

Illinois River

National Fish and Wildlife Refuges Complex

Environmental Assessment

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U.S. Fish and Wildlife Service
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**ENVIRONMENTAL ASSESSMENT
FOR
IMPLEMENTATION OF THE COMPREHENSIVE CONSERVATION PLAN
FOR ILLINOIS RIVER NATIONAL WILDLIFE AND FISH REFUGE COMPLEX**

Abstract: The U.S. Fish and Wildlife Service is proposing to implement a Comprehensive Conservation Plan (CCP) for the Illinois River National Wildlife and Fish Refuge Complex in Illinois. This Environmental Assessment (EA) considers the biological, environmental, and socioeconomic effects that implementing the CCP (the preferred alternative is the proposed action) and two other 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 Refuges for the next 15 years. This management action will be achieved by implementing a detailed set of goals, objectives, and strategies described in a CCP.

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Chapter 1: Purpose and Need for Action

1.1 Purpose

The purpose of the proposed action is to specify a management direction for the Illinois River National Wildlife and Fish Refuge Complex (Refuge Complex) (Figure 1) in central and western Illinois for the next 15 years. This management direction will be described in detail through a set of goals, objectives, and strategies in a Comprehensive Conservation Plan (CCP).

The action is needed because adequate, long-term management direction does not exist for the Refuge Complex. Management is now guided by several short-term plans and general policies. Also, the action is needed to address current management issues and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a Comprehensive Conservation Plan for all national wildlife refuges.

The Refuge Complex consists of Chautauqua National Wildlife Refuge (NWR), Meredosia NWR, and Emiquon NWR. Chautauqua National Wildlife Refuge was established by Executive Order 7524 on December 23, 1936. Meredosia NWR was established in 1973 under the authority of the Migratory Bird Conservation Act of 1929. Emiquon NWR was established under the Emergency Wetlands Resources Act of 1986.

The purposes for the Refuges derive from their establishing authority. The purposes are:

Refuge	Purpose
<i>Chautauqua NWR</i>	“...as a refuge and breeding ground for migratory birds and other wildlife” (Executive Order 7524, dated December 23, 1936) “...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (Migratory Bird Conservation Act.)
<i>Meredosia NWR</i>	“...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (Migratory Bird Conservation Act) “...suitable for 1) incidental fish and wildlife-oriented recreational development, 2) the protection of natural resources, 3) the conservation of endangered species or threatened species...the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors...” (Refuge Recreation Act)
<i>Emiquon NWR</i>	“...the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and convention...” (Emergency Wetlands Resources Act)

We prepared this Environmental Assessment (EA) using guidelines established under the National Environmental Policy Act of 1969. The Act requires us to examine the effects of proposed actions on the natural and human environment. In the following sections we describe three alternatives for future refuge management, the environmental consequences of each alternative, and our preferred management direction. We designed each alternative as a reasonable mix of habitat prescriptions and wildlife-dependent recreational opportunities, and then we selected our preferred alternative based on its environmental consequences and its ability to achieve the Refuges' purposes.

1.2 Need for Action

For the Illinois River Refuge Complex, there is a need to provide healthy aquatic habitat for fish, mollusks, and crustaceans in the Illinois River and its tributaries. There is a need to find solutions to sedimentation problems within the Illinois River watershed. There is a need to support populations of declining grassland, savanna, forest and wetland bird species. There is a need to improve the relations between the community and the Refuge. In addition, the Plan is needed to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the Service to develop and implement a CCP for all national wildlife refuges.

Based on the above needs, the purposes of the Refuges, the mission of the National Wildlife Refuge System and ecosystem considerations, the planning team established the following goals for the Refuge Complex. Each of the three management alternatives described in this EA will be able to at least minimally achieve these goals.

Wildlife: Perpetuate listed species, waterfowl and other migratory birds, and native fish and mussels within the Illinois River Corridor, while restoring and preserving the biological integrity, diversity, and environmental health of the Refuge Complex.

Habitat: Provide high quality habitat within the Illinois River Corridor for the benefit of listed species, waterfowl and other migratory birds, native fish and mussels, and native biological diversity.

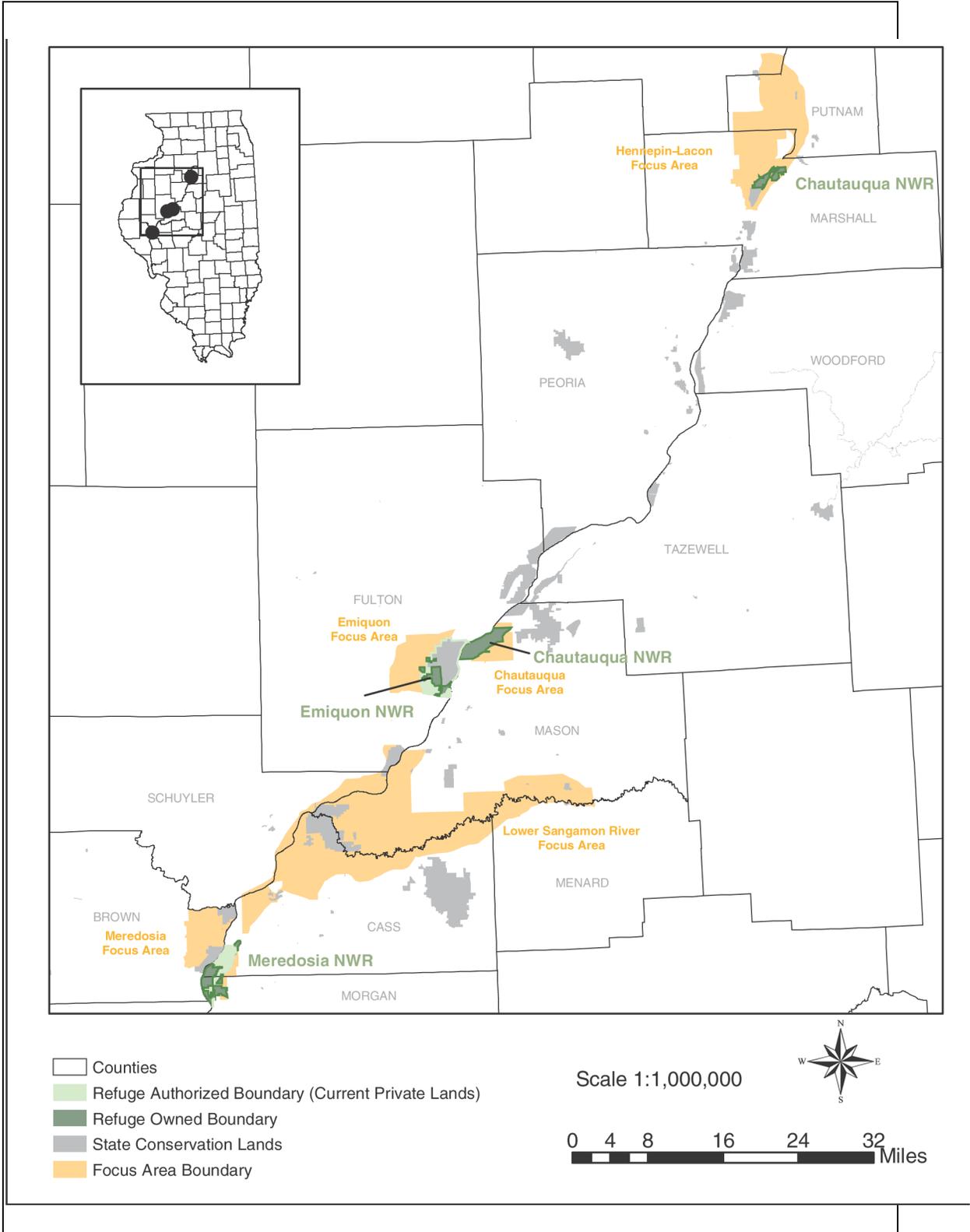
Visitor Services: Provide the public with abundant high quality, wildlife-dependent public use opportunities on Refuge Complex land, including hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

Refuge Administration: Provide leadership and support at the Refuge, ecosystem, and landscape scales that is pro-active in addressing a wide-range of conservation opportunities and issues.

