pasture/Hay	32.1	19.2
Cultivated Cropland	35.6	14.2
Woody Wetland	0.9	0.5
Herbaceous Wetland	7.2	36.2

3.8. Geology and Soils

Crane Meadows NWR is located on the Anoka Sand Plain, a large, flat sandy outwash landscape thought to be lacustrine in origin and created by glacial recession (Minnesota DNR 2009a). This landform contains small dune features, low ground moraines, outwash plains, kettle lakes, and tunnel valleys (Wright 1972). The Refuge consists of primarily flat uplands with some gently rolling hills, and peat-filled lowlands interspersed with shallow lacustrine wetlands.

Morrison County is underlain by layered bedrock of both metamorphic and igneous rock – primarily Cambrian and Ordovician dolomite, sandstone, and shale (Morey 1976). The bedrock surface slopes southward and subsurface depth to bedrock can range from 0-200 feet.

Information on farmland suitability and drainage characteristics has been collected by the USDA Natural Resources Conservation Service and is contained in their Soil Survey Geographic Database (SSURGO). According to these data, 95 percent of the area in the Refuge acquisition boundary is not prime farmland, with only 352 acres of prime farmland, and 309 acres of farmland of statewide importance. (See Figure 18 on page 44 of the CCP.) Fifty-eight percent of the Refuge lands have poor drainage

characteristics, 35 percent have good drainage, and the remaining 6.4 percent is open water (see Figure 7 on page 26) (USDA-NRCS 2009).

According to the SSURGO database, 18 major soil series occur within Crane Meadows NWR acquisition boundary, with open water comprising 6.4 percent of the Refuge (See Table 7 on page 46 of the CCP and Figure 20 on page 47 of the CCP). All of the soils found on the Refuge are very deep and were formed as a result of glacial events. The primary constituent soil series are Menahga, Seelyville, Markey, Isan, Bowstring, and Duelm, together accounting for over 75 percent of the Refuge soils. Most soils in this area are subject to wind or water erosion without conservation measures in place, contain excess water, or have insufficient water holding capacity.

For details on major soil constituents, see Chapter Three: Refuge Environment and Current Management, in the CCP.

3.9. Water and Hydrology

Crane Meadows NWR falls within the Platte-Spunk Watershed (MN HUC 7010201) of the Upper Mississippi River Basin. The Upper Mississippi River Basin begins at the headwaters of the Mississippi River, extends southward throughout central

Figure 6: Land Cover Within Crane Meadows NWR

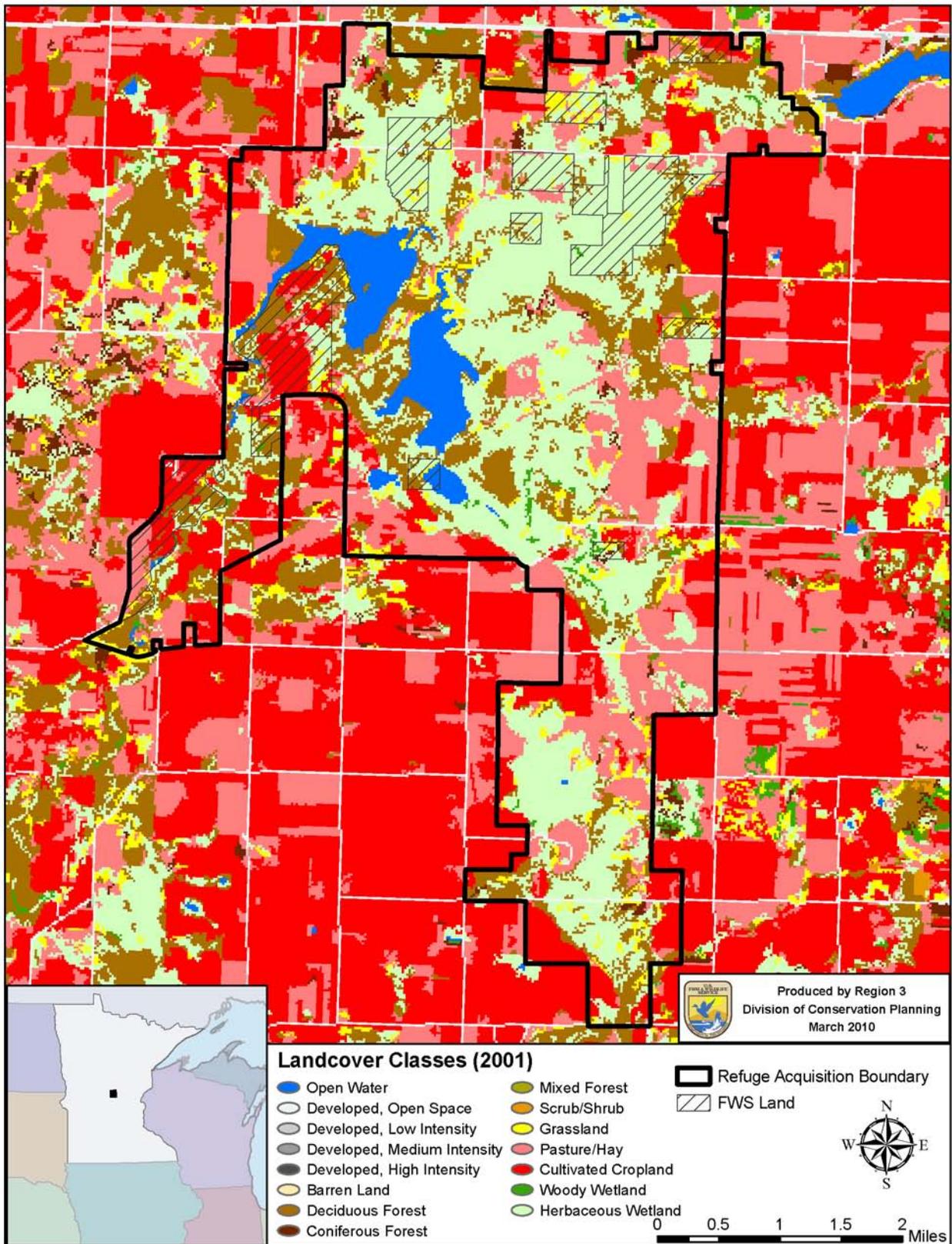
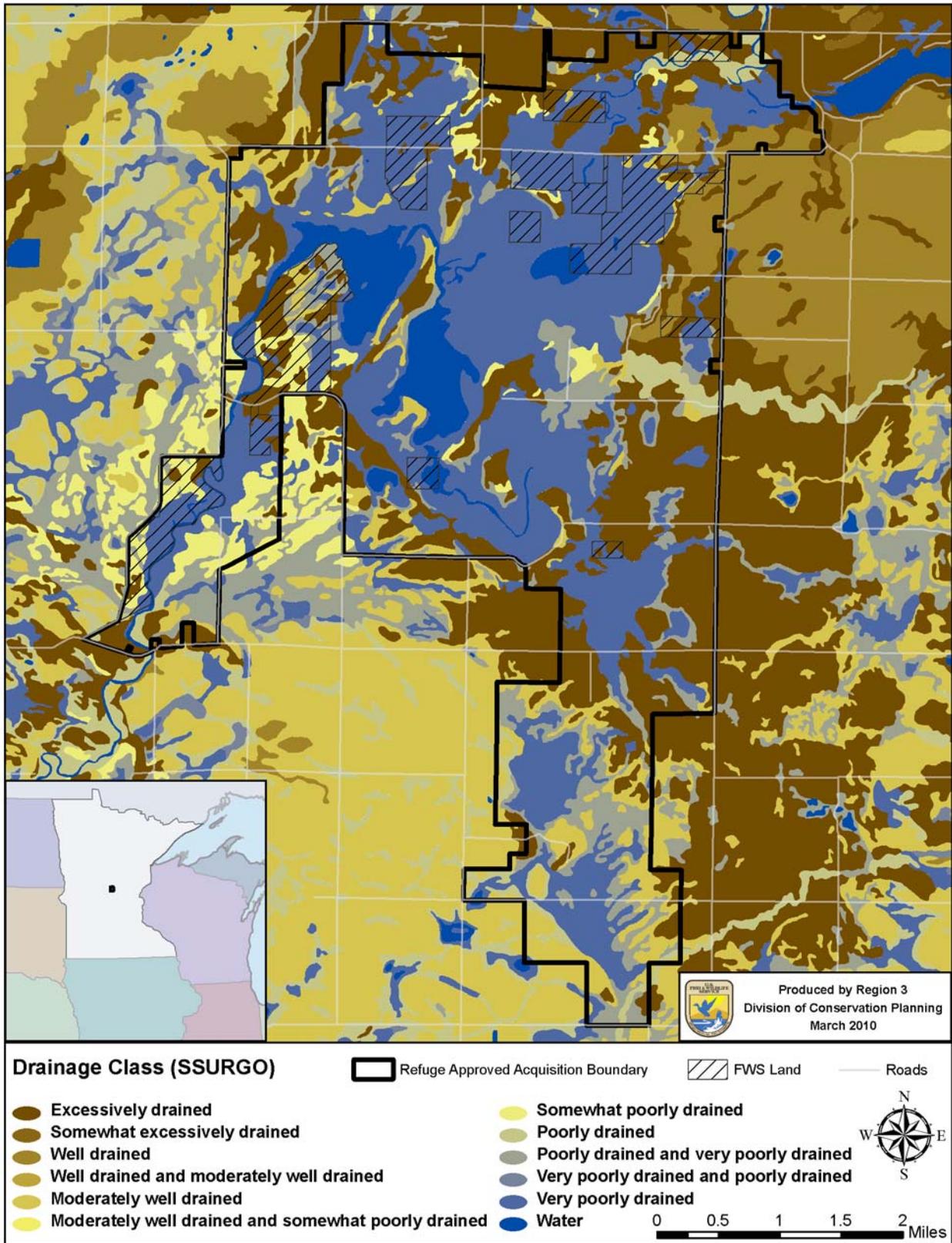


Figure 7: Soil Survey Drainage Classes, Crane Meadows NWR



Minnesota, and ends near the city of St. Paul, Minnesota. The Platte-Spunk River sub-watershed begins in southern Crow Wing County, runs diagonally northeast to southwest through Morrison County, includes the northwest section of Benton County, and ends in northeast Stearns County (see Figure 21 on page 49 of the CCP.). There are approximately 56,000 people and 1,919 farms within the 652,667-acre watershed. The primary resource concerns include soil erosion, woodland management, surface and groundwater quality, and surfacewater and wetland management (USDA NRCS 2008).

The wetland complex that comprises the majority of the Refuge includes two large shallow lakes, Rice Lake (320 acres) and Skunk Lake (314 acres), and one smaller open water basin, Mud Lake (56 acres). The Rice-Skunk Lakes wetland complex is also the confluence of four major waterways: Rice Creek and the Platte River, which flow into Rice Lake from the north, and Skunk and Buckman Creeks, which enter Skunk Lake from the east and southeast and pass through to Rice Lake (refer to Figure 2 on page 3). The headwaters of these four creeks ultimately pass through the Refuge as well, and include Wolf, Little Mink, and Big Mink Creeks above the Platte River, Hillman Creek above Skunk Creek, and Kuntz and Mischke Creeks above Buckman Creek. In addition to waters that drain through the wetland complex, the southern spur of the Refuge contains the upper reaches of a cold water stream, Little Rock Creek. Approximately 32 linear miles of stream and river channels within the acquisition boundary meander slowly through the wetland complex.

In total, the drainage from more than 272,000 acres of upstream land passes through the Refuge. The majority, (256,254 acres, or approximately 400 square miles) passes directly through the Rice-Skunk Wetland Complex (353:1 watershed to basin ratio) before eventually making its way to the Mississippi River near Rice, Minnesota 8 miles down the Platte River (DNR 2006a). The remaining effective watershed area drains through the Little Rock Creek System and finally drains into the Mississippi River just north of the city of Sartell.

All open waters in the area of the Refuge are public and are managed by the state. During the first half of the 20th century there was high demand from local sportsmen in the area to provide minimum water levels in the Rice-Skunk shallow lake complex for hunting and boating navigability, particularly during drier periods of the year. In response, in 1961 the Minnesota Legislature mandated the construction of a weir for water level stabilization where the Platte River exits Rice Lake. After acquiring flowage easements, purchasing physical properties, and conducting studies and

monitoring activities in the area, the George Selke Memorial dam was constructed between 1971 and 1974. The dam consists of 300 feet of sheet piling with six 5-foot variable crest stoplog bays on the west end. Despite this major water structure, the remainder of the hydrology in the wetland complex remains relatively intact, its streams unchannelized, and its open waters undeveloped.

Water quality in the watershed and within the Crane Meadows NWR wetland complex has been sampled by various agencies over the past few decades. Data indicate that water quality within the watershed ranges from good, during low water conditions, to poor, during high water event samples. Poor water quality during high water events are likely the result of non-point source run-off upstream of the Refuge. Continued and expanded monitoring is needed throughout the watershed to assess the impacts of specific contaminants and identify their pathways into Refuge waters.

Skunk Creek, Little Rock Creek, and the Platte River (downstream of the shallow lake complex) are all on Minnesota's 2010 Draft List of Impaired Waters (MN-PCA 2009c) for a variety of water quality impairments.