1.3 Decisions to Be Made

The Regional Director for the Great Lakes-Big Rivers Region will need to make two decisions based on this EA: (1) select an alternative 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. The planning team has recommended Alternative 3 to the Regional Director. The CCP was developed for implementation based on this recommendation.

Figure 1: Location of Illinois River National Wildlife & Fish Refuge Complex



1.4 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. The purposes of the Refuges are listed in the Section 1.1. Additional authority delegated by Congress, federal regulations, executive orders and several management plans guide the operation of the Refuge Complex. Appendix E contains a list of the key laws, orders and regulation that provide a framework for the proposed action.

1.5 Scoping and Public Involvement

The planning process began with scoping in 1998, and public meetings were conducted in the towns of Henry, Meredosia and Lewistown in April 1999. Refuge Complex staff and regional planners conducted more public meetings in May 2000 and February 2002 to provide an update on the planning process. Staff have also met with the Illinois Department of Natural Resources, The Nature Conservancy and several working groups.

The Service used a participatory planning process to develop the CCP and EA for the Refuge Complex. Throughout the planning process the Service has initiated outreach to stakeholders, including representatives from other federal and state agencies, special interest groups, industry and non-profit organizations, landowners living adjacent to Refuge land, Refuge visitors, and Service employees. Information about the CCP was provided to stakeholders and the general public through news releases, presentations, interviews, informational letters, public meetings, briefings, and the Internet. Questionnaires, focus groups, public meetings, and one-on-one discussions were used to gather input.

The draft EA was released for public review and comment with the draft CCP in September 2003. During the review period, which ended on October 20, 2003, three open house meetings were conducted in the communities of Meredosia, Lewistown and Henry, Illinois, for the purpose of hearing public comment on the draft documents.

A summary of the comments we received and our responses to those comments is located in Appendix K.

1.5.1 Issues and Concerns

Internal and external scoping and discussion with the public revealed several issues and concerns currently facing the Refuge Complex. One general theme of the issues and concerns was the loss of habitats and the effect on wildlife species that are the Service's responsibility. This includes threatened and endangered species, migratory birds and fish that cross jurisdictions. Another general theme was the need to improve the quality and quantity of wildlife-dependent recreational opportunities on the Refuge Complex. In addition to these general themes, some issues were specific to particular locations on the Refuge Complex. The particular issues and concerns that make up the general themes or relate to specific locations are:

Wildlife Management Issues

- Protect listed species.
- Perpetuate waterfowl and other migratory birds.
- Recover native fish and mussels.
- Safeguard biological integrity, diversity and environmental health.

- Wildlife are creating crop depredation problems on neighboring farm fields.
- Avian botulism has been a serious problem on Lake Chautauqua and continued monitoring is needed.

Habitat Management Issues

- We are losing wetlands.
- We are losing native forest.
- We are losing native grasslands.
- We are losing native savanna.
- Habitat is being degraded.
- An oxbow restoration on Emiquon NWR is affecting drainage on local land, and the Refuge needs to find another means of drainage for the North Globe.
- Sedimentation is resulting in backwater lakes, sloughs and side channels of the Illinois River Corridor filling in.

Visitor Services Management Issues

- The public has identified additional recreational opportunities that the Refuge Complex could provide.
- Refuge Complex infrastructure needs to be upgraded for safety reasons as well as for universal accessibility.
- The Refuge Complex needs to increase its visibility and understanding of its mission.
- Waterfowl hunting quality is being hurt/helped by a structure at the mouth of Quiver Creek.
- Some hunters have suggested that the Refuge Complex serve as sanctuary for waterfowl and not produce food, thus improving hunting on area clubs.

A complete listing and further discussion of these issues and concerns can be found in Chapter 2 of the CCP and Chapter 2 of this EA.

Chapter 2: Description of the Alternatives

2.1 Formulation of Alternatives

Three management alternatives were developed by the planning team based on issues, concerns and opportunities presented during the CCP scoping process. The issues that are discussed came from individuals, cooperating agencies, conservation organizations and Refuge staff. A summary of the three alternatives is provided in Table 2 on page 135.

The three management alternatives were developed to address most of the issues, concerns and opportunities identified during the CCP planning process. Specific impacts of implementing each alternative will be examined in three broad categories:

Wildlife: How can the Refuge contribute to the preservation of listed species, provide for waterfowl and other migratory birds, aid in the recovery of native fish and mussels, and safeguard biological integrity and diversity?

Habitat: What is the appropriate level and nature of wetland, forest, grassland, and savanna habitat restoration and maintenance projects?

Visitor Services: What is the appropriate level of wildlife-dependent recreational activities on the Refuge and how can the quality and universal accessibility be improved? How can the Refuge Complex become better known in local communities?

During the development of the alternatives, the planning team considered: the issues and concerns identified during the scoping, the purpose(s) of each Refuge within the Refuge Complex, and the vision and goals of the Refuge Complex. The planning team also paid close attention to federal, state, and local landscape level plans and planning efforts and stakeholder expectations for the Service and the Refuge Complex. Societal trends relevant to wildlife and habitat management and public use of the Illinois River Corridor were also considered. The planning team developed the three management alternatives assuming that a large budget increase for Refuge operations is unlikely during the life of the plan. The team also limited its considerations to uses that are compatible with the purposes of the Refuge.

Each of the alternatives articulates management direction for the conservation of species, ecosystems, and landscapes across the project area (in varying degrees) for the purpose of providing for the biological needs of listed species, waterfowl and other migratory birds, native fish and mussels, and native biological diversity and to provide the public with high quality wildlife-dependent recreation and education opportunities.

2.2 Alternatives Considered But Eliminated From Consideration

2.2.1 Floodplain/River Connectivity

Over time, several stakeholders have suggested that the Illinois River would be better served by the Refuge Complex if its floodplain wetlands were linked to the river by way of a hydrologic connection like upper Lake Chautauqua.

Historically, the Illinois River system supported a diverse system of braided channels, riparian lands, side channels, sloughs, islands, sandbars, and backwater lakes. However, during the past 200 years, thousands of acres of these habitats have been lost to development. Many of the watershed's upland prairies and forests have been converted to agricultural use, reducing the land's ability to hold water and increasing the flows and sediment in tributary rivers. Each year it is estimated that more than 14 million tons of sediment are transported through the Illinois River watershed. More than half (7 million tons) is said to be deposited in the Illinois River Valley each year. As a result, many of the backwater lakes, side channels and sloughs associated with the Illinois River Corridor have filled in at an alarming rate, some having lost more than 70 percent of their water storage capacity. The opening of the "Illinois Waterway" from 1919 to 1930 dramatically changed the river's flow pattern. The influx of Chicago's waste water and some 10,000 cubic feet per second of water diverted from Lake Michigan raised the river's average water level by 1.5 to 4 feet, increasing both average flows and the frequency and severity of floods. The construction of dikes, levees, and water control structures have constrained the river's flows to a flowing channel with the principle purpose of supporting commercial navigation. As a result of these activities, many fish, mammal, waterfowl, mussel, and other related life forms have declined drastically.

Due to altered water and sediment regimes, water management is now needed to establish and sustain diverse and productive vegetative communities in backwater areas within the Illinois River floodplain. Unfortunately, the same water control needed to establish and sustain vegetation for some fish and wildlife often negatively impacts other fish and aquatic life that use these areas. Without water control, establishing and maintaining vegetative communities and their attendant functional values for aquatic life would be minimal. The vegetative community, hydrologic cycle maintenance, and biological diversity and production may require periodic "management" to mimic the natural hydrograph that was once present in this system.