3.10. Refuge Habitats

The Refuge acquisition boundary currently contains a great variety of upland and lowland habitat types. The diverse vegetative composition and habitat types of this area correlate to a high diversity of wildlife species that are typical of wetlands, forests, and grasslands. The current habitat composition of the Refuge acquisition boundary consists of approximately 50 percent wetland, 20 percent agriculture, 17 percent woodlands, 6.6 percent grassland/prairie, 1.4 percent conifer plantation, 1.3 percent oak savanna, 1.2 percent pasture, and 2.5 percent developed areas. A list of habitat types, definitions, and acreages for both the acquisition boundary and Service-owned property can be found in Table 3 beginning on page 28).

3.10.1. Wetlands and Open Water

According to the National Wetlands Inventory, the proposed Refuge acquisition boundary encompasses approximately 7,787 acres (56 percent) of various wetland and open water habitats that together comprise an extensive and diverse wetland complex (FWS 2004).

This inventory included areas recorded as partially drained/ditched; approximately 1,792 acres (13 percent) within the Refuge acquisition area, 267 of which occur on properties currently owned by the Service. The wetland types in the inventory include

Table 3: Habitats Found at Crane Meadows NWR

HABITAT ^a	DESCRIPTION	ACRES ^b	
		Authorized for Acquisition	Currently Owned
Open Water	Portion of a lake with a water depth of >1m and without emergent vegetation (Cowardin et al. 1979). Skunk, Rice, and Mud Lakes are the three lakes with varying 'open water' status.	153.9	17.8
River/Stream	Lotic or running water environment (Goldman and Horne 1983). The Platte and Skunk Rivers, and Rice and Buckman Creeks flow through the Refuge.	32.0 miles	3.1 miles
Emergent Marsh	Shallow water wetland (water depths 20-60 inches) dominated by cattails, bulrushes, and submergent and floating aquatic plants (coontail, milfoil, pondweeds, water-lilies, etc.); floating mats; areas along shorelines of lakes, ponds, rivers, or in shallow basins.	1,599.3	102.2
Sedge Meadow	Open wet meadow dominated by sedge, with broad-leaved graminoids and < 25 percent shrub cover.	2,640.4	458.9
Willow-Dogwood Shrub Swamp	Open wetlands dominated by broad-leaved graminoids and > 25 percent shrub cover. Shrubs include willows, red-osier dogwood, speckled alder, and bog birch.	2,499.9	410.0
Southern Rich Conifer Swamp	Tamarack-dominated swamps on shallow to deep peat, occasionally on floating mats at edges of ponds. Found in basins on moraines and outwash plains. Other trees species include elm, red maple, and paper birch.	0	0
Northern Floodplain Forest	Deciduous riparian forests on sand alluvial soils along rivers and streams. Typically dominated by silver maple, but on the Refuge this habitat includes ash, American elm, box elder, basswood, etc.	435.3	52.4
Wet Prairie	Tallgrass-dominated herbaceous vegetation, some forbs, shrub layer is absent to sparse, and no trees. Typic species include prairie cordgrass, big bluestem, Indian grass, woolly sedge, and Canada goldenrod.	911.0 ^c	379.1 ^c
Southern Mesic Prairie	Tallgrasses dominant, but several mid-height grasses also important, forb rich, shrub layer sparse, no trees. Typic species include big bluestem, Indian grass, little bluestem, porcupine grass, stiff goldenrods, purple and white prairie clovers. Some Refuge areas have been planted to this habitat type.		
Southern Dry Prairie	Shortgrass-dominated herbaceous vegetation, some forbs, no trees. Typic species include little bluestem, side-oats grama, prairie dropseed, porcupine grass, junegrass, silk aster, purple coneflower, pasqueflower, harebell, etc.		
Southern Dry Savanna	Scattered trees 25-50 percent (mostly bur oak with some black oak and jack pine, typically graminoid-dominated, forb-rich herbacious layer includes side oats grama, prairie dropseed, stiff goldenrod, silk aster, etc.	185.1	5.3

Table 3: Habitats Found at Crane Meadows NWR (Continued)

HABITAT ^a	DESCRIPTION	ACRES ^b	
		Authorized for Acquisition	Currently Owned
Jack Pine Woodland	Dry-mesic pine or hardwood forest dominated by evergreens (primarily jack pine). Other species may include red pine, quaking aspen, bur oak, and northern red oak.	84.5	8.8
Oak Woodland	Dry-mesic hardwood forests; typically deciduous-dominated, but at times mixed deciduous-conifer. Tree species include bur oak, pin oak, northern red oak, white oak, basswood, and American elm.	1,181.5	201.9
Oak-Aspen Woodland	Commonly dominated by northern pin oak, with quaking aspen, paper birch, big-toothed aspen, bur oak, northern red oak or red pine also abundant. At Crane Meadows, this habitat is dominated by aspen.	671.9	66.0
Agriculture	Land used for crop production and raising livestock. Common crops cultivated within the proposed Refuge boundary includes corn, small grain, and alfalfa. Livestock is dairy, pork, or poultry.	2,942.2	10.8
Conifer Plantation	Planted native or non-native conifers. Jack, red, and white pine are native to the area.	199.5	11.9

- For consistency, vegetation classes from the 2006 vegetation assessment were compared to habitats defined by MN DNR (2005) and reclassified to these standards.
- All acreages are approximate GIS acres.
- The 3 prairie types are not easily distinguished on the aerial imagery used to assess these habitat types. Acreages for all three prairie sub-types are combined here.

open water, emergent, scrub-shrub, forested, unconsolidated bottom, and a few lacustrine and riverine areas. The 2004 NWI inventory classified most of the system as palustrine, and 852 acres as either riverine or lacustrine. Of the palustrine environments, 4,509 acres were classified as emergent, 941 acres were scrub/shrub, 181 were forested, 61 were considered unconsolidated bottom, and 1,243 acres contained a mixture of these classes (see Figure 8 on page 30 - Cowardin et al. 1979, FWS 2004).

Similarly, a 2006 vegetation mapping project for the Refuge acquisition boundary (see Figure 9 on page 31) cites 6,894 acres of wetland habitat excluding forested wetlands. Habitat classes for this 2006 classification include open water, rivers and streams, emergent marshes, sedge meadows, and willow-dogwood shrub swamps. Rice and Skunk Lakes account for approximately 643 acres of these Refuge wetlands and are characterized as emergent marsh. The four tributaries flowing into the lakes; the Platte River, Rice Creek, Skunk River, and Buckman Creek, combined with the Platte River exiting the complex, together account for a total of 32 stream miles within the acquisition boundary.

In addition to the lakes (emergent marshes) and tributaries, other important wetland habitats within the complex include a relatively intact, extensive sedge meadow and willow-dogwood shrub swamp. These two habitats extend along the perimeter of the lakes (emergent marshes), rivers and creeks and together cover approximately 5,140 acres of proposed Refuge lands (see Figure 9 on page 31).

3.10.2. Wild Rice

Wild rice (*Zizania sp.*) in Minnesota has great cultural, ecological, and economic value, and has been harvested in the Great Lakes region for thousands of years (Valppu 2000). It is important from an ecological perspective as well, by providing food and shelter for many fish and wildlife species. Wild rice serves as one of the most important food sources for waterfowl in North America, with an ability to produce more than 500 pounds of seed per acre and host a diversity of invertebrates that also help feed many wetland species. At least 17 bird species on Minnesota's 'species of greatest conservation need' list use the habitat provided by wild rice – primarily for reproduction and foraging (MN-DNR 2006b).

Figure 8: National Wetland Inventory Vegetation Classes, Crane Meadows NWR

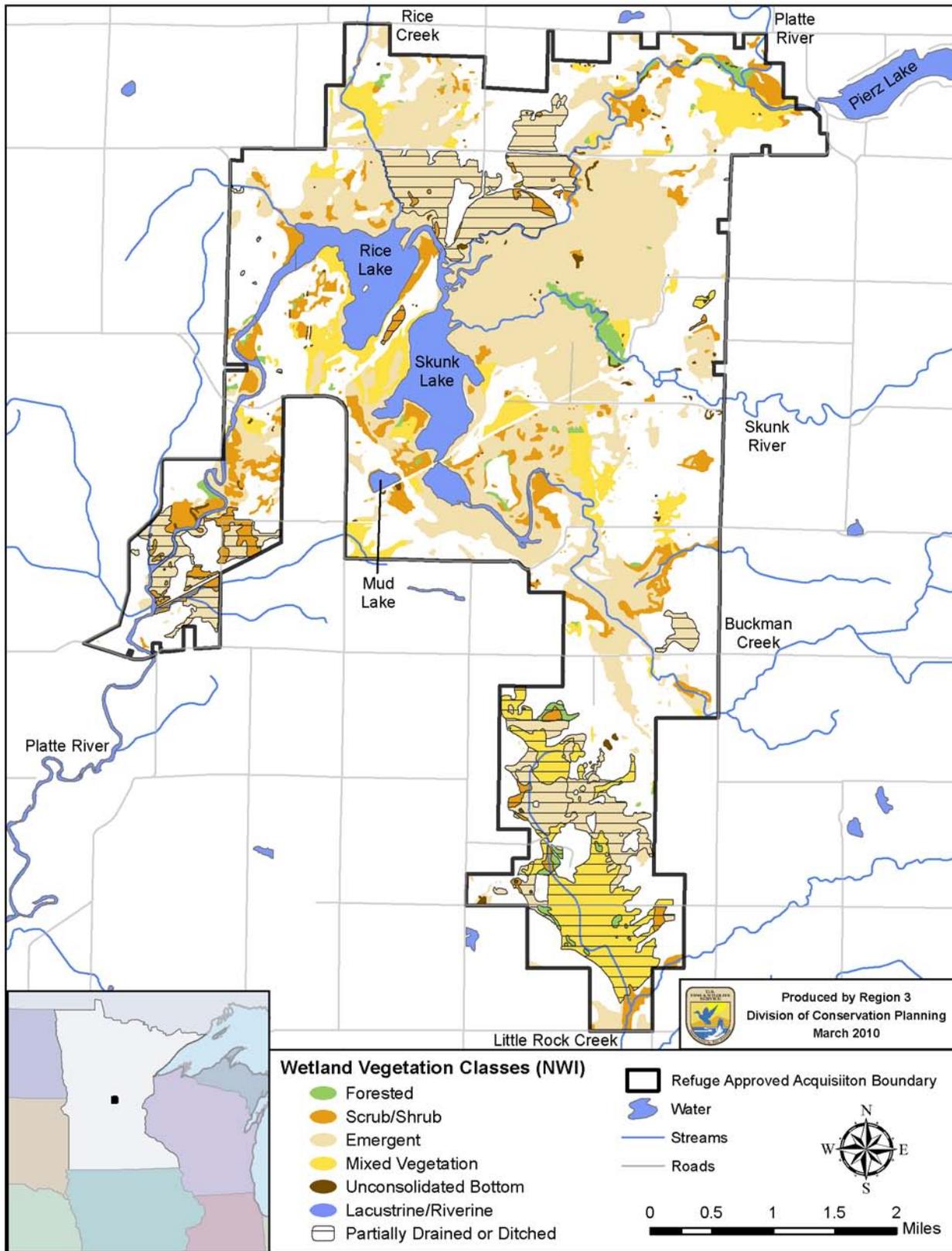


Figure 9: Refuge Vegetation Based on 2006 Imagery, Crane Meadows NWR

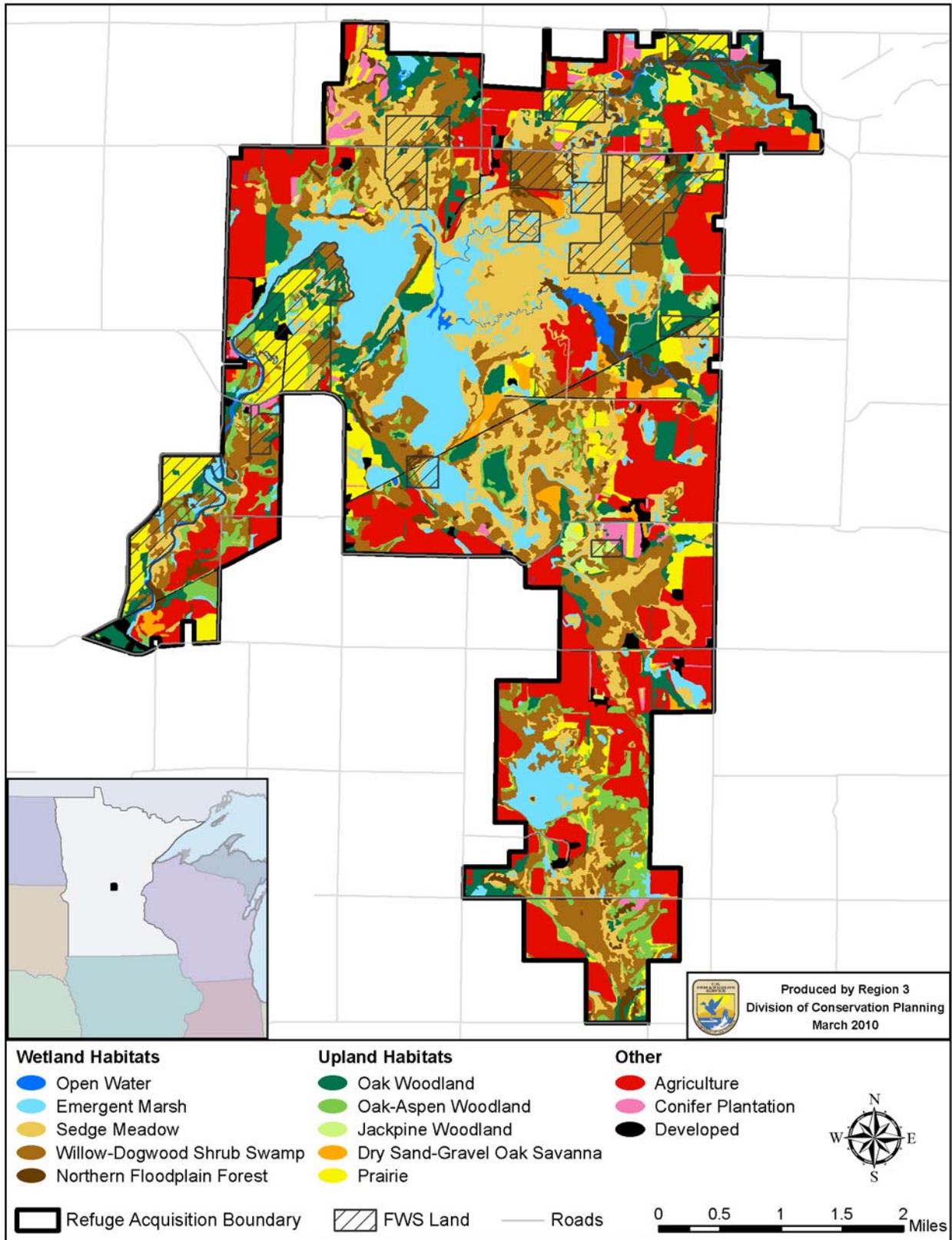


Table 4: Wild Rice Productivity at Crane Meadows NWR (2008)

Lake Name	Size (Acres)	Estimate Wild Rice Coverage (Acres)
Mud	23	9
Rice	323	250
Skunk	320	256

The historic range of wild rice included the entire state, but it now occurs most commonly in 55 Minnesota counties in the central and north-central portions of the state.

In the wild rice study submitted by the DNR to the Minnesota Legislature in 2008, wild rice inventories were noted for the water bodies within the Crane Meadows NWR wetland complex; Rice, Skunk, and Mud Lakes (see Table 4). This information estimates the potential wild rice coverage and associated productivity in each lake within the complex.

3.10.3. Woodlands

Based on the 2006 vegetation map (Figure 9 on page 31), the Refuge acquisition area has approximately 2,572.2 acres of woodlands including both upland and bottomland forests that support a variety of tree species. Areas of upland forest include oak woodlands (1,181.5 acres) dominated by bur oak and northern pin oak, oak-aspen woodland (671.9 acres) dominated mostly by aspen species, and jack pine woodland (84.5 acres) comprised mostly of jack pine but interspersed with quaking aspen and northern pin oak. Bottomland forests are designated as northern floodplain forests (435.3 acres) which is essentially a riparian zone following the watercourses and/or forested areas near and adjacent to the lakes. Tree species inhabiting bottomland forests include silver maple, aspen, elm, ash, basswood, box elder and a small amount of tamarack. Also included in this total are 199.5 acres of conifer plantations in private ownership, including spruce, and jack, red, scotch, and white pines.

3.10.4. Oak Savanna

Small patches totaling approximately 185 acres of a native oak savanna subtype, identified as southern dry savanna, have been retained in the Refuge acquisition area from pre-settlement times. This subtype is characterized by a relatively open community of scattered or clumped (25-50 percent canopy cover; 5-50 square-feet, per-acre basal area), short (15-45 feet), open grown bur oak trees that are usually interspersed with northern pin oak, may

have black oak and jack pine components, and with a nearly continuous cover of both prairie and forest forbs and graminoids (Wovcha et al. 1995).

3.10.5. Grasslands

The Refuge contains approximately 911 acres of grassland habitat including a few small remnants of native southern dry prairie (sand prairie). Other open grasslands on the Refuge include southern mesic prairie, consisting mostly of native warm season grasses and tallgrass prairie species that were planted during restoration efforts; and wet prairie characterized by both warm and cool season grasses, sedges, and forbs.

3.10.6. Agriculture

Agriculture remains the leading economic activity in Morrison County. Many of the Refuge in-holdings are currently being used for agricultural purposes. Crop production within the proposed Refuge boundaries consists mainly of corn, small grains, and alfalfa. Other agricultural uses in the immediate vicinity include dairy, pork and poultry farms. A number of pasture / grassland areas are used for grazing livestock as well. Also, some sedge meadows and wetland edges are hayed during years of normal or below average precipitation.

The wetland complex is experiencing pressure from large scale farming and, to a lesser extent, residential development on adjacent lands within the acquisition boundary. Several large-scale agricultural and livestock operations have developed in recent years. Large installations have been erected to house hundreds and even thousands of animals.

3.11. Refuge Wildlife

3.11.1. Birds

The Refuge supports populations of many bird species and its diverse habitats attract more than 200 species each year. The abundance of wetland habitat attracts a variety of wetland-dependent species to the area including the Greater Sandhill Crane, a bird that was almost completely extirpated from Minnesota by the beginning of the 20th century. Historical records show cranes used Rice and

Skunk Lakes in pre-settlement times. The first recorded sighting after extirpation was in 1958. Sandhill Cranes have been recorded every year since, and the area has emerged as one of the most important nesting areas for cranes in central Minnesota, with a current estimate of 40 breeding pairs in the area. The Refuge also serves as a staging ground for thousands of cranes during fall migration.

Waterfowl are generally abundant in the spring and into the fall, and include most species of ducks and geese found in the Prairie Pothole Region of Minnesota. Some waterfowl species of conservation concern use the Refuge during certain life-stages including Northern Pintail (migration), Lesser Scaup (migration), American Black Duck (migration/winter), Mallard (breeding/resident), Canvasback (migration), and Trumpeter Swan (migration). The most common nesting species of ducks are Mallard, Blue-winged Teal, and Wood Duck. During spring and fall migration, up to 10,000 ducks, a mixture of both divers and dabblers, and geese may be present at one time on Rice and Skunk Lakes and surrounding wetlands. High concentrations of Mallards, Ring-necked Ducks, Wood Ducks, Lesser Scaup, and Blue-winged Teal can be observed in the fall and thousands of Canvasbacks and Mergansers are present in early spring.

Other wetland-dependent birds found in the area include Great Blue Heron, American Bittern, Common Loon, Horned Grebe, Common Snipe, Sora (Rail), Sedge Wren, Black Tern, Foster's Tern, and Northern Harrier. Exposed mud flats that occur sporadically on the edges of Refuge wetlands attract some shorebirds including Wilson's Phalarope, Greater and Lesser Yellowlegs, Solitary Sandpiper, and Spotted Sandpiper.

More than 100 other bird species have been recorded during the breeding and migration seasons. Some of the common songbirds attracted to the woodlands and open grassland areas on the Refuge include Eastern Kingbird, Eastern Bluebird, Northern (Baltimore) Oriole, Rose-breasted Grosbeak, Brown Thrasher, and Scarlet Tanager. Several songbirds of conservation concern also inhabit the Refuge woodlands and grasslands during the breeding season including Golden-winged Warblers, Black-billed Cuckoo, Red-headed Woodpecker, Bobolink, and Eastern Meadowlark. Year-round residents include Black-capped Chickadees, Red and White-breasted Nuthatches, Downy, Hairy, Pileated, and Red-bellied Woodpeckers, Ruffed Grouse, Ring-necked Pheasant, and Wild Turkey. Common birds of prey that inhabit the Refuge include Bald Eagle, Red-tailed Hawk, Northern Goshawk, Red-shouldered Hawk, American Kes-

rel, Osprey, Sharp-shinned Hawk, Coopers Hawk, Barred Owl, and Great Horned Owl. See Appendix C for a list of all bird species found on the Refuge.

3.11.2. Mammals

The Refuge lies within the known breeding range of 54 mammal species. Of these, 35 species have been confirmed on Refuge lands. Bison and elk were historically present on the landscape, but were extirpated in the early 1900s.

The largest mammal that inhabits and breeds on the Refuge is the white-tailed deer. Other large mammals common to the Refuge include coyote, red fox, and on occasion black bear. Gray wolves will occasionally pass through the area, but do not have established packs on the Refuge. Other predators on the Refuge include mink, river otter, short-tailed weasel, and badger. Small mammals typical of this area include short-tailed shrew, star-nosed mole, white-footed mouse, deer mouse, plains pocket gopher, and thirteen-lined ground squirrel. Observations of two state special concern species on the Refuge include plains pocket mouse and the prairie vole. Little brown bats and red bats have also been identified on the Refuge. Muskrat, beaver, raccoon, and mink are common in wetland habitat, while uplands harbor a variety of mice, voles, shrews, and ground and tree squirrel species. See Appendix C for a list of all mammal species found on the Refuge.

3.11.3. Amphibians and Reptiles

Ten species of amphibians and 11 species of reptiles have been documented on the Refuge. Many of these species are dependent on Refuge wetlands, such as painted turtles, snapping turtles, and tiger salamanders while others, including eastern garter snake, brown snake, eastern and western hognose snake, and gopher (bull) snake, are associated with the upland habitats. The state-listed threatened Blanding's turtle is dependent on both upland and wetland habitats. The eastern gray tree frog, Cope's gray tree frog, wood frog, and western chorus frogs are commonly heard on the Refuge and inhabit wooded areas adjacent to sedge meadows, emergent marshes, or potholes. See Appendix C for a list of all herpetofauna found on the Refuge.

3.11.4. Fish

Forty fish species have been identified in lakes and rivers on the Refuge. Game fish species include northern pike, walleye, smallmouth bass, largemouth bass, bluegill, and black crappie. A large population of carp and other roughfish also inhabit the open waters. Species that are indicators of ecosystem health within Refuge waters include redhorse suckers and shiners. Many fish in these areas experience winterkill caused by depletion of oxygen dur-

ing the winter months. Much of the watershed is restocked naturally from the Mississippi River by way of the Platte River downstream from the Refuge. See Appendix C for a list of all fish species found on the Refuge.

3.11.5. Threatened and Endangered Species

3.11.5.1. Animals

Gray wolves, a federally-listed endangered species, are also currently listed under a threatened status in the state of Minnesota. Wolves do not have any established packs on the Refuge but intermittently pass through the area. In 2001, a program was initiated to reintroduce an experimental non-essential population of federally listed endangered Whooping Cranes. The intent was to establish an eastern migratory flock that would summer and breed in central Wisconsin and winter in west-central Florida. On rare occasions, individuals from this experimental population have been observed in the area near Crane Meadows NWR. The mosaic of vegetation communities, mainly the wetland complex at Crane Meadows NWR can provide essential habitat for this species if the population continues to grow and disperse. Bald Eagles were once federally-listed as threatened, but were delisted on August 9, 2007 and moved to a protected status under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. This species is commonly observed in the area during spring and fall migration and the Refuge currently supports three nesting pairs. Peregrine Falcons were also once federally endangered and were delisted in 1999 after their remarkable comeback. Currently, Peregrine Falcons are state-listed as threatened and are occasionally seen on the Refuge during spring and fall migration.

State-listed threatened or special concern birds species documented on the Refuge include Trumpeter Swan, Wilson's Phalarope, Horned Grebe, Nelson's Sharp-tailed Sparrow, Short-eared Owl, Red-shouldered Hawk, American White Pelican, and Forster's Tern. Greater Prairie Chickens were once documented using a cultivated field within the Refuge acquisition boundary. The Refuge supports a Blanding's turtle population, a state-listed threatened species, and other reptiles with special concern status including snapping turtles, western hognose snake, and gopher snake. Two species of mussel with state special concern status have also been documented on the Refuge, the creek heelsplitter and black sandshell found in the Skunk River (see Appendix C for a list of the mussel species present at Crane Meadows NWR).

3.11.5.2. Plants

Three species of rare plants have been documented on the Refuge. Small populations of blunt sedge and Hill's thistle (state-listed special concern species) were found in southern dry prairie (sand prairie) and southern dry savanna remnants on the Refuge. The state-listed endangered tubercled rein-orchid has been documented in two locations on the Refuge in southern mesic/wet prairie and sedge meadow habitats.

3.12. Threats to Resources

3.12.1. Agricultural Development

Agriculture is the primary land use and leading economic activity in Morrison County. More natural areas have been converted to cropland in the County than to any other cover type, and many of these areas were already converted by the middle of the 20th century. Refuge resources are adversely affected by the application of pesticides, herbicides, and fertilizers on neighboring and upstream lands. These substances are not only a source of contamination but can also lead to increased erosion, sedimentation, and eutrophication in the watershed and Refuge wetlands. Many of these substances, such as organochlorines and organo-phosphates, are known to be toxic to fish and wildlife via direct exposure, bioaccumulation, and bio-magnification (Cox 1991).

Other threats to resources posed by agriculture include:

- Animal barns and poultry houses pose threats regarding undesirable nutrient levels, wastes, contaminants in surface waters, and rapid infiltration through sandy soils into local aquifers.
- Center pivot irrigation increases habitat loss and fragmentation. This activity also depletes groundwater sources and impacts the levels of local water tables; increases erosion, runoff, and sedimentation; impacts adjacent habitats by increasing local moisture levels; and degrades soils by increasing soil mineral levels and salinity if applied long term.
- Tiling and channelizing waterways for agriculture threatens the natural function of the Rice-Skunk wetland system by destroying wetlands and increasing fragmentation of bottomland habitat.

See Chapter 3 of the CCP for more detail.

3.12.2. Invasive Species

Several invasive species occupy the Refuge, many of which are exotic. Currently, Siberian elm, black locust, buckthorn, Canada thistle, leafy spurge,

common tansy, and spotted knapweed pose the greatest threat to Refuge uplands. Proliferation of aspen may also lead to problems in upland restoration sites.