Under all Alternatives, Refuge Complex land will be managed for the benefit of aquatic life by providing a managed hydrologic exchange between the river system and the aquatic system that does not jeopardize the health and well-being of the aquatic system as a whole. Such exchange would provide, among other things, important nutrient laden sediment, particulate matter, and invertebrate biomass to the river's aquatic food web. Fish access would be provided for desirable fish spawning, nursery, rearing, summering, and overwintering, while protecting wetland vegetation from large numbers of migrating carp.

2.2.2 Quiver Creek Water Control Structure

Several local people suggested that the Refuge should leave the 3X3 structure at the mouth of Quiver Creek open to keep ice from forming on Lake Chautauqua until the end of the waterfowl hunting season. Several comments implied the Service was purposefully closing the structure to force waterfowl to migrate farther south.

All water management activities on Lake Chautauqua and other areas of the Refuge Complex are done for the purpose of promoting diverse and productive vegetative communities. Service policy

is to avoid management practices that will “short stop” waterfowl (i.e., manipulate pools in order to keep ice off longer in the season than would occur “naturally”). In all Alternatives, the Refuge Complex will not manipulate water levels to provide open water on Lake Chautauqua beyond natural freeze-up in an effort to keep waterfowl in the area. We will continue to manage the water on Quiver Creek upstream from the control structure to benefit hunting of waterfowl.

2.3 Management Actions Common to All Management Alternatives

2.3.1 Archaeological and Cultural Resource Protection

As part of its larger conservation mandate and ethic, the Service through the Refuge Complex Manager applies several historic preservation laws and regulations to ensure historic properties are identified and are protected to the extent possible within its established purposes and Refuge System mission.

Early in project planning for all undertakings, the Refuge Complex Manager informs the RHPO (Regional Historic Preservation Officer) to initiate the Section 106 process. Concurrent with public notification and involvement for environmental compliance and compatibility determinations if applicable, or cultural resources only if no other issues are involved, the Refuge Manager informs and requests comments from the public and local officials through presentations, meetings, and media notices. Results are provided to the RHPO.

When the Service and one or more other federal agencies have Section 106 responsibilities, the Service initiates the procedures in 36 CFR Part 800 independently of other agencies unless a lead federal agency has been determined.

Archeological investigations and collecting are performed only in the public interest by qualified archeologists or by persons recommended by the Governor working under an Archaeological Resources Protection Act permit issued by the Regional Director. The Refuge Manager has found this third-party use of Refuge land to be compatible. The requirements of ARPA apply to Service cultural resources contracts; the contract is the equivalent of a permit. The Refuge Complex Manager issues special permits for archeological investigations. Refuge personnel take steps to prevent unauthorized collecting by the public, contractors, and Refuge personnel; violators are cited or other appropriate action taken. Violations are reported to the Regional Historic Preservation Officer.

The Refuge Complex has an onsite museum collection of five art pieces and off-site archeological collections that are managed under the Region-wide Scope of Collection Statement (10-31-94). Archeological surveys have produced archeological collections totaling more than 20,100 artifacts. These artifacts are curated at the Illinois State Museum under terms of a cooperative agreement. Artifacts are owned by the Federal Government and can be recalled by the Service at any time.

2.3.2 Hydrology and Drainage

It is Service policy not to cause any artificial increase of natural water levels, width, or flow of waters without ensuring that impacts would be limited to those lands in which the Service acquires an appropriate management interest. It is the Service policy not to impede the flow of waters from other lands, even if that flow passes through lands acquired by the Service. The following management actions would apply to all alternatives:

- Site-level studies and detailed planning will be performed prior to the Refuge Complex undertaking any management activity directly affecting drainage of any private land.

- If the Refuge Complex does inadvertently create a water-related problem for any private landowner (flooding, soil saturation, increase in water table height, etc.), the problem will be corrected by the Refuge Complex at the Refuge Complex's expense.
- The Refuge Complex will continue to maintain ditches and water control structures that influence water access and use downstream.
- The Refuge Complex will also continue to document water rights and use to protect water resources for the benefit of fish, wildlife, plants and public use of Refuge water-dependent resources.

2.3.3 Prescribed Fire

Under each alternative we propose to adopt the Fire Management Plan for the Refuge Complex, which was drafted in 2002 and is available at the Refuge Office for inspection.

Prescribed fire is used regularly on the Refuge Complex as a habitat management tool. Periodic burning of grasslands reduces encroaching vegetation. Fire also encourages the growth of desirable species such as native, warm-season grasses.

Trained and qualified personnel perform all prescribed burns under precise plans. A burn is conducted only if it meets specified criteria for air temperature, fuel moisture, wind direction and velocity, soil moisture, relative humidity, and several other environmental factors. The specified criteria (prescription) minimize the chance that the fire will escape and increase the likelihood that the fire will have the desired effect on the plant community.

How often we burn established grassland and forest units depends on management objectives, historic fire frequency, and funding. The interval between burns may be 2 to 5 years or longer. As part of the prescribed fire program, we will conduct a literature search to determine the effects of fire on various plant and animal species, and we will begin a monitoring program to verify that objectives are being achieved.

We cannot and will not start a prescribed fire without the approval of the Regional Fire Management Coordinator when the area is at an extreme fire danger level or the National Preparedness level is V. In addition, we will not start a prescribed fire without first getting applicable concurrence when local fire protection districts or the State of Illinois have instituted burning bans.

Spot fires and escapes may occur on any prescribed fire. The spot fires and escapes may result from factors that cannot be anticipated during planning. A few small spot fires and escapes on a prescribed burn can usually be controlled by the burn crew. If so, they do not constitute a wildland fire. The burn boss is responsible for evaluating the frequency and severity of spot fires and escapes and, if necessary, slowing down or stopping the burn operation, getting additional help from the Refuge staff, or extinguishing the prescribed burn. If the existing crew cannot control an escaped fire and it is necessary to get help from other entities, the escape will be classified as a wildland fire and controlled accordingly. Once controlled, we will stop the prescribed burning for the burning period.

We may conduct prescribed burns at any time of year. However, the normal prescribed fire season begins November 15 and ends March 31.

We will use existing firebreaks, which we may improve through mowing or tilling. By policy, if we contemplate any new firebreaks or below surface improvements to existing firebreaks, the Regional Historic Preservation Officer will be consulted before the work begins.

Burn plans written by the Refuge staff document the treatment objectives, the prescription, and the plan of action for carrying out a burn. A burn plan includes all the elements specified in the Service's Fire Management Handbook. Details regarding fire resources and procedures can be found in the Refuge's Fire Management Plan.

2.3.3.1 Fire Prevention and Detection

In any fire management activity, firefighter and public safety will always take precedence over property and resource protection.

Historically, fire influenced the vegetation on the Refuge Complex. Now, fires burning without a prescription are likely to cause unwanted damage. In order to minimize this damage, we will seek to prevent and quickly detect fires by:

- Discussing fire prevention at safety meetings prior to the fire season and during periods of high fire danger and periodically training staff in fire prevention.
- Posting warnings at visitor information stations during periods of extreme fire danger.
- Notifying the public via press releases and personal contacts during periods of extreme fire danger.
- Investigating all fires suspected of having been set illegally and taking appropriate action.
- Depending on neighbors, visitors, cooperators, and staff to detect and report fires.
- Requesting additional resources from the Illinois Interagency Fire Dispatcher in Murphysboro, Illinois, (618-687-1731), if adequate resources are not available locally.