Regarding Refuge wetlands, purple loosestrife is an exotic species, is invasive in areas near the Refuge, and requires routine monitoring due to its high level of invasiveness. Reed canary grass is also an aggressive invasive species that competes with and displaces native wetland vegetation. Phragmites requires monitoring for increases in abundance within the complex; as some subspecies are invasive and others native. These species can reduce the quality of habitat for wetland-dependent wildlife species. Routine monitoring is required to understand and prevent the spread of these and other invasive species on the Refuge.

3.12.3. Urban and Residential Development

Increased population and development may impact the Refuge resources and land acquisition by adding to habitat loss and fragmentation, changing property ownership and zoning, and increasing other human activities that may conflict with the Refuge purposes and the Refuge System mission.

The Refuge is located 7 miles southeast of the closest town, Little Falls, Minnesota, which has an estimated population of 8,200 and 545 housing units. Within the last decade, the population of Little Falls has grown by 5.5 percent.

The population of Morrison County has increased by 10 percent in the last 20 years, and 3.6 percent in the last decade, to reach a current count of 33,000 people. The number of housing units in Morrison County has increased 12.8 percent within the last decade, with approximately 16,000 house or condo units (U.S. Census 2009).

3.12.4. Contaminants

An aerial survey of possible contamination sites in the area was conducted by the Service in August of 1991. No unusual sources of contaminants were found other than abandoned private waste sites.

The Greater Morrison County Sanitary Landfill is located approximately 1.5 miles west of the Refuge. Surveys of the area surrounding the landfill have indicated contamination in the form of volatile organic compounds (VOCs) in the underlying groundwater. However, measured VOC levels are low (less than 300 parts per billion at the edge of the groundwater plume) and have not been detected beyond 500 feet from the landfill boundary. The general direction of the upper aquifer groundwater movement beneath the landfill heads away from the Refuge-to the southeast toward the Platte River.

3.13. Administrative Facilities

Because of Crane Meadows NWR's small size and limited land in fee-title ownership, there is a small staff and minimal administration facilities. The main office (a converted private residence), four maintenance buildings, and their associated gravel parking lots comprise the administrative headquarters. The office building was renovated in 1992 when the Service began managing the first Refuge tracts, and has three offices and a small kitchen /common area.

3.14. Cultural Resources

The geology and hydrology in the area surrounding the Crane Meadows NWR have combined to produce one of the most potentially rich archaeological locations in the region. The pre-settlement habitats of oak savanna, tallgrass prairie, and sedge-meadow wetland, co-mingled with a large number of water features (Rice Lake, Skunk Lake, Mud Lake, Platte River, Skunk River, Rice Creek, Buckman Creek, and Little Rock Creek), would have provided an inviting wealth of animal and plant resources (particularly wild rice) for the prehistoric inhabitants of the region.

To date, three prehistoric archaeological sites have been positively identified within the boundaries of the Refuge acquisition boundary. All three are habitation and mound sites containing between 2 and 10 circular burial mounds each. The largest of the mounds is reported to be between 15 and 25 feet high – likely the largest mound in Morrison County. Archaeological research conducted in the habitation areas has revealed that these locations were occupied for at least the last 3,000 years. Two of the mound sites were determined to be so significant and unique, that they were designated the *Rice Lake Prehistoric District* and listed on the National Register of Historic Places (NRHP) on October 2, 1973.

The Pelkey Lake Site, which is located only 1 mile north of the Refuge, was also listed on the NRHP in 1973. Archaeological evidence there indicates that the site was used for the last 10,000 years by people of the Paleo-Indian, Archaic, and Woodland periods. In addition, dozens of local residents have collected artifacts from the area (four archaeological sites are known to exist immediately adjacent to the Refuge) that reflect a long and continuous occupation of the region beginning with the Paleo-Indian period approximately 10,000 years ago.

Table 5: Refuge Visitation – Crane Meadows National Wildlife Refuge

Refuge Activity	2005	2006	2007	2008
Platte River Trail	1,960	2,098	4,508	5,388
Habitat Day	500	550	450	475
Environmental Education	615	151	396	688
General Refuge Visitation	8,171	3,925	5,380	6,317

3.15. Visitor Services

The National Wildlife Improvement Act of 1997 established six priority uses of the Refuge System:

- Hunting
- Fishing
- Wildlife observation
- Wildlife photography
- Environmental interpretation
- Environmental education

All but hunting and fishing are a part of current management at Crane Meadows NWR. The Headquarters Unit is currently the only Refuge property with public access and accommodations for public use. The Refuge provides a number of facilities including trails, observation platforms, kiosks, and benches to facilitate wildlife-dependent recreation, and overall visitation for Refuge activities has increased in recent years (see Table 5 on page 36).

3.15.1. Hunting

The Refuge is not currently open to hunting because Service land ownership inside the Refuge acquisition boundary is relatively small, scattered, and interspersed with privately owned land. Consistent with its establishment goals, Refuge staff are seeking ways to overcome these and other obstacles to provide safe and manageable hunting opportunities at Crane Meadows NWR.

3.15.2. Fishing

Fishing is permitted on all state-managed public waters, including Rice, Skunk and Mud Lakes, and the Platte River. Fishing, however, is not permitted on Crane Meadows NWR property along the banks of Refuge rivers, streams, or lakes. Public boat access to these areas is available at two sites maintained by the state. One is located above the low flow dam and affords access to Rice, Skunk, and Mud lakes. Another site just below the dam provides access to the Platte River.

3.15.3. Wildlife Observation and Photography

Opportunities to observe and photograph wildlife are provided year-round on the scenic 3.7-mile Platte River Trail (see Figure 10 on page 37). The trail leads visitors along the banks of the Platte River to the edge of Rice Lake, then returns to the trailhead through oak woodland, oak savanna and prairie habitat. The trail has four loops. Two shorter, inner loops are available for visitors with limited time or mobility. Long and medium length loops are also available. The entire trail was improved and surfaced with crushed granite in June 2008. Two observation platforms are provided, one adjacent to the Platte River near the trailhead and the other overlooking Rice Lake. The Rice Lake Overlook was constructed with a permanent spotting scope and a wide middle section to accommodate larger groups and provide a space for environmental education programs. Bicycles and horses are not permitted on Refuge trails.

During the winter season, the Platte River Hiking Trail is groomed for cross country skiing as snow conditions permit. A double wide groomer is used to set a side-by-side track. Snowshoers and winter hikers are asked to be respectful of tracks set for skiers and hike to the side of the trail.

3.15.4. Interpretation and Programs

3.15.4.1. Habitat Day

The Refuge, the Friends of Crane Meadows NWR, and numerous other co-sponsors annually host Habitat Day for Wood Ducks and Bluebirds during March. Since 2000, this event has developed and enhanced partnerships among more than 40 natural resource agencies, conservation organizations, area schools, and local businesses.

3.15.4.2. Platte River Cleanup

The Refuge, the Friends of Crane Meadows NWR, and the Royalton Lions Club host an annual river cleanup each June. Participants clean a 26.5-mile stretch of the Platte River from Highway 27 south to the Mississippi River. The northern section

Figure 10: Existing Visitor Services Facilities, Crane Meadows NWR

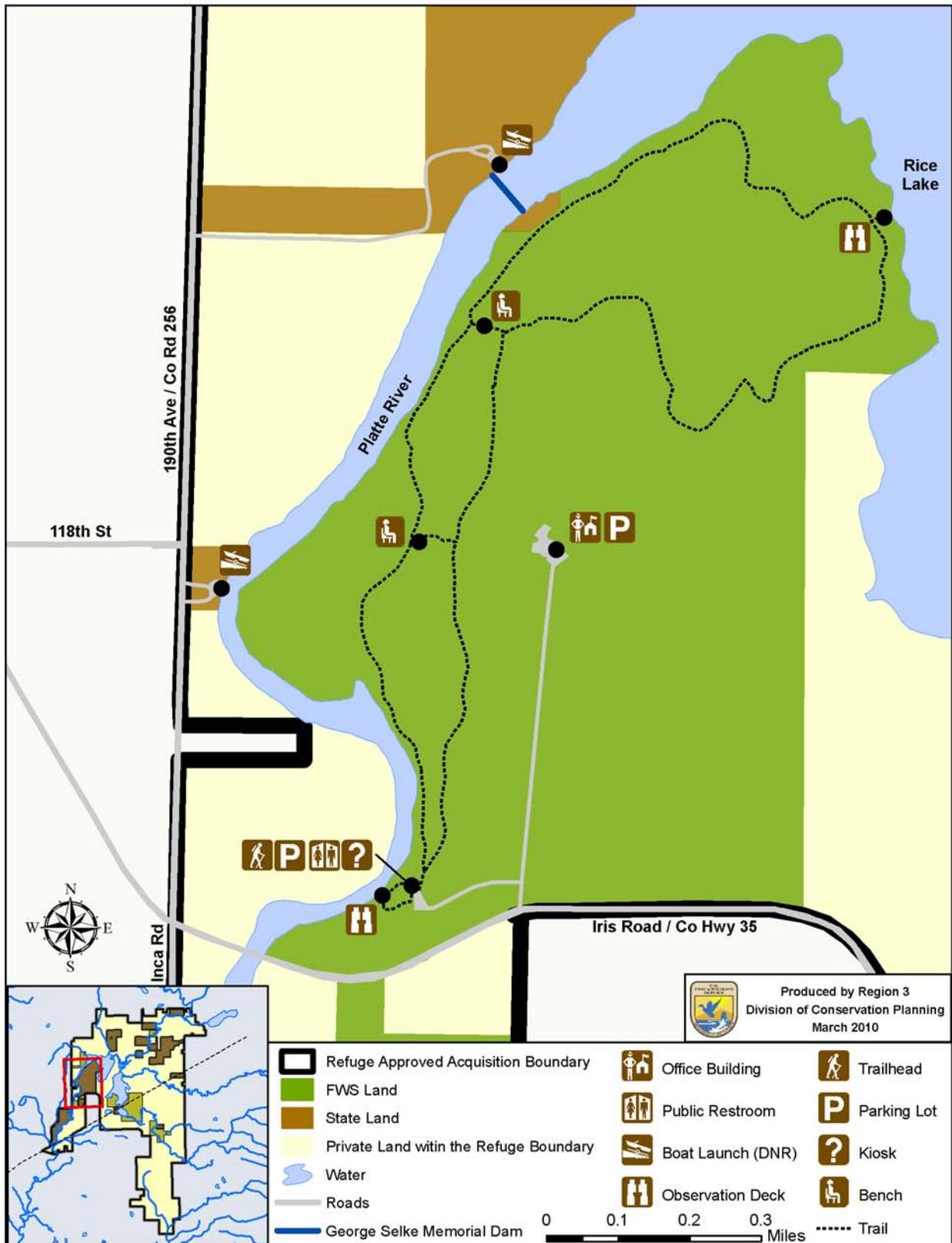


Table 6: Volunteerism at Crane Meadows National Wildlife Refuge

	2004	2005	2006	2007	2008
Total Number of Volunteers	32	37	41	63	71
Total Volunteer Hours	1722	2326	1865	2543	2626

of this route flows through the Refuge, and participants have the opportunity to fish and birdwatch while picking up litter.

3.15.4.3. Bat Program

The Refuge hosted a bat program in 2007 and 2008. Participants were able to build bat houses to take home, attend presentations on bats species in Minnesota, take tours to locate bats, and learn about the mechanics of echolocation.

3.15.4.4. Bird Tour

The Refuge, its Friends Group, and the Morrison Birding Club offer a guided bird tour on the Platte River Trail each spring. The Morrison County Birding Club has helped the Refuge develop a birding brochure, and lists Crane Meadows NWR on their website as an excellent birding spot in the county.

3.15.4.5. Environmental Education and Outreach

Staff and volunteers lead educational programs at the Refuge for organized groups upon request. For a number of years, Royalton Elementary School has used Crane Meadows NWR in the spring as an outdoor classroom. In 2009, the Friends of Crane Meadows established an Environmental Education Committee to initiate dialog with area school superintendents, principals, and teachers to use the Refuge as an outdoor classroom for their students. The Royalton School District will be the pilot project.

Refuge staff and Friends members bring a Refuge exhibit to local business expos, the Morrison County Fair, home and garden shows, senior expos, and other off-site events as opportunities arise. Refuge staff assists with the U. S. Fish and Wildlife Service exhibit at the annual Game Fair in Anoka County in October. They also work with chapters of Pheasants Forever during their Youth Day Programs.

The Refuge participates in the Morrison County Water Festival held at Camp Ripley each year during the third week in September. Several hundred fifth-grade students from Little Falls and other area schools attend and participate in a variety of 30-minute environmental education programs conducted by staff from the Refuge, Camp Ripley, Mor-

risson County Soil and Water Conservation District, The Nature Conservancy, and the Minnesota Department of Natural Resources.

3.15.4.6. Friends Group

The Friends of Crane Meadows NWR, a non-profit 501(c)(3) organization formed in September 2006, assists the Refuge with educational programs and provides financial backing for selected programs and projects through fund-raising activities. At the end of fiscal year 2008, the Friends Group had 61 members. The Friends' projects have included funding and assistance with the construction of the Rice Lake observation deck, and the development of the greenhouse program which grows native wildflowers for planting on the Refuge.

3.15.4.7. Volunteer Program

Volunteers actively participate in a wide variety of visitor services and biological programs on the Refuge. Their activities include wildlife surveys, wildflower gardening, assisting with special events, and trail maintenance. Table 6 shows an overall increase in volunteerism on the Refuge over the past 5 years.