2.3.3.2 Fire Suppression

We are required by Service Policy to use the Incident Command System (ICS) and firefighters meeting National Wildfire Coordinating Group (NWCG) qualifications for fires occurring on Refuge property. Our suppression efforts will be directed toward safeguarding life while protecting Refuge resources and property from harm. Mutual aid resources responding from Cooperating Agencies will not be required to meet NWCG standards, but must meet the standards of their Agency.

All fires occurring on the Refuge and staffed with Service employees will be supervised by a qualified Incident Commander (IC). The IC will be responsible for all management aspects of the fire. The IC will obtain the general suppression strategy from the Fire Management Plan, but it will be up to the IC to implement the appropriate tactics. Minimum impact suppression tactics will be used whenever possible. As a guide, on low intensity fires (generally flame lengths less than 4 feet) the primary suppression strategy will be direct attack with hand crews and engines. On higher intensity fires (those with flame lengths greater than 4 feet) we may use indirect strategies of back fires or burning out from natural and human-made fire barriers. The barriers will be selected based on their ability to safely suppress the fire, minimize resource degradation, and be cost effective.

During periods of drought we may use severity funding under guidelines of the Service Fire Management Handbook to provide adequate fire protection for the Refuge.

In suppressing a fire, we will:

- Use existing roads and trails, bodies of water, areas of sparse or non-continuous fuels as primary control lines.

- Conduct backfiring operations from existing roads and natural barriers to halt the spread of fire when appropriate.
- Use burnouts to stabilize and strengthen the primary control lines.
- Use either direct or indirect attack methods, depending upon the situation. Using backfire in combination with allowing the wildland fire to burn to a road or natural firebreak would be least damaging to the environment. However, direct attack by constructing control lines as close to the fire as possible may be the preferred method to establish quicker control.
- Use retardants on upland areas when appropriate.
- Not use earth moving equipment (dozers, graders, plows) for suppression activities on the Refuge without the approval of the Refuge Manager or his/her designated representative.
- Evaluate all areas where wildland fires occur on Refuge administered lands prior to the aerial or ground application of foams and/or retardants. Only approved chemical foams and retardants will be used (or not used) in sensitive areas such as those with riparian vegetation.
- Not use wildland fire for resource benefits.
- Keep engines on roads and trails to the fullest extent possible.
- Ensure additional resources are ordered whenever it appears a fire will escape initial attack efforts, leave Service lands, or when the fire complexity exceeds the capabilities of the existing command or operations.
- Monitor Refuge fires until declared out.
- Conduct rehabilitation prior to firefighters leaving the fire. All trash will be removed. Fire lines will be refilled and water bars will be added, if needed. Hazardous trees and snags will be cut and all stumps will be cut flush with the ground. Damage to improvements caused by suppression efforts will be repaired, and a rehabilitation plan will be completed if necessary. If re-seeding is necessary, it will be accomplished according to Service policy and regulations.

2.3.4 Wildlife Depredation

Neighboring landowners have complained in recent years about crop losses due to grazing by geese and deer. Early season losses following emergence of crops occur from all species on lands bordering Refuge Complex land. Canada Geese graze on crops for several weeks after emergence. White-tail deer feed on crops throughout the growing season. Crop damage varies by species and location with some neighbors suffering greater losses than others. To help reduce the problem associated with grazing geese, under all alternatives the Refuge Complex will continue to loan propane exploders to farmers to deter geese from grazing on crops, particularly wheat and green beans. Most farmers don't object to waterfowl eating "waste" grain because it reduces volunteer corn problems the next season. The U.S. Department of Agriculture now has animal damage responsibilities. The Refuge Complex will provide landowners with contacts in the Department of Agriculture for assistance with animal damage control that is beyond our capability.

2.3.5 Disease Monitoring and Treatment

Avian botulism has been a serious problem on Lake Chautauqua with a loss of 8,000 birds in 1997 and a loss of 2,623 birds in 1998. Staff from the Wildlife Health Laboratory in Madison, Wisconsin, provided assistance and confirmed that avian botulism was the agent of death of the birds. Refuge staff advised the Corps of Engineers that the ditching item in the Habitat Restoration and Enhancement Project was not adequate to de-water as needed to prevent significant losses of birds from botulism. Refuge staff monitored the situation closely starting in August of 1999 and began picking up sick and dead birds as soon as a problem appeared to be developing. Losses were limited to 278 birds in 1999 but number of birds lost in 2000 was 933. The Corps of Engineers contracted to have a level ditch constructed from the pump station to the outlet structure in the summer of 2001. Refuge staff were able to de-water the lake at the first sign of sick birds and

losses were negligible. Refuge staff will continue to closely monitor the health of birds on the Refuge and react quickly and decisively to minimize losses to diseases.

The Refuge Complex will continue to monitor the health of birds on Lake Chautauqua beginning in early August through frost. When and if the problem arises, sick and dead birds will be gathered to avoid spread of toxins. If the problem persists, the Refuge Complex will drain the lake and force the birds away from the problem area. Refuge staff will continue to be alert for sick or dead animals on Refuge Complex land and surrounding areas. The Wildlife Health Laboratory in Madison will be contacted for guidance if we find sick or dead birds suspected of cholera, west Nile virus, or other serious diseases.

2.3.6 Waterfowl Food and Sanctuary

Two written comments and several oral comments from the public expressed concern about the amount of food for waterfowl presently produced on Chautauqua NWR and the potential for food production on Emiquon NWR. Some hunters suggested that the Service should provide only sanctuary for waterfowl and not produce any food. This management action was proposed so waterfowl would be more likely to fly off Refuge Complex land to private hunting clubs to find food sources, which would result in better hunting for the hunt clubs. Others orally expressed concern that without food and sanctuary provided by the Refuge Complex, migrating waterfowl would pass over the area without stopping. Several people pointed out that providing waterfowl food and sanctuary at least every 50 miles along the Illinois River has been an unwritten goal of local and regional wildlife managers for years.

It is the position of the U.S. Fish and Wildlife Service to provide food, water, and sanctuary for waterfowl at strategic locations along flyways for the long-term health, sustainability, and distribution of waterfowl populations. The Service will continue to provide food, water and sanctuary on established areas under all alternatives. Any new lands within currently authorized boundaries that are added to the Refuge system along the Illinois River, and where the Service has purchased all of the ownership rights, will be evaluated as to the need for these elements. If it is determined that adequate food, water and sanctuary are available to meet the needs of waterfowl on adjacent lands, the newly acquired/managed areas may be opened for waterfowl hunting and other uses.

2.3.7 Listed Species

Chapter 3 describes the threatened and endangered species on the Refuge Complex. Section 7 of the Endangered Species Act outlines a mechanism for ensuring that actions taken by federal agencies do not jeopardize the existence of any listed species. We conducted a “Section 7” review concurrent with the review of the draft CCP. Under all alternatives Bald Eagles would be protected with buffer zones and decurrent false aster would be protected with physical barriers. Indiana bats would be protected if they occur on the Refuge. Under alternatives 2 and 3, additional monitoring and inventory of listed species would occur.

2.3.8 Habitat Management

Habitat management on the Illinois River Complex of refuges entails a combination of active and passive management. Management seeks to mimic natural processes where possible in this greatly modified ecosystem. Drainage, diversion of Great Lakes water, elimination of natural cover, and artificial structures such as locks and dams on the river have all contributed to the challenges to maintain natural functioning processes within the ecosystem. Due to the loss of much of the historical riparian, wetland, and upland habitats, management intensity must be increased to meet the fish and wildlife needs within the areas remaining to support them. This is particularly true in the wetland habitats where dikes, water pumps, and water control structures play an integral role in restoration of wetland habitats. Reconnection of habitats to the river is an

integral part of the management but it must be regulated to control unnaturally frequent or severe flood events and excessive siltation. In uplands, habitats may be restored passively by allowing succession to occur or they may require active planting and management such as with the restoration of native grasslands where planting and controlled burning are key management tools.