Chapter 4: Environmental Consequences

This chapter further explores the potential direct and indirect effects of actions proposed in the management alternatives described in the CCP and EA. Effects to the environment, ecosystem, and human communities associated with Crane Meadows NWR are discussed.

Several potential management effects and environmental changes will be common under all alternatives and are summarized in Section 1: Effects Common to All Alternatives.

There are also a number of environmental and social impacts that will differ among the three future management alternatives proposed for Crane Meadows NWR. In the case of Crane Meadows NWR, these impacts are most easily discussed by topic and are covered in Section 2: Summary of Effects by Management Alternative. The following topics are examined in further detail in Section 2 for each of the three proposed management alternatives:

- Wetland habitats
- Upland habitats
- Wildlife species
- Water resources
- Visitor services
- Socio-economics

The final section of this chapter, Section 3: Cumulative Impact Analysis, reviews the cumulative impacts of proposed management actions at Crane Meadows NWR. As defined by The National Environmental Policy Act (NEPA) of 1969, these are, “The impact(s) on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person takes such other actions (40 CFR 1508.7).”

4.1. Effects Common to All Alternatives

4.1.1. Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Clinton on February 11, 1994. Its purpose was to focus the attention of federal agencies on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all com-

munities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low income communities access to public information and participation in matters relating to human health or the environment.

None of the management alternatives described in this EA will disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The percentage of minorities in Morrison County, where Crane Meadows NWR is located, is lower than the average of the state of Minnesota and much lower than the United States as a whole. According to 2008 U.S. Census data, Morrison County has little ethnic diversity, with 98.2 percent of its population classified as white/Caucasian, and less than 1 percent of the population in any single minority; Black, Native American, Asian, or Hispanic. The number of persons living below poverty level (13.3 percent), however, is higher than the 9.6 percent state average (U.S. Census Bureau, 2009). Regardless of the demographic structure and income in the county, public use activities offered under each of the alternatives would be available to any visitor regardless of race, ethnicity or income level.

4.1.2. Cultural Resources

The Service is responsible for managing and protecting archeological and historic sites found on national wildlife refuges. The consequences of past, current, and proposed management on cultural resources are the same across all alternatives. Any management actions with the potential to affect cultural resources would require Refuge Manager review, as well as review by the Service’s Regional Archaeologist in consultation with the state of Minnesota Historic Preservation Office, as mandated by Section 106 of the National Historic Preservation Act. Therefore, determining if particular actions within an alternative have the potential to affect cultural resources is an ongoing, well-established, and regulated process that would occur during the planning stages of any proposed projects. The preferred approach to protecting archaeological, historical,

and other cultural resources is to avoid them altogether. In some special cases, management activities on the Refuge may take precedence over cultural resources, but all precautions and actions will take place to ensure maximum protection and preservation of the resources.

Some management activities may have the potential to impact cultural resources via ground disturbance. The most direct way to minimize disturbance of cultural resources on the Refuge is to reduce or eliminate building or construction activities. All of the alternatives presented in this EA call for low levels of development, thereby inferring little negative effect on the Refuge's cultural and historic resources.

There may be archaeological sites within prescribed burn units on the Refuge, yet prescribed burning has little potential to affect these resources. Fire will be only a temporary disturbance to the surface vegetation and soil and will not have any effect on archaeological artifacts buried beneath the surface. Other fire program activities including constructing and managing firebreaks, hazardous fuels reduction projects, tree thinning associated with restoring oak savannas from woodlands, and other activities requiring heavy machinery typically involve some shallow ground disturbance. Any such proposed activities that could negatively impact cultural sites will be surveyed prior to management activity to ensure protection of any cultural or archaeological resources present.

4.1.3. Climate Change

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

Several impacts of climate change on natural systems, habitat, and wildlife have been identified that may need to be considered and addressed in the future. The following are examples of some of these predicted impacts:

- Cold water habitat required for many fish species in the Great Lakes region could be reduced, thereby negatively affecting their survivability, the survival of their prey species, and other resources they depend on.
- Plant and animal communities may change as species' ranges shift northward; less adaptable species becoming threatened by the changing conditions, and other more tolerable species moving in to take their place.
- Animal and insect species historically found farther south may colonize new areas to the

north as winter climatic conditions become more moderate.

- Plant species that are most tolerant to variable environmental conditions and are often invasive in nature (sometimes exotic), will likely out compete native plants for resources.
- Ducks and other waterfowl could lose breeding habitat due to more extreme and frequent droughts.
- Changes in the timing of migration and nesting may result in potential conflict with the natural life cycles of their prey species.

Managers and resource specialists on the Refuge need to be aware of these possible changes due to climate change. When feasible, documentation of long-term vegetation, species, and hydrologic changes should become a part of research and monitoring programs on the Refuge. Adjustments in Refuge management direction may be necessary over the time to adapt to changes in climate. The following paragraphs are excerpts from the 2000 report, *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change*, produced by the National Assessment Synthesis Team, an advisory committee chartered under the Federal Advisory Committee Act to help the US Global Change Research Program fulfill its mandate under the Global Change Research Act of 1990. These excerpts are from the section of the report focused upon the eight-state Midwest region.

4.1.3.1. Observed Climate Trends

Over the 20th century, the northern portion of the Midwest, including the upper Great Lakes, has warmed by almost 4 degrees Fahrenheit (2 degrees Celsius), while the southern portion, along the Ohio River Valley, has cooled by about 1 degree Fahrenheit (0.5 degree Celsius). Annual precipitation has increased, up to 20 percent in some areas, with much of this coming from more heavy precipitation events (NAST 2000)."

4.1.3.2. Scenarios of Future Climate

During the 21st century, it is highly likely that temperatures will increase throughout the region, likely at a rate faster than that observed in the 20th century, with models projecting a warming trend of 5 to 10 degrees Fahrenheit (3 degrees to 6 degrees Celsius) over 100 years. Precipitation is likely to continue its upward trend, with 10 to 30 percent increases across much of the region. Increases in the frequency and intensity of heavy precipitation events are likely to continue in the 21st century. Despite the increase in precipitation, rising air temperatures and other meteorological factors are likely to lead to a substantial increase in evapora-

tion, causing a soil moisture deficit, reduction in lake and river levels, and more drought-like conditions in many areas (NAST 2000).”

4.1.3.3. Midwest Key Issues

Water Resources

Water levels, supply, quality, and water-based transportation and recreation are all climate-sensitive issues affecting the Midwest Region. Despite the projected increase in precipitation, increased evaporation due to higher summer air temperatures is likely to lead to reduced water levels in the Great Lakes. Of 12 models used to assess the future of Great Lakes hydrology, 11 suggest significant decreases in lake levels while one suggests a small increase. The total range of the 11 models’ projections ranges from a less than 1-foot increase to a more than 5-foot decrease. A 5-foot (1.5-meter) reduction would lead to a 20 to 40 percent reduction in outflow to the St. Lawrence Seaway. Lower lake levels will cause reduced hydropower generation downstream, with reductions of up to 15 percent by 2050. The projected increase in demand for water across the region while there is a simultaneous decrease in net flows is of particular concern. As demands for water increase there is a possibility for increased national and international tension related to growing pressure for water diversions from the Lakes. For smaller lakes and rivers like those at Crane Meadows NWR, reduced flows are likely to make water quality issues more acute. In addition, the projected increase in very heavy precipitation events will likely lead to an increase in flash flooding, and thus worsen agricultural and other non-point source pollution as more frequent heavy rains wash pollutants into rivers and lakes. Lower water levels are likely to make water-based transportation more difficult, with increases in navigation costs from 5 to 40 percent. Some of this increase may be offset as reduced ice cover extends the navigation season and the geography of navigable waters changes. Reduced water levels may also decrease shoreline damage resulting from high lake levels by 40 to 80 percent.

Adaptations: A reduction in lake and river levels would require adaptations such as re-engineering of ship docks and locks for transportation and recreation. If flows decrease while demand increases, international commissions focusing on Great Lakes water issues will become even more important in the future. Improved forecasting of extreme precipitation events could help reduce some related impacts.

Agriculture

Agriculture is of vital importance to this region, the nation, and the world. Agricultural systems have exhibited a capacity to adapt to moderate differ-

ences in growing season climate, and it is likely that agriculture will be able to continue to adapt. With an increase in the length of the growing season, double cropping, the practice of planting a second crop in a single year after the first is harvested, is likely to become more prevalent. The fertilization effects of carbon dioxide are likely to enhance plant growth and contribute to generally higher yields. The largest increases are projected to occur in the northern areas of the region, where crop yields are currently temperature limited. However, yields are not likely to increase in all parts of the region. Consumers may pay lower prices due to increased yields, while producers are likely to suffer reduced profits because of declining prices. Increased use of pesticides and herbicides are very likely to be required, presenting additional challenges. With agriculture as the major economic activity in Morrison County, and affecting lands within and adjacent to Crane Meadows NWR, many of these affects could have direct implications on land protection and water quality at the Refuge.

Adaptations: Plant breeding programs can use climate prediction models to direct research to breeding new varieties for new growing conditions. Farmers can then choose varieties better suited to the expected climate. It is likely that plant breeders will need to use all tools available in adapting to climate change, including genetic engineering. Modifying planting and harvest dates, planting densities, and using integrated pest management, conservation tillage, and new farm technologies are additional options. There may be opportunities to shift or expand the area where certain crops are grown if climate conditions become more favorable. Weather conditions during the growing season are the primary factor in year-to-year differences in corn and soybean yields. Droughts and floods result in large yield reductions. Severe droughts like the drought of 1988 cause yield reductions of over 30 percent. Reliable seasonal forecasts would help farmers adjust their practices from year-to-year to respond to such events.

Changes in Semi-natural and Natural Ecosystems

Forests: Different U.S. forest types are expected to expand (oak-hickory), contract (maple-beech-birch), or disappear altogether (spruce-fir) (Ryan et al. 2008). The Upper Midwest has a unique combination of soil and climate conditions that favor the growth of conifer forests. Higher temperatures and increased evaporation will likely reduce boreal forest acreage, and make current forestlands more susceptible to pests and diseases. It is likely that the southern transition zone of the boreal forest will be susceptible to expansion of temperate forests, not to mention increased competition from other land use pressures. However, warmer weather (coupled with

beneficial effects of increased carbon dioxide on vegetation), are likely to lead to an increase in tree growth rates on marginal forestlands that are currently temperature-limited. Most climate models indicate that higher air temperatures will cause greater evaporation and hence reduce soil moisture, a situation conducive to forest fires. Increased temperatures and longer growing seasons may also speed up decomposition rates and nutrient cycling, depending on water availability. As the 21st century progresses, there will be an increased likelihood and intensity of environmental stress on both deciduous and coniferous trees, making them susceptible to disease, pest infestation, and ultimately, mortality. Because Crane Meadows NWR lies in a thin transition zone between the eastern forests and the prairies to the west, changes in the structure of wooded and partially-wooded (savanna) habitats are possible over time.

Water Habitats: As lake water temperatures increase, major changes in freshwater ecosystems will very likely occur. For example, a shift may occur from cold water fish species such as trout, to warmer water species such as bass and catfish. Warmer water is also likely to create an environment more susceptible to invasive, non-native species. Runoff of excess nutrients (such as nitrogen and phosphorus from fertilizer) into lakes and rivers is likely to increase due to an increase in heavy precipitation events. This, coupled with warmer lake temperatures, is likely to stimulate the growth of algae, depleting dissolved oxygen content in the water to the detriment of other living organisms. Reduced lake levels will likely impact the current distribution of wetlands. There is a chance that some wetlands could migrate gradually over time, but in areas where their migration is limited by the topography or anthropogenic land change, they would disappear. Changes in bird populations and other native wildlife have already been linked to increasing temperatures, and more changes are likely in the future. As a predominantly wetland system, the availability of water and a changing aquatic species structure could have serious implications for management, habitat availability, and species conservation at the Refuge.

Outdoor Recreation

The climate change impacts on environmental systems will have direct consequences to humans. In the context of Service management responsibilities, this may result in effects on appropriate and compatible refuge uses. Popular winter activities at Crane Meadows NWR such as cross-country skiing and snow-shoeing may have shorter seasons, and have the potential to be compromised by reduced snow cover. Opportunities for warm-season activities can be expected to see similar, but opposite

change. Not only may warm-weather recreation seasons lengthen, but changing life cycles and distributions of wildlife may alter opportunities for hunting, wildlife viewing, and photography. Changes in activities not only affect refuge management, but the local and regional economy.

4.1.3.4. Carbon Sequestration

The increase of carbon dioxide within the earth's atmosphere has been linked to the gradual rise in surface temperature, a phenomenon commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes one of the primary climate-related management strategies that can be considered despite uncertainty surrounding site-specific climate change effects. The U.S. Department of Energy's "Carbon Sequestration Research and Development" (U.S. DOE, 1999) defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Terrestrial vegetation is a tremendous factor in global carbon sequestration. Terrestrial biomes of all types - grasslands, forests, wetlands, tundra, and deserts, and their soil and plant communities - are capable of capturing and storing carbon, thereby removing a portion of the atmospheric carbon dioxide. The Department of Energy report's conclusions note that ecosystem protection has important implications for the global carbon balance, and that efforts should be made to reduce or prevent the release of carbon currently stored in the terrestrial biosphere (U.S. DOE, 1999). Conserving natural habitat with the intention of capturing and storing carbon also has benefits for wildlife. The actions proposed in this CCP would conserve or restore land and habitat from degraded or non-natural conditions, and would thus provide certain carbon sequestration benefits. The endeavors of the NWRS are positive contributions in ongoing efforts to mitigate human-induced global climate change, and also benefit populations of wildlife species throughout the Nation.