2.4 Description of Management Alternatives

The following paragraphs present a brief summary of each alternative. The goals, objectives, and strategies that describe the details for each alternative are presented in Table 1 on page 123.

2.4.1 Alternative 1 (No Action)

The “No Action” alternative considers a future based on recent trends in operation and management of the Refuge Complex and subsequent conservation of the Illinois River Corridor for the benefit of Service trust resources. As such, Alternative 1 represents the “status quo” in the management of the Refuge Complex. Analysis of a “No Action” alternative is a requirement of the NEPA and Service planning procedures.

Under Alternative 1, Refuge management direction would continue under existing guidance contained in Refuge Complex management plans (e.g., Refuge Master Plan, Step-down plans, etc). For Emiquon NWR, existing management direction is contained in the final environmental assessment and decision document (1993) that was prepared when that Refuge was originally planned. In all cases, management under this alternative would be carried out according to written documentation contained in Refuge Complex management plans and within the existing approved boundaries of Chautauqua, Meredosia, and Emiquon national wildlife refuges. Work outside Refuge boundaries would continue through the Partners for Fish and Wildlife Program throughout the 20-county district.

We would manage 200 acres of native grassland within the Refuge Complex. Cooperative farming would be continued to control undesirable species in areas to be planted to native grasses. No savanna habitat would be protected or restored. By 2017, we would manage 4,500 acres of native forest. We would continue to manage 6,000 acres of wetlands.

Under this alternative we would support hunting and fishing at 2003 visitation levels. Additional recreational facilities would include three new interpretive trails at Emiquon NWR. We would provide two photo/hunting blinds and access trails for wildlife observation and hunting. We would construct an accessible fishing platform at Chautauqua NWR. We would continue to provide environmental education to 1,900 students each year. We would continue current outreach efforts to local groups.

2.4.2 Alternative 2, Refuge Focus

Under Alternative 2, management direction at the Refuge Complex would proceed under new guidance brought about through the development of a CCP and its step-down management plans. A common feature linking action items in Alternative 2 is the emphasis on completing land acquisition from willing sellers within the authorized boundaries of Emiquon NWR and Meredosia NWR as funding allows. There would be increased restoration of habitats and more wildlife-dependent recreation opportunities. Work outside Refuge boundaries would continue through the Partners for Fish and Wildlife Program throughout the 20-county district.

Under this alternative our objective would be to restore a proportion of the native fish and mussel species on the Refuge Complex. We would also seek to add diversity within the Refuge Complex by converting pine plantations to upland hardwood forests. We would manage the deer population with controlled hunts.

We would manage 1,000 acres of native grassland within the Refuge Complex. Cooperative farming would continue for management purposes. We would seek to manage 200 acres of savanna. By 2017, we would manage 6,000 acres of native forest and 10,000 acres of wetlands.

Under this alternative we would seek to expand hunting opportunities by evaluating and opening additional existing Refuge lands and newly acquired lands within currently authorized boundaries and providing accessible blinds. We estimate that in 15 years an additional 4,000 acres could be opened to hunting. We would expand fishing opportunities beyond the current planned program by opening additional areas to bank fishing, providing two accessible fishing facilities, and constructing a boat ramp. In addition to currently planned facilities, we would increase the opportunities for wildlife observation by expanding the hours of the auto-tour and developing additional pull-off areas. We would provide environmental education to 2,500 students each year. Additional support to environmental education and interpretation would be offered through an additional staff person, programs, materials, and facilities that would include signs and restrooms. We would expand our outreach activities in partnership with others through special programs, tours, website, and other media beyond what is currently done.

2.4.3 Alternative 3, Refuge Resource Area Focus (Preferred Alternative)

Under Alternative 3, management direction at the Refuge Complex would proceed under new guidance brought about through the development of a CCP and associated step-down management plans. We would complete land acquisition from willing sellers within the authorized boundaries of Emiquon NWR and Meredosia NWR as funding allows. There would be increased restoration of habitats and more wildlife-dependent recreation opportunities. The Service would concentrate efforts of the Partners for Wildlife Program within five focus areas: Meredosia, Lower Sangamon River, Emiquon, Chautauqua, and Hennepin-Lacon that encompass 236,160 acres (see Figures 2, 3, 4 and 5).

The major difference between this alternative and Alternative 2 is in the conservation efforts made in Illinois River Focus Areas. Under this alternative, like in Alternatives 1 and 2, the Refuge Complex would enhance fish and wildlife habitat protection, restoration, and management within the boundaries of the Illinois River Refuges. There would be no expansion of existing authorized land acquisition boundaries. The acres managed, recreational opportunities offered, and facilities that would be developed are the same as in Alternative 2.

Unlike Alternative 2, conservation efforts would be actively encouraged within the five focus areas over the next 15 years. The Refuge Complex would refocus its Partners for Wildlife Program across the five focus areas in the hope of developing additional voluntary partnership agreements in these areas. We would work toward protecting 380 acres of native grassland, 200 acres of savanna, and 1,300 acres of native forest within the focus areas through voluntary partnerships.