One Refuge activity in particular, prescribed burning, releases carbon dioxide directly to the atmosphere from the biomass consumed during combustion and soil disturbance. However, there is no net loss of carbon in grassland systems, since the vegetation would eventually have died and nearly equivalent carbon dioxide quantities would have been released through the process of decay. Also, shortly after the burn, new vegetation quickly germinates and sprouts to replace the burned biomass, and sequesters or assimilates an approximately equal amount of carbon as was lost to the air. Over multiple years of burns, an increasing root network

develops below the soil surface in prairies, effectively capturing large quantities of carbon. Overall, there should be little or no net change in the amount of carbon sequestered at Crane Meadows NWR from prescribed burning activities. However, the restoration of lands previously cleared for agriculture will increase the total quantity of sequestered carbon on the Refuge. Trees and grasses characteristic of the upland habitats found at Crane Meadows NWR, are effective at capturing and storing carbon both above and below the ground surface.

4.1.4. Prescribed Fire

All alternatives call for an active prescribed burning program to control habitat succession and mimic the historic fire regimes on which many of the Refuge species and habitats depend.

4.1.4.1. Upland and Wetland Habitats

The prescribed burning program will have a visible impact on vegetation and the land. Immediately after a fire much of the land will be blackened. There will be few grasses or understory forbs remaining and most of the brush will be scorched. Trees may be scorched and scared thereafter. Because of wet ground conditions or patchy fuels, there are often areas within the burn unit that are untouched by fire, resulting in a patchy, mosaic burn. The woodlands, oak savannas, and prairies at Crane Meadows have evolved with fire and, through time, developed adaptations to endure fire's seemingly harmful effects. In fact, many plant species have important adaptations that allow them to survive, thrive, and even require fire for their long-term survival. For example, Indian grass and jack pine require fire for reproduction, and bur oak has thick bark and an extensive root system to survive burns. Fires are also beneficial in controlling invasive and exotic species from taking over native plant communities, and they help prevent woody encroachment in oak savannas, prairies, and wetlands. Additionally, fire disturbance creates colonization sites for native prairie plants to take root and favorable conditions for growth. Units are burned on a rotation once every 3-4 years to give sufficient recovery time for existing plant communities and time for new plants to establish. After a spring burn, native grasses and forbs will begin to grow within a few days. The enriched soil will promote rapid growth such that after 2 or 3 weeks the ground will be covered with fresh sprouts of green vegetation. Some of the less fire resistant trees will show signs of wilting and may succumb. After one season of regrowth, most signs of prescribed burning will be difficult to detect without close examination, except tree scarring. Other signs of the burn will remain for longer periods. For instance, firebreaks will be maintained for use in containing wildland fires and

future prescribed burns, and vehicle tracks through the burn area may remain if the vehicle created ruts in the ground. Travel across the burn area will be kept to a minimum where possible.

The effect of fires on soil is dependent largely on fire intensity and duration. Areas with high fuel loads, a slow backing fire is usually required for containment and to achieve the desired burn results. The intense heats generated by a slow backing fire will have a greater effect on the soils than fast, cooler head fires. The cool, moist soils of wetter areas in the burn units or areas with little fuel will be minimally affected by the fire. The degree of impact to the soil is a function of the thickness and composition of the organic mantle. In cases where only the top layer of the mantle is scorched or burned, there will be no effect on the soil. This usually occurs in the forested areas with leaf litter. On open grassland sites, the blackening of the relatively thin mantle will cause greater heat absorption and retention from the sun. This will encourage earlier germination during the spring growing season. Nutrient release occurs as a result of burning as well as the normal decomposition process, but fire will accelerate nutrient release. The rate and amount of nutrients released will be dependent on the fire duration and intensity as well as the amount of humus, duff, and other organic materials present in the mantle. The increase, immediately after a burn, of calcium, potash, phosphoric acid, and other minerals will give the residual and emergent vegetation a short-term boost. There is no evidence to show that the direct heating of soil by a fire of low intensity has any adverse affect.

4.1.4.2. Wildlife Species

The majority of the prescribed fires will take place in early spring prior to the hatching and birthing periods for most species (i.e. deer fawns, song bird broods, etc.) and in late fall when the young animals have matured enough to avoid the fire. Prior to European settlement and wildfire suppression, fires played a major role in shaping the historic landscapes of the region and the Refuge's native plant and animal communities. Animals and plants associated with these fire dependent habitat types have evolved with fire and, through time, developed adaptations to endure fire's effects. The immediate impact of fire on animals is generally less severe, as both vertebrates and invertebrates have shown to be fairly successful at avoiding fire. Many small mammal species, amphibians, reptiles, and invertebrates will survive burns by retreating into underground burrows, or by going under water until the burn passes through. Healthy large mammals and birds have the ability to escape. During spring burns some birds may loose their nests, but if the prescribed burn is early enough in the breeding sea-

son the majority of these animals will re-nest. Also, prescribed fires tend to burn in a mosaic fashion leaving some areas unburned and providing refugia for wildlife species. Changes in the plant community following a fire have benefits on the animal communities that inhabit these ecosystems.

The long-term survival of wildlife species depends on the health of the plant community, which is enhanced by intermittent prescribed burns in a fire-dependent ecosystem. Fire programs also create a diverse mosaic of habitat conditions that support a wide array of native wildlife species. These prescribed burns may result in the mortality of some individuals, but will benefit the species at the population level by creating and maintaining highly productive habitat.

4.1.4.3. Impact on the Community and Visitor Services

Prescribed burning on the Refuge will benefit the public by improving some recreational opportunities. For example, the improved habitat conditions created by fire will increase food resources for native wildlife populations and improve visibility by suppressing woody encroachment and reducing shrub abundance in open landscapes. Also, visitor safety is enhanced by controlled burning. If a wildland fire occurs on or near the Refuge, previously burned areas on the Refuge and existing fire-breaks will help suppress these wildfires. Smoke from a Refuge fire could impair visibility on roads and become a hazard. All efforts will be made during prescribed burning activities to assure that smoke does not impact smoke sensitive areas such as roads and local residences. The impacts of smoke can be reduced through management actions including the use of traffic controls and signage, altering ignition techniques and sequence, halting ignition, or even suppression as needed. Burning activities will be only conducted when the prerequisite weather conditions are met and Refuge staff are to prevent heavy smoke concentrations from occurring in nearby communities. Prescribed fire operations may temporarily impact air quality, but the impacts are mitigated by selection the appropriate prescription window, limiting burn unit size, monitoring wind direction, and gauging the distance from nearby population centers. In the event of wind direction change, mitigation measures will be taken to assure public safety and comfort. Refuge staff will work with partner agencies and state air quality personnel to address smoke issues that require additional mitigation. In addition, the Fire Management Plan will describe specific measures to deal with smoke management problems for each unit. Public concern will be reduced through a concerted effort by Refuge staff to inform local citizens about the prescribed burning program, the benefits of fire to wildlife, and the safety precautions taken during

all Refuge burns. Interpretive programs explaining the prescribed burning program will also be a component of Refuge outreach and education.

It is possible that a prescribed fire may escape a planned burn zone and into a neighboring area. An escape can be caused by factors that may or may not be preventable. Inadequate firebreaks, too few personnel, unpredicted changes in weather conditions, peculiar fuel types, and insufficient knowledge of fire behavior are factors that can lead to a loss of control. An escaped fire can turn into a very serious situation, where buildings, equipment, and people's lives could be endangered. A wildfire on the Refuge would be less harmful than one on private lands. Extreme care, careful planning, and adherence to the unit prescription will occur as all prescribed burns are conducted. Additional precautions will be taken when burning areas that are near developed areas, private property, and/or a Refuge boundary. In the event that a prescribed fire does jump a fire-break and burn into unplanned areas, there is a high probability of rapid control with minimal adverse impacts. In general, prescribed burns will have light fuel loads (0.25 to 3 tons of fuel per acre), will be burned under low fuel moisture conditions, and burned under specific climatic conditions. The network of firebreaks and roads will greatly assist in rapid containment of escaped prescribed burns or in the event of a wildfire. All nearby water sources and escape routes will be documented, and in most cases, all of the Refuge fire-fighting equipment will be immediately available at the scene. The applicable Minnesota DNR fire suppression crews and local fire departments will always be notified of prescribed burns. Thus, maximum numbers of experienced personnel and equipment are immediately available for wildfire suppression activities.

4.1.5. Other Common Effects

None of the alternatives would have more than negligible, or at most minor, effects on soils, topography, noise levels, land use patterns, transportation and traffic, waste management, human health and safety, or visual resources in and around the Refuge.

4.2. Summary of Effects by Management Alternative

This section describes the differences between potential environmental consequences of adopting each Refuge management alternative. Table 7, "Comparison of Impacts by Management Alternative for Crane Meadows NWR," on page 49 more generally and concisely summarizes and compares the alternatives according to variations in environmental impacts.

4.2.1. Alternative A (Current Management Direction)

4.2.1.1. Wetland Habitats

The Rice-Skunk wetland complex will benefit under this alternative as additional land is acquired and wetlands on newly acquired lands are maintained, improved, and/or restored. Opportunistic land acquisition has the potential to increase protection of the wetland complex by protecting it from development of all kinds. However, this alternative does not define specific acquisition targets and is less proactive about land acquisition, thus opportunities may be lost to protect the most critical areas within the acquisition boundary. Without specifying how much of what types of wetland habitats are desired, and where, this alternative will neither lend the most effective protection to specific conservation targets nor seek to maximize biodiversity in the wetland complex. Little emphasis is placed to historic benchmark conditions and geographic distributions for wetlands, which fails to meet the Service policy on Biological Integrity, Diversity, and Environmental Health (601 FW 3). This policy directs the managers of all units in the Refuge System to consider the “composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape,” in Refuge planning and management. In this sense, bottomland forest remains over-represented, and the overall quantity of wetland acreage remains under-represented in this alternative, having direct implications for wildlife associated with these habitat types. Southern rich conifer swamp, or ‘bog’ habitats would remain absent on the Refuge. The use of prescribed fire will benefit the system by mimicking historic habitat controls, helping suppress woody encroachment into open wetland habitats and providing a more diverse mosaic of wetland communities.

On a more site-specific scale, certain management actions must be carefully conducted to minimize negative impacts to habitats. For example, management may require heavy equipment for wetland restoration activities (i.e. plugging ditches). Such management actions may cause temporary soil disturbance, erosion, and sedimentation. In addition, if heavy equipment has been off-site, or its use history is unknown, it can serve as a vector for the spread of invasive species. Furthermore, following most restoration activities, areas may also have increased susceptibility to the establishment of invasive species and invasive-exotic species (reed canary grass, quaking aspen, purple loosestrife, phragmites, box elder, and cattail) during the period of vegetation re-establishment. If soil is brought in

from an off-site location during ditch plugging operations there is potential for an influx of invasive species or contaminants.

4.2.1.2. Upland Habitats

Upland restoration in areas surrounding the wetlands will provide a limited buffer from agricultural land use, infrastructure development, and run-off, erosion, and contamination associated with these land uses. Seeding upland areas to local ecotype tall-grass prairie has the benefit of increasing this rare habitat type on the landscape and removing acres from agricultural use. However, most historical records indicate that prairie was a minor component of the pre-settlement landscape at Crane Meadows (US OSG 1852, Marschner 1930, USDA 2009). This alternative does little to decrease the over-representation of upland forests, or the near absence of jack pine and oak savannas. Numerous savanna plant and animal species have declined from numbers historically present on the Refuge. Routine prescribed burning activities will serve to suppress woody encroachment in prairies and savannas, enhance prairie grasses and forbs, and set back succession across upland habitats.

This alternative does not address deficiencies regarding baseline data collection of the native plant species present on the Refuge, nor investigation of species that were historically present. Uplands remain susceptible to the spread of invasive species due to limited or reactive monitoring and control. This alternative contains little in the way of inventory, monitoring, or documentation necessary to observe environmental change over space and time, leaving gaps in our understanding of ecological trends - including climate change.

4.2.1.3. Wildlife Species

In addition to the current acreage held in fee title, newly acquired and restored lands will provide additional habitat for resident wildlife species, and breeding habitat for migratory birds. Increasing prairie will provide nesting habitat for declining populations of grassland bird species such as Eastern Meadowlarks, Grasshopper Sparrow, Field Sparrow; the state-listed threatened Blanding’s turtle; bull (gopher) snakes; and others. Additionally, larger expanses of prairie habitat are required by Upland Sandpipers, a rare and declining grassland bird species, for breeding. Additional wetland restoration will providing habitat for a number of resident species by such as Blanding’s turtles, mink, beaver, muskrat, and others, and will provide more nesting habitat for waterfowl such as Mallards, Blue-winged Teal, and Trumpeter Swans. However, all of these benefits are based on an assumption of

increased habitat resulting from acquisition and restoration activities. The current rate of acquisition is low.

This alternative does not address the long-standing need for the baseline data of wildlife populations on the Refuge. These inventories are necessary to determine presence/absence of species, and to detect changes within populations, and to design and implement effective wildlife management strategies.