Figure 2: Meredosia Focus Area

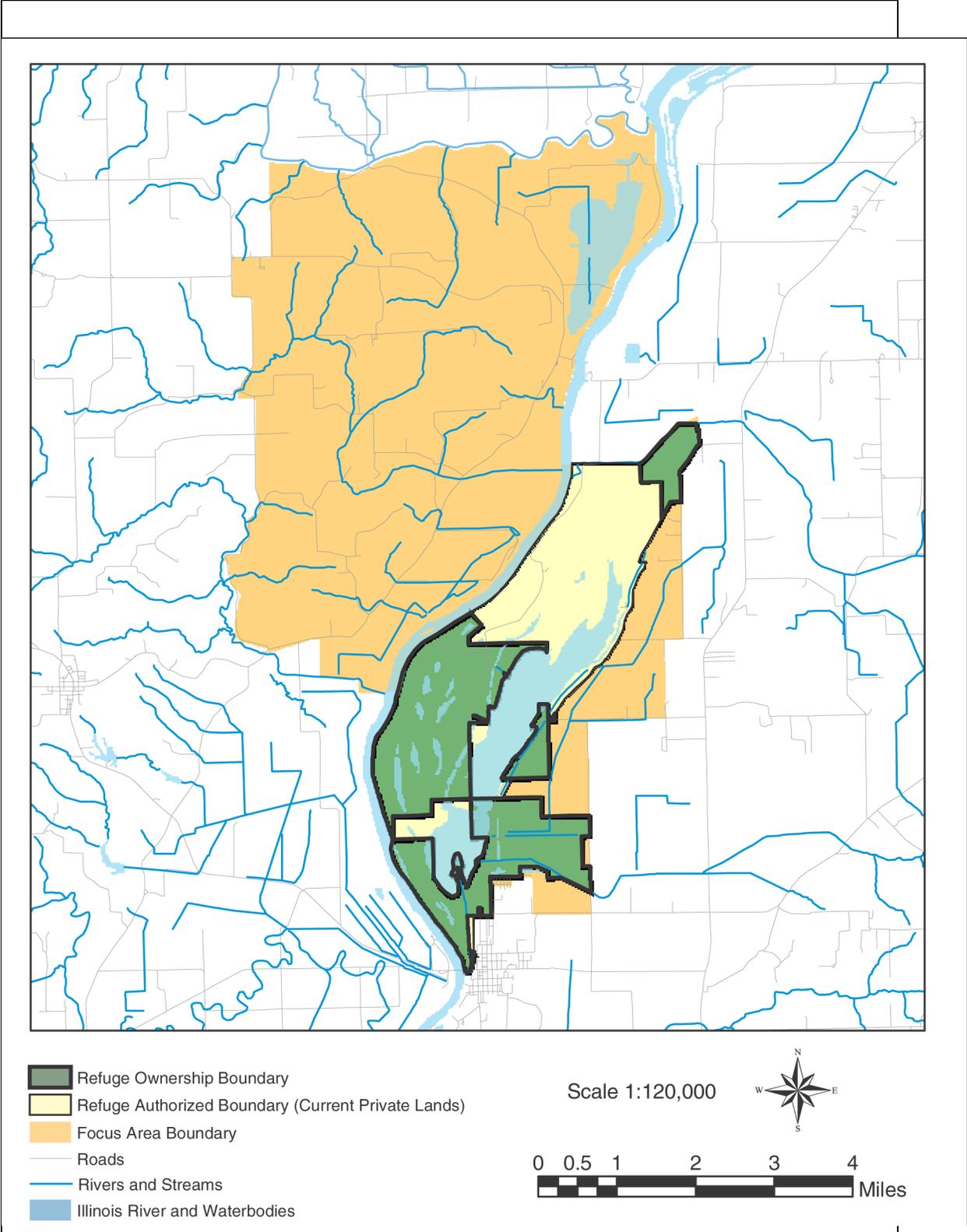


Figure 3: Hennepin-Lacon Focus Area

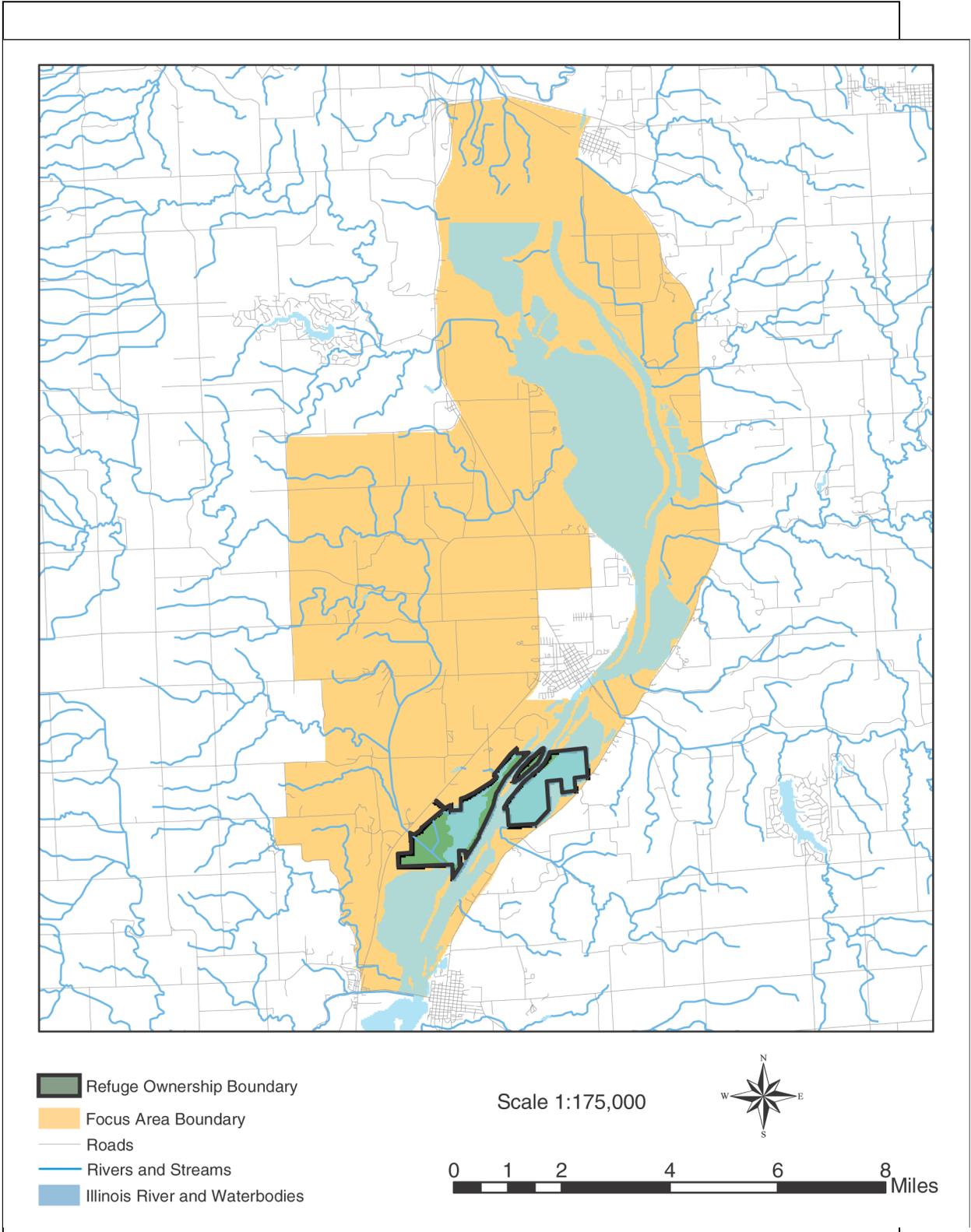


Figure 4: Lower Sangamon Focus Area

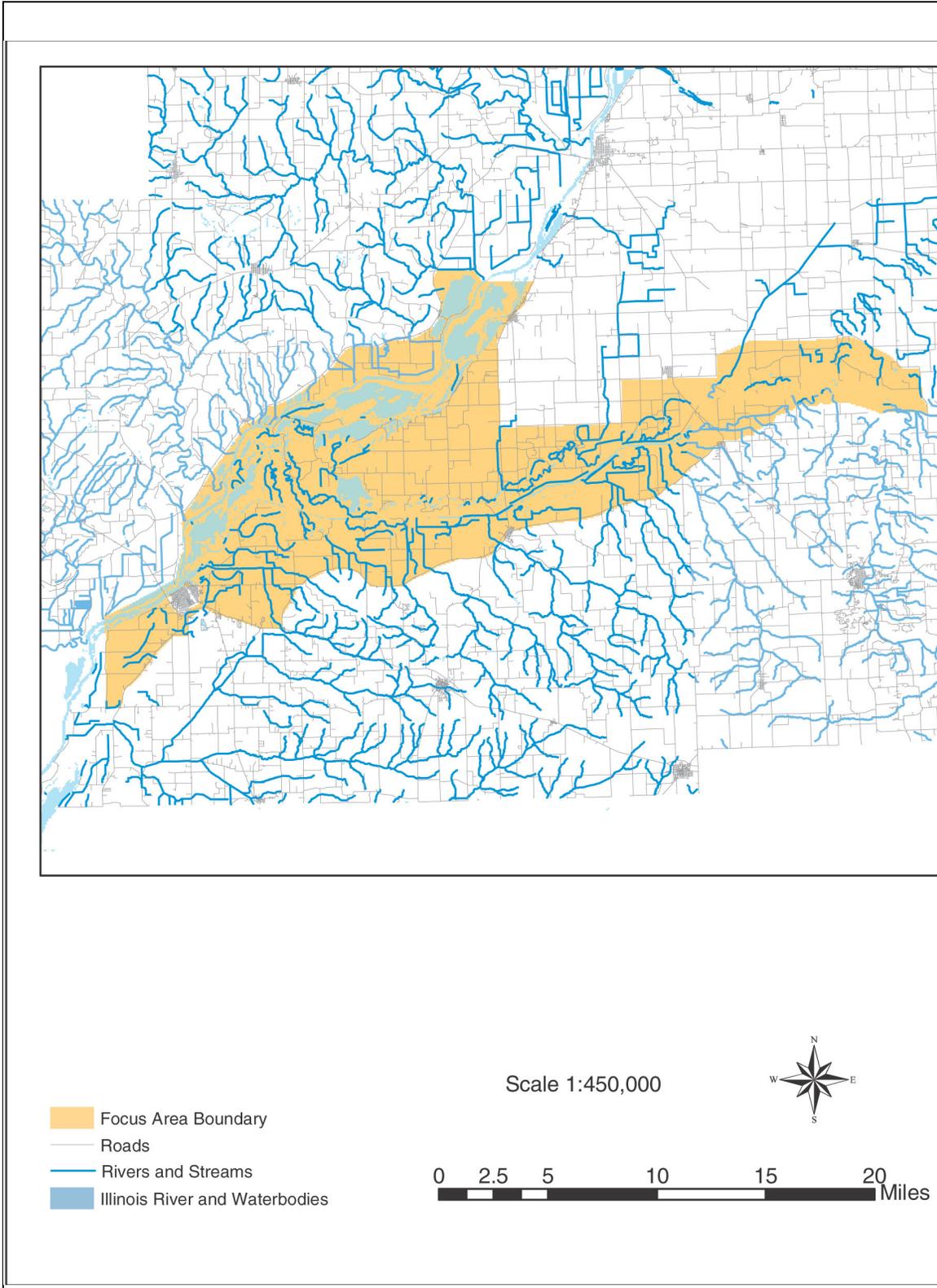


Figure 5: Chautauqua and Emiquon Focus Areas

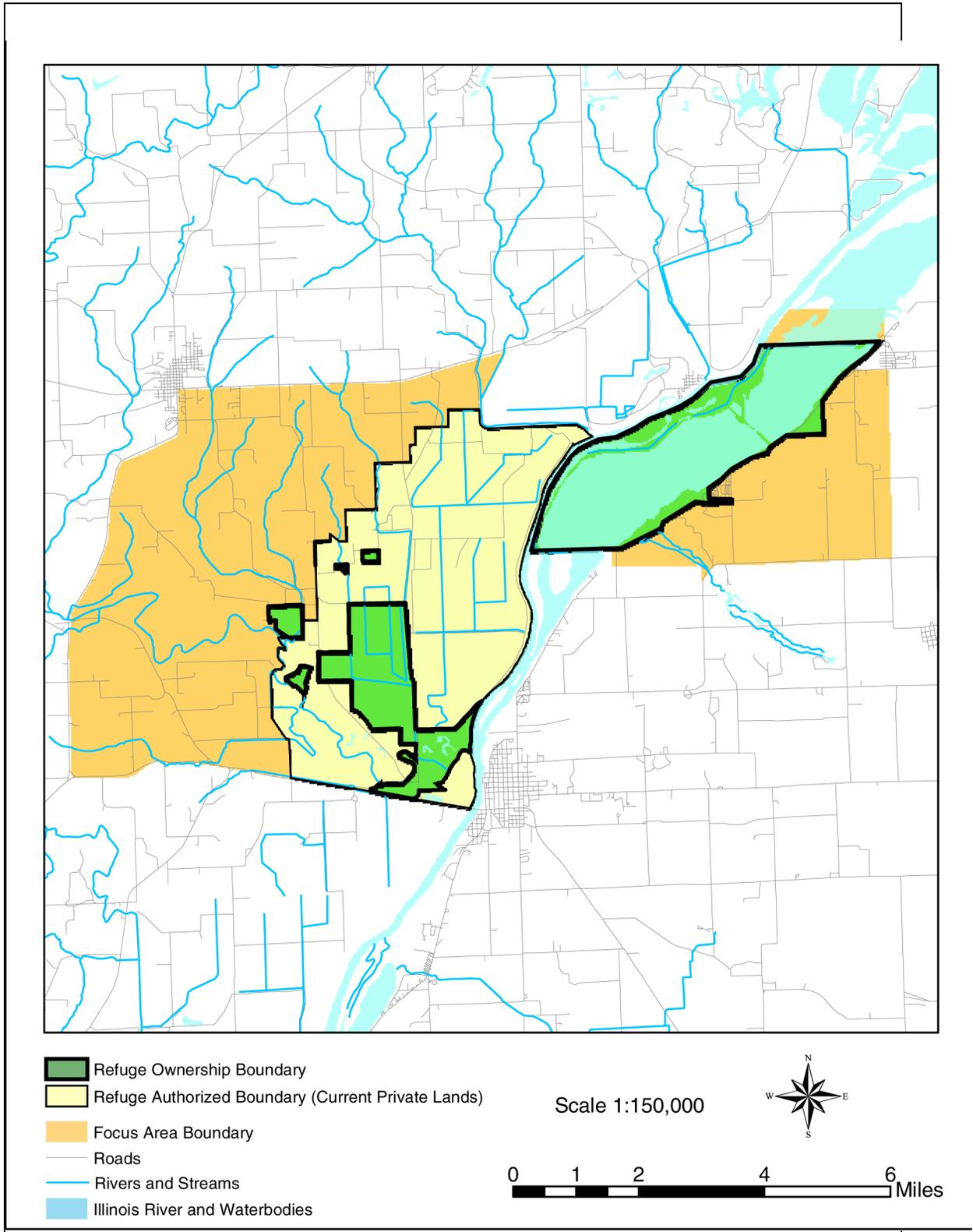


Table 1: Alternatives Described by Goals, Objectives and Strategies

Description	Alternative		
	1	2	3
WILDLIFE MANAGEMENT GOAL			
Perpetuate listed species, waterfowl and other migratory birds, and native fish and mussels within the Illinois River Corridor, while restoring and preserving the biological integrity, diversity, and environmental health of the Refuge Complex			
LISTED SPECIES			
Objective: Protect Bald Eagles occurring on Refuge Complex land from human disturbance.	U	U	U
Strategy: Minimize human activities within 300 feet of bald eagle roosts.	U	U	U
Strategy: Enforce protective buffer zones around bald eagle nests in accordance with the <i>Northern States Bald Eagle Recovery Plan</i> .	U	U	U
Strategy: Continue to monitor Bald Eagle nesting success on the Refuge Complex land.	U	U	U
Objective: Protect Decurrent False Aster populations occurring on Refuge Complex land from human disturbance, including constructing physical barriers to restrict vehicle and foot traffic (minimum 50-foot protective zone).	U	U	U
Strategy: Monitor Decurrent False Aster populations on Refuge Complex land to determine if they are self-sustaining.	U	U	U
Strategy: Evaluate the potential for enhancing existing populations and for establishment of additional Decurrent False Aster populations on Refuge Complex land. Implement the recommendations from the evaluation.	U	U	U
Strategy: Ensure that Refuge and private lands projects support the goals and objectives of the Recovery Plan for Decurrent False Aster.	U	U	U
Objective: If Indiana bats occur on the Refuge Complex, protect them from human disturbance.	U	U	U
Strategy: Encourage partners to monitor for the presence of Indiana bats		U	U
Objective: Encourage colonization of Indiana Bats on Refuge Complex land through forest restoration (day roost and nursery habitat) on Emiquon and Meredosia Refuges throughout the life of this plan.		U	U
Strategy: Ensure that 20 percent of tree species (big nut and shell bark hickories) used in future forest restoration contribute to meeting the needs of Indiana bats (See Forest Habitat Restoration section 2.2.3 for habitat strategies and projects).		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Objective: By 2006, in cooperation with state and federal biologists, inventory and assess listed species and their habitats throughout the Illinois River Corridor and determine the extent to which the life cycle needs of listed species are being met within each habitat type. Evaluate the potential reintroduction of species suitable to the habitat of the Refuge Complex (e.g., Higgin's eye pearly mussel).		U	U
Strategy: Enlist the support of the Service's Upper Mississippi River/Tallgrass Prairie Ecosystem Team and the Midwest Natural Resource Group in ascertaining an appropriate lead and in obtaining the funds necessary to complete the effort.		U	U
NATIVE FISH AND MUSSELS			
Objective: By 2019, restore and maintain native fish and mussel species diversity to 85 percent (fish) and 50 percent (mussel) of those that were historically present in the Illinois River System at the end of the 19th century. Presently there are approximately 102 species of fish, 37 species of mollusks, and 10 species of crustaceans found in the vicinity of the Refuge Complex (Appendix 5). This objective would be accomplished in accordance with strategic planning efforts of the state of Illinois.		U	U
Strategy: Work with the Illinois DNR and Service fishery resource staff to develop a comprehensive aquatic resource step-down management plan for the Refuge Complex by 2006. Cooperate and coordinate with Illinois DNR, LTRM, and Service Fishery Biologist in managing the fishery in the north and south pools of Lake Chautauqua.		U	U
Strategy: Enhance aquatic nuisance species control throughout the Illinois River Corridor, including funding additional research on controlling carp in managed wetlands.		U	U
Strategy: Working with state and federal fishery staff, establish and maintain an annual fish and mussel monitoring program on Refuge Complex land by 2006.		U	U
Strategy: Evaluate the need for continued stocking of game fish populations in Lake Chautauqua's North Pool.		U	U
BIOLOGICAL INTEGRITY, DIVERSITY, AND ENVIRONMENTAL HEALTH			
Objective: Safeguard management options and prevent further degradation of landscape processes by promoting diverse and productive plant and animal communities within the Refuge Complex that are appropriate to soil type, climate, and landform.		U	U
Strategy: Maintain and/or restore the ecological processes of nutrient cycling, energy flow, and hydrologic cycles on Refuge Complex land characteristic of the geo-climatic setting. Manage Refuge Complex land to mimic natural ecosystem processes (e.g., fire, flooding, succession). Use an integrated mix of restoration tools to repattern succession/disturbance regimes and achieve sustainable landscape conditions. Consolidate and coordinate activities where multiple needs can be addressed relative to landscape health (e.g., water quality, riparian processes and functions, forest health, recovery of succession/disturbance regimes, etc).		U	U
Strategy: By 2010, convert all of the Refuges non-native habitat to native habitat (i.e., convert cropland to wetland or bottomland forests).		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: In cooperation with the State of Illinois, manage the deer population on Refuge Complex land through controlled hunts.		U	U
Strategy: Continue land acquisition within the authorized boundaries of the Emiquon and Meredosia Refuges as funds become available. Presently there are 9,009 acres of land within the authorized boundary at Emiquon NWR and 1,747 acres at Meredosia NWR to be acquired.	U	U	U
Objective: Safeguard management options and prevent further degradation of landscape processes by promoting diverse and productive plant and animal communities within Illinois River Focus Areas that are appropriate to soil type, climate, and landform.			U
Strategy: Provide connectivity to the matrix of land in which Refuge Complex land occurs.			U
Strategy: Accelerate the current status and trends effort toward restoration and conservation of biological diversity in the Illinois River Corridor through a comprehensive and coordinated system that complements existing authorities. Focus Federal, state, and local agencies having related responsibility and/or expertise in this area to increase efficiency and develop consistency in natural resource conservation. Work with partners through the Midwest Natural Resources Group and the Service's Ecosystem Team to expand the focus on landscape management and planning. This would include identifying, protecting, and restoring important landscapes historically occurring within the Illinois River Corridor in a manner so that their arrangement mimics the natural organization found prior to European settlement.			U
Strategy: Ensure private landowners within Refuge Complex Focus Areas have viable options for restoring and maintaining their land for the benefit of biological integrity, diversity, and environmental health. Provide technical assistance and financial incentives to landowners through the Refuge's Partners for Wildlife Program. Seek to intensify and concentrate other federal, state, and private programs in high priority areas.			U
Objective: Manage or eliminate exotic and invasive species on the Refuge Complex below present levels.	U	U	U
Strategy: Evaluate commercial fishing on Refuge land (on a case-by-case basis) as a tool for exotic species control and research.		U	U
Strategy: Control and eliminate (where feasible) all undesirable non-native species on Refuge Complex land throughout the life of this Plan. Maintain noxious-weed-free plant communities and restore plant communities with noxious weed infestations through the use of broad-scale, integrated management strategies.	U	U	U