4.2.1.4. Water Resources

This alternative will have minor impacts on water resources. The acquisition, protection, and where necessary, restoration of additional land will benefit rivers, streams, lakes, and wetlands in the vicinity, and downstream of the Refuge. Because this alternative has no water monitoring component, the Refuge will have little information on water resource conditions, issues, and changes on the Refuge or in the larger watershed. Without a hand in designing water monitoring and improvement activities, solutions will continue to be mitigatory instead of preventative.

4.2.1.5. Visitor Services

It is expected that visitor's services will continue at current levels over the life of the plan under this alternative. Opportunistic fee title acquisition will slowly increase the total acreage available for public use, but visitor services are unlikely to expand. With the continuation of current staffing levels it is unreasonable to increase the maintenance burden brought by adding new trails, signs, kiosks, observation decks, and other facilities. Not expanding visitor services offerings, and not opening the Refuge to new uses such as hunting and fishing are likely to benefit Refuge wildlife by minimizing wildlife disturbance, but does little to increase advocacy or increase public support and awareness of the Refuge. Nor does it address the need to stabilize growing state game animal populations such as white-tailed deer.

4.2.1.6. Socio-economics

Little or no additional socio-economic benefit is expected for nearby communities as a result of the objectives in this alternative.

4.2.2. Alternative B (Preferred Alternative)

4.2.2.1. Wetland Habitats

This alternative addresses the need to restore and protect one of the few remaining large, high quality wetland complexes in central Minnesota. Formal federal protection will ensure the long-term persistence of this unique ecosystem on the landscape. As land is acquired in fee title, the conversion

of agricultural areas to restored prairies and savannas in the uplands will provide the wetland complex with an upland buffer, which will mitigate to some degree the current harmful effects (erosion, sedimentation, pollution, etc.) of agricultural practices on nearby wetlands. Restoring drained wetlands and converting some areas of bottomland forest to sedge meadow and southern rich conifer swamp will have the effect of increasing biodiversity, the amount of these rare and declining habitats, as well as the species associated with them. It will also bring Refuge conditions closer to the original mosaic of pre-settlement habitats. Decreasing bottomland forest will have negative effects on some species associated with wooded wetlands.

Management tools such as targeted land acquisition and a structured prescribed fire program will provide additional benefits by emphasizing the most critical habitat for protection and mimicking historic disturbance regimes to create and maintain the desired quantity and distribution of woody vegetation. Many organisms within the wetland complex are sensitive to water quality and quantity conditions, and will benefit from objectives in this alternative that increase water resource monitoring and improvement projects. Monitoring and baseline inventories of wetland plants will help inform and improve the effectiveness of future habitat management. Finally, wetland habitats will benefit from a reduction of invasive plant species on the Refuge that have a tendency to outcompete native species for resources and space.

4.2.2.2. Upland Habitats

Objectives for upland habitat in the preferred alternative will eliminate agricultural use, expand oak savanna, and reduce both prairie and upland woodlands. Many benefits will result from the returning cropland to natural cover types, including an increase in wildlife habitat, an increase in the carrying capacity for native wildlife species, more land available to natural resources and a reduction in land and water degradation associated with row cropping (i.e. erosion and soil loss, sedimentation, fertilizer and agrochemical run-off, eutrophication, salinization, ground water depletion, and contamination). Plant and animal species associated with oak savanna, including a diversity of native grasses and forbs, will benefit from this alternative. However, there will be less habitat suited to species requiring the completely open environment associated with prairie and the closed canopy conditions associated with upland forest. This direction for upland habitat management is based on descriptions of historic cover types found on the Refuge, and will increase the land available for rare prairie and savanna plant species with declining populations throughout their original range due to habitat loss and fragmenta-

tion. Thinning oak woodlands for oak savanna restoration will provide ideal sunlight and shade conditions to encouraging the growth of native understory species that otherwise remain in the seed bank, and will also enhance the growth of desired tree species. However, thinning may also encourage the growth of less desirable 'pioneer' species such as American hazelnut, raspberry, buck-thorn, oak shrubs, or aspen.

Management tools such as targeted acquisition and a structured prescribed fire program will provide additional benefits by emphasizing the most critical habitat for protection and mimicking historic disturbance regimes to create and maintain the desired quantity and distribution of woody vegetation. Wildlife and resource monitoring, research to establish benchmark habitat conditions, and baseline inventories of upland plants will benefit the Refuge by providing the necessary information to make sound management decisions for current conditions, appropriate restoration activities, and will help foster the use of adaptive management principles as conditions change through time.

With regards to site-specific management activities, restoration or transitional phases will likely require the use of heavy equipment that may have temporary adverse impacts to uplands including localized soil and plant disturbance. In addition to understory plant disturbance, heavy equipment can injure desirable standing trees increasing susceptibility to stress, diseases, fire, and other factors that cause tree mortality. The Refuge will take a number of precautions to reduce negative impacts to desired tree species, such as conservative use of tree thinning (take less trees to meet desired basal area to mitigate unexpected mortality); implement thinning activities during winter months while the ground is frozen; and cutting outside of the oak wilt season (April 15 – July 1).

4.2.2.3. Wildlife Species

Overall, wildlife species will benefit from increased land acquisition, restoration of native habitats, and water quality improvements. These conditions promote healthy populations of native wildlife. There may be slight changes in the wildlife community as the landscape is modified from current conditions to benchmark conditions, but all effects are expected to be positive. These changes may be most evident with the conversion of woodlands to savannas favoring species with a preference of more open habitat. However, many wildlife species associated with savannas and woodlands are tolerant of a wide spectrum of canopy conditions. More wildlife species associated with prairies will occupy the Refuge as agricultural land is converted to prairie.

The increased monitoring associated with this alternative will benefit species of conservation concern such as the Bald Eagle and Blanding's Turtle, will provide the data for management actions that can increase the overall biodiversity and health of the ecosystem, and may provide additional insight regarding a key food resource for wildlife on the Refuge, wild rice.

On a more project-specific level, restoration activities may have direct, adverse impacts (even mortality) on individuals, but such activities will benefit the population as a whole over the long-term. Increased visitation by 'non-consumptive' users may temporarily disrupt normal daily activities and/or temporarily stress animals. Consumptive Refuge uses such as managed white-tailed deer and turkey hunts, and fishing (if opened as a Refuge use), will also negatively impact targeted species; but if the appropriate harvest regime and regulations are implemented, the impacts to the species' population will be negligible or beneficial depending on species' abundance.

4.2.2.4. Water Resources

Routine monitoring of water resources within Refuge boundaries will provide management with the information necessary for decisions concerning improvements to the five major streams, three shallow lakes, and numerous wetlands that form the Refuge wetland complex. Habitat improvement projects conducted in the watershed above the Refuge will improve all downstream ecosystems. These improvements will benefit these specific water resources as well as all habitats, plants, and animals within the system.

4.2.2.5. Visitor Services

This alternative proposes a marked enhancement of visitor services offered by the Refuge. Increased programs, kiosks, directional signage, parking areas, observation decks, restrooms, and trails will benefit the public. There should be minimal impacts to wildlife because most improvements are within zones that have already been developed for visitor use to some degree. The potential increase of visitor use, primarily new hunting and fishing opportunities and increased visitation within the Sedge Meadow Unit, may have potential adverse impacts Refuge habitats and wildlife including wildlife disturbance, accidental and intentional pollution, soil disturbance, and direct impacts to plants. A related benefit to increased visitor use, is a parallel increase in support for the Refuge. This is an important factor in the future of the Refuge, especially the availability of 'willing sellers' when funds come available for acquisition.

4.2.2.6. Socio-economics

Based on the improvements proposed under this alternative, Crane Meadows NWR would provide more socio-economic benefits to surrounding communities than it can offer currently. A larger Refuge, offering a greater diversity of public uses and access, with more healthy habitat conditions, and additional public support would have positive impacts on local tourism. Wildlife observation and new hunting and fishing opportunities have the potential to generate a substantial amount of economic activity in the region. Refuge visitors spend money on a wide variety of goods and services within in the community, such as food, lodging, transportation, outdoor apparel, binoculars, cameras, film, firearms, ammunition, and fishing tackle. This direct spending in turn generates economic activity – increased output, jobs, income, and tax revenue throughout the local economy. With an increase in staffing from two to four, the Refuge’s annual payroll for employees will generate additional economic activity in the local and regional economy. The Refuge also purchases materials, equipment, and services from local suppliers.

Along with an increase in staffing, outreach and education would increase under this alternative. The benefits of environmental education for youth are hard to assess qualitatively, but it emphasizes hands-on activities, cooperative learning, a connection to the community, environmental ethics, leadership skills, critical thinking, decision-making, and problem solving.

4.2.3. Alternative C (Watershed Focus)

Alternative C preserves all facets of the preferred alternative (B), but directs additional efforts and resources to improving the condition of the watershed that encompasses Crane Meadows NWR. In addition to all the environmental consequences discussed in Alternative B, this alternative will provide specific watershed-wide benefits to bottomland habitats, aquatic and other water-sensitive wildlife, landscape hydrologic resources, and water-themed visitor services. Working on restoration activities and riparian conservation in the larger watershed area will improve both the biotic and abiotic conditions on the Refuge, and provide a heightened awareness of the importance of water resources to wildlife and humans alike.

4.3. Cumulative Impacts Analysis

“Cumulative impact” is the term that refers to impacts on the environment that result from the incremental impact of the proposed action when added to other past, present and reasonably foreseeable future actions, regardless of what agency

(federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In this section, the cumulative impacts of each of the three alternatives are discussed in terms of carbon sequestration, water resources, and hunting.

4.3.1. Carbon Sequestration

Global climate change and associated stressors have recently been recognized by the USFWS as the most pervasive and complex challenge to the NWRS for the conservation of trust resources. The geographic isolation and small size of conservation landholdings, combined with anthropogenic physical barriers across the landscape compound the challenges of climate change. Nevertheless, individual symptoms of climate change can be addressed at smaller scales, such as the refuge level, to contribute to large-scale mitigation of climate change impacts. Habitat protection and restoration can be used to sequester and store carbon to offset the emission of greenhouse gases. Through land acquisition, creative partnerships, and educational programs, Crane Meadows NWR will work to protect and restore habitat safeguarding and enhancing the potential for carbon sequestration on lands that could otherwise be developed or farmed. These actions contribute to the Refuge System’s goal of establishing a national strategic plan for mitigating human-induced impacts to climate change. They also support the Refuge System in meeting its legal mandate to maintain the biological integrity, diversity, and environmental health of the Refuge System, and the species and habitats therein.

4.3.2. Water Resources

Improvements to water resources within Refuge boundaries and the watershed will have overall positive impacts on water resources downstream. Several factors influence sedimentation and water quality within and adjacent to the Crane Meadows NWR acquisition boundary, agriculture being the single most influential factor. Agriculture is the predominant land use in Morrison County, comprising approximately 37 percent of the county’s land. Run-off from crop fields, pastureland, and feedlots are considerable non-point sources of pollution influencing water. In addition to soil erosion, chemicals found in pesticides, herbicides, and fertilizers degrade water quality and aquatic habitat. All three alternatives proposed in this environmental assessment would benefit the watershed and downstream water resources by increasing protection of habitat on- and off-Refuge, reducing sedimentation, encouraging the use of best management practices, and fostering a greater awareness of the importance of soil and water conservation. The incremental nega-

Table 7: Comparison of Impacts by Management Alternative for Crane Meadows NWR

Issue Topic	Alternative A:	Alternative B:	Alternative C:
	(Current Management)	(Preferred)	(Watershed: Same as Alt. B, Plus)
Wetlands	Slight increase in habitat and associated species as new land is acquired	Moderate increase in habitat and associated species as new land is acquired on-Refuge	Greater increase in habitat and associated species as new land is acquired on-Refuge and restored up-watershed
Upland Prairie	Increase as new land is acquired on-Refuge	Decrease habitat and associated species on-Refuge	Decrease habitat and associated species on-Refuge, increase habitat in watershed
Southern Dry Savanna	No change from present	Increase habitat and associated species	Same as Alternative B
Oak Woodland	No change from present	Decrease habitat and associated species	Same as Alternative B
Water Resources	No change from present	Increased knowledge of status and trends, gradual improvement in water quality	Increased knowledge of status and trends, and gradual improvement of water quality throughout watershed
Prescribed Fire	Woody vegetation suppressed where possible	Managed habitat acreages, improved wetland and upland habitat conditions	Same as Alternative B
Land Acquisition	Acquisitions rare	Increase fee title land on-Refuge in quality habitat target areas resulting from increased acquisition efforts	Increase fee-title land on and adjacent to Refuge in sensitive water resource areas resulting from increased acquisition efforts
Partners Program & FSA Easements	No change from present	Increased habitat protection in Morrison County and Platte-Spung Watershed	Increased habitat protection in sensitive water resource areas of the watershed
Federal and State T&E Species / RSCC	Participate in larger monitoring efforts	Increase understanding and work with concern species - Bald Eagle and Blanding's turtle	Same as Alternative B
Migratory Birds	Participate in larger monitoring efforts	Increase understanding of different bird groups – grassland, songbirds, etc.	Same as Alternative B
Native Plant Species	No management	Increase understanding of existing community – improve restoration activities	Same as Alternative B
Invasive / Exotic Plant Species	Reactive management	Increase understanding on-Refuge and reduce affected areas	Increased understanding in watershed and reduce affected areas
Wild Rice	No management	Increase data and understanding of trends	Same as Alternative B
Welcoming and Orienting Visitors	General maintenance - no change from present	Improvement in public orientation and understanding	Improvement in public orientation and understanding, including water resource topics
Hunting	No change from present	Increase opportunities	Same as Alternative B
Fishing	No change from present	Evaluate opportunities on-Refuge	Increase opportunities on- and off-Refuge
Wildlife Observation & Photography	No change from present	Increase opportunities on-Refuge	Increase opportunities watershed-wide

Table 7: Comparison of Impacts by Management Alternative for Crane Meadows NWR

Issue Topic	Alternative A:	Alternative B:	Alternative C:
	(Current Management)	(Preferred)	(Watershed: Same as Alt. B, Plus)
Environmental Education & Interpretation	No change from present	Increase opportunities	Increase opportunities, heightened public awareness of water resource issues
Outreach & Partnerships	No change from present	Increase Refuge support	Increase Refuge support - particularly water resource-related partnerships and outreach
Cultural Resource Management	No change from present	No change from present	No change from present
Volunteers & Refuge Friends Group	No change from present	Increase Refuge support	Increase conservation activities and Refuge support and within watershed
Law Enforcement	No change from present	No change from present	No change from present
Staffing	No change from present	Increase staffing	Increase staffing

tive impacts of any site specific restoration activities - past, present, or future - would be greatly outweighed by the net positive long-term impacts of increasing protection of riparian areas, restoring wetlands, and otherwise monitoring and protecting water resources.

4.3.3. Hunting

Hunting is a popular and traditional pastime in rural areas of Minnesota. At many National Wildlife Refuges across the country hunting is a priority public use, including refuges neighboring Crane Meadows in Minnesota. Hunting seasons and bag limits on refuges for non-migratory species are established within guidelines provided by the state. The state guidelines and regulations are based on wildlife population indices that determine the amount of harvest a particular population can sustain without impacting long-term population goals. There is ample scientific data to support that modern hunting regulations only harvest the surplus portion of the population without affecting the breeding stock. Hunting within the bounds of the harvestable surplus is considered compensatory mortality, where the harvest deaths are substituting for deaths that would otherwise occur naturally (i.e., old age, starvation, disease, or predation.) In fact, with the reduction of available habitat and large predators in many areas, hunting has become an important management tool for keeping the deer population within healthy limits. The white-tailed deer hunt in Minnesota is a prime example, with approximately 250,000 deer harvested annually between 2003 and 2006.

If a hunting program is implemented on the Refuge, it will add to the total number of animals harvested at both the state and National levels. However, the hunting program will not be substantial enough to cumulatively affect populations across the county, state, or country. Deer hunting, if opened to the public, would occur in September, October, and November following state regulations, and would be a managed program for hunters with disabilities and for youth hunters. If a turkey hunting program is implemented, it would occur from mid-April through May, and would also be offered only to hunters with disabilities and to youth hunters. In addition to hunts being limited to specific audiences and occurring during specific time periods, not all hunters will be successful, therefore reducing the number of animals harvested on the Refuge and contributing in only a small way to the overall harvest.

4.3.3.1. Anticipated Impacts on Wildlife Species

The Service has established a general framework for hunting seasons on refuges. Additionally, states may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative or restrictive in their selections than the federal frameworks but never more liberal. Season dates and bag limits for National Wildlife Refuges open to hunting are never longer or larger than the state regulations. At Crane Meadows NWR, the proposed hunts will be limited to state seasons and regulations, and will be more conservative. Finally, hunting activities on the Refuge will be 1) consistent with resource objectives

of the Refuge, and 2) supported by yearly state harvest estimates indicating that target species support a harvestable surplus.

Resident Big Game – White-tailed Deer

Deer hunting does not have regional population impacts due to the restricted home ranges of white-tailed deer. The Refuge currently provides limited habitat for white-tailed deer mostly because of the discontinuous state of lands held in fee title; however, suitable deer habitat is present throughout the acquisition boundary. Most of the Service-owned lands are a mosaic of sedge meadow, willow-dogwood shrub swamp, emergent marsh, prairie, oak savanna, floodplain forest, and oak woodland. White-tailed deer are habitat generalist but will primarily inhabit deciduous forests or other habitats that offer ample cover. The diverse array of habitats on the Refuge provides the necessary food, water, and protective cover needed for deer survival. Population density estimates in this area were 11-20 deer/square mile in 2009 (MN DNR 2010). Deer hunting is a popular activity for local sportsmen and women, and visitors from the surrounding area. State wildlife managers in the area monitor the deer population. The number of annual permits issued to hunters is determined by harvestable surplus, or the number of animals that can be harvested without affecting the breeding population. Because of these monitoring activities and state hunting regulations, there will be no cumulative negative impacts on deer abundance and distribution if a deer hunting season is implemented on the Refuge under Alternatives B or C. Natural predators of white-tailed deer, including grey wolves, black bears, and coyotes, have been observed on, or near the Refuge. With the presence of these natural predators and their potential to impact the local and state-wide deer populations, continued annual monitoring will be necessary. Studies in the Midwest have determined that the impacts of predators to deer populations are additive to the existing mortality rate, which includes hunting by humans.

Wild Turkeys

In addition to white-tailed deer, Wild Turkey hunting is another proposed hunting opportunity at Crane Meadows under Alternatives B and C. These alternatives will allow turkey hunting on Crane Meadows NWR in accordance with the hunting seasons and regulations set forth by the state of Minnesota, and the opportunity will be available only to hunters with disabilities and to youth hunters.

The historical range of Wild Turkeys in Minnesota was limited to the extreme southern portion of the state (Leopold 1931, Mosby 1959) and did not include Morrison County, Minnesota. Shortly after European settlement (approximately 1880), tur-

keys were extirpated from Minnesota because of habitat loss and unregulated hunting. The first successful reintroduction attempt began in 1971 with the release of 29 individuals relocated from Missouri and released in Houston County, Minnesota. The intent of this reintroduction was to establish a viable population in the state that could sustain annual spring and fall hunting seasons (MN DNR 2007). After this reintroduction proved successful, the Minnesota Department of Natural Resources released more birds in suitable habitat in other counties. This trap and transplant program has allowed the Wild Turkey population to expand its range throughout the entire southern and western portions of the state, including areas north of its historic range (including Morrison County) and what is currently considered the northernmost biological limit for this species. Wild Turkeys now occupy most of the suitable and available habitat in Minnesota with an estimated population of over 60,000 birds.

Turkey hunting on the Refuge will be limited to designated hunting zones and specific dates to limit conflict with other non-consumptive uses on the Refuge. Hunting will be conducted in accordance with all applicable state and federal regulations. Coordination with Minnesota DNR biologists will provide the population trend information necessary to manage this program long-term. Turkey hunts will be of limited duration, limited to the number of hunters specified by the Refuge hunt plan, and limited to specific zones of the Refuge. Currently, there are eight spring hunting periods in the state of Minnesota starting on the second Wednesday of April, each period lasting 5 days in length. The bag limit for the disabled turkey hunt on the Refuge will be consistent with state regulations for the spring; one Wild Turkey with a visible beard per hunter. Turkey population estimates indicate that the population within the Refuge can easily sustain a managed harvest without cumulative impacts to the state-wide population. The local population may experience minimal impacts due to the hunts proposed in Alternatives B and C. The Refuge hunts will only contribute a small percentage to the total Wild Turkey harvested in the state.

Non-Game Wildlife

Non-game or non-hunted wildlife includes non-hunted migratory birds such as songbirds, wading birds, raptors, and woodpeckers; small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, skinks, turtles, salamanders, frogs, and toads; and invertebrates such as butterflies, moths, and other insects and spiders. Except for migratory birds and some species of migratory bats, butterflies and moths, these species

have very limited home ranges and hunting could not affect their populations regionally; thus, only local effects will be discussed here.

Potential disturbance to non-hunted migratory birds could take the form of local, regional, and/or flyway effects. Regional and flyway effects are not applicable to species that do not migrate (most woodpeckers, and some songbirds including Northern Cardinals, Blue Jays, Black-capped Chickadees, etc.) The cumulative effects of disturbance to non-hunted migratory birds under all alternatives are expected to be negligible for the following reasons. The deer hunting season would not coincide with the nesting season. Turkey hunting will be early in the spring before most resident species are nesting, and will be limited to certain areas of the Refuge. For these reasons, there are no anticipated long-term impacts to non-game wildlife by hunting. Disturbance to the daily wintering activities of birds, such as feeding and resting, might occur during the managed deer hunts, but such impacts will be minimal and temporary. Disturbance to birds by hunters would probably be commensurate with that caused by non-consumptive users. Thus, cumulative effects of disturbance to non-hunted migratory birds under the proposed action are expected to be negligible.

With regard to non-avian wildlife, disturbance would be unlikely for the following reasons. Small mammals, including bats, are less active during the fall and winter months when the deer hunting season occurs. Many small mammals are also nocturnal. Both of these characteristics make hunter interactions with small mammals very rare. Hibernation or torpor by cold-blood reptiles and amphibians also limits their activity during the spring and fall hunting seasons when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season. Encounters with reptiles and amphibians in late spring and early fall are rare, and should not have cumulative negative effects on reptile and amphibian populations. Invertebrates are also inactive during cold weather and would have few interactions with hunters during the hunting seasons. Some interaction may occur in the spring during turkey hunting season, but no negative effects to invertebrates or other non-game wildlife species are expected. Refuge regulations and implementation of limited, managed hunts further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles are restricted to publicly accessible roads, the take of any wildlife other than in-season game species is not permitted, and harassment of any wildlife is strictly forbidden.

The ingestion of lead shot by non-hunted wildlife has the potential for cumulative impact to wildlife. For this reason, the use of lead shot would not be permitted on the Refuge for any type of hunting, and is not a concern at Crane Meadows NWR.

Some species of bats, butterflies, and moths are migratory. Cumulative effects to these species at the 'flyway' level should be negligible. These species are in torpor or have migrated through Minnesota by peak hunting season in the fall. Some hunting would occur during September and October when these species are migrating; however, hunter interaction would be commensurate with that of non-consumptive users and there are no anticipated impacts to these species. In the spring during turkey hunting season, these species are just coming out of hibernation or are in the process of migrating north. There may be encounters with these species during the spring, but impacts are expected to be negligible to National and local populations.

Threatened and Endangered Species

Federally listed threatened or endangered species occur infrequently at Crane Meadows NWR. Grey wolves are currently the only federally-listed species with a range that overlaps Crane Meadows NWR. Observations of wolves on the Refuge are limited and those observed are typically considered dispersing individuals. There are no known established packs within the Refuge acquisition boundary, but there are packs nearby (within 20 miles). For this reason, and due to the elusive behavior of wolves, hunters are unlikely to encounter them. An Intra-Service Section 7 evaluation under the Endangered Species Act will be included as an appendix in the Final CCP. It must conclude that the proposed action would have no effect on threatened and endangered species on the Refuge, and thus, the cumulative impact on listed species would be negligible.

4.3.3.2. Anticipated Impacts on Visitors Services

As public use levels at Crane Meadows NWR increase over time, unanticipated conflicts between user groups may occur. The Refuge's visitor use programs would be adjusted as needed to eliminate or minimize conflicts and to continue providing quality wildlife-dependent recreation opportunities. Experience on many national wildlife refuges has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Overall, the cumulative impact of hunting on other wildlife-dependent recreation at Crane Meadows NWR would be negligible to minor.

Chapter 5: List of Preparers and Contributors

5.1. Preparers

Sherburne-Crane Meadows NWR Complex

- Anne Sittauer – Refuge Manager
- Paul Soler – Wildlife Refuge Specialist
- Lizzy Berkley – Biologist
- Nancy Haugen – Park Ranger

Region 3 Regional Office, Division of Conservation Planning

- Jared Bowman – Wildlife Biologist / Refuge Planner
- Jane Hodgins – Technical Writer / Editor

Minnesota DNR - Little Falls Area Wildlife Office, Section of Wildlife

- Beau Liddell – Area Wildlife Supervisor

5.2. Contributors

Contributions to the CCP and EA were made by the following individuals:

- Bob Russell – Nongame Biologist (Region 3 Regional Office, Division of Migratory Birds)
- David Kluth – Regional Archaeologist (Region 3 Regional Office, NWRS)
- Maggie O’Connell – Chief of Visitor Services and Outreach (Region 3 Regional Office, NWRS)
- Pat Heglund – Chief of Biological Resources (Region 3 Regional Office, NWRS)
- Josh Eash – Hydraulic Engineer/Hydrologist (Region 3 Regional Office, Division of Facilities, Management, and Budget)

Chapter 6: Consultation and Coordination With Stakeholders

The Service and Refuge have conducted extensive consultation and coordination for nearly two years with stakeholders in developing the CCP and EA for Crane Meadows National Wildlife Refuge. See Chapter 2 of the CCP for a more detailed description of the process.

One open house format scoping meeting was held on February 19, 2009, at Crane Meadows NWR in the maintenance building, and a Refuge Planning Workshop was held in coordination with numerous key stakeholders the last week of March 2009. Attendees and participants at the open house and planning workshop included local citizens and neighbors, recreational users, representatives from local, state, and federal offices and agencies, conservation organizations, local news media, and other stakeholders.

In particular, the Minnesota Department of Natural Resources has actively participated in, and contributed to the CCP planning process. A representative from the Minnesota DNR has been a part of the core planning team, including participation in planning meetings and review of all documents. Additional specialists from the Minnesota DNR participated in the March planning workshop and have contributed important information to the CCP and EA throughout the planning process.

Notification of preparation of the CCP and EA is to be sent to the appropriate federally-recognized tribes, historical organizations, and all other organizations and offices that request it. See Appendix J of the CCP for a more complete communications list.