Strategy: Aggressively control invasive shrubs and trees in grasslands.	U	U	U
Strategy: Minimize the impact exotic species have on Refuge forest land.	U	U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: Employ an integrated management system to control or contain pest plant species. These integrated management practices include the use of mechanical, chemical and biological techniques for the control of weeds. Mechanical control involves the use of disking or plowing, chemical control involves the application of U.S. Fish and Wildlife Service approved herbicides, and biological control includes the use of approved biological agents such as rosette weevils on musk thistle.	U	U	U
HABITAT MANAGEMENT GOAL			
Provide high quality habitat within the Illinois River Corridor for the benefit of listed species, waterfowl and other migratory birds, native fish and mussels, and native biological diversity			
NATIVE GRASSLANDS			
Objective: By 2019, the Refuge Complex will protect and manage 200 acres of high quality native grassland habitat for the benefit of listed species, waterfowl and other migratory birds, and native biological diversity.	U		
Objective: Continue the use of the Refuge Complex’s Cooperative Farming Program as a habitat management tool to address specific management problems. Several cooperative farmers from the local community currently farm Refuge Complex land on a two-thirds/ one-third crop-share lease, with one-third of the harvest being allocated to the Refuge Complex. The program assists in preventing undesirable woody species from invading an area that will be planted to native grasses and controlling invasive plant species (i.e. reed canary grass, cottonwoods, maples).	U	U	U
Objective: By 2019, the Refuge Complex will protect and manage 1,000 acres of high quality native grassland habitat for the benefit of listed species, waterfowl and other migratory birds, and native biological diversity.		U	U
Strategy: Create, restore, or enhance small (40-100 acres) and medium-sized (100-1,000 acres) blocks of grassland habitat comprised of short, medium, and tall height-density patches containing diverse structure (e.g., bare soil, stiff-stemmed forbs, sparse woody vegetation) with a 75 percent grass and 25 percent forbs mix with a minimum of 6 grass species and a minimum of 30 herb species. The Refuge will focus on creating blocks of grassland habitat that is structurally open and free of major linear woody edges. In most cases, woody cover will represent less than 5 percent of the grasslands habitat. Maintain Refuge grasslands through periodic burning and / or mowing / or light grazing with some grasslands (25-50 percent of the total grassland landscape) remaining free from burning, mowing, or grazing between 3 and 6 years to provide habitat for Henslow’s Sparrow, Northern Bobwhite, Field Sparrow, and other species which prefer a well-developed duff layer and the presence of some shrubs. Some thicket areas and isolated trees (plum, cherries, sumac, crabs, hawthorns) should be allowed to persist to provide breeding habitat for Loggerhead Shrike, Bell’s Vireo, Yellow-breasted Chat, and other species in some prairies and old-fields. Maintain hydrology in wet meadows.		U	U
Strategy: In cooperation with the state, selectively control medium-sized predators such as coyotes, skunks, fox, and raccoons in Refuge Complex grasslands until sufficiently sized blocks of grassland habitat are restored.		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: Protect, restore, and manage an additional 300 acres of native grassland habitat on the North Globe Drainage District (within Emiquon Refuge boundary) once an adequate realty interest is acquired.		U	U
Strategy: Restore and manage 50 acres of native grassland habitat on the Wilder Tract (within Emiquon Refuge boundary).		U	U
Strategy: Restore and manage an additional 70 acres of native grassland habitat on the Shearl tract (within Meredosia Refuge boundary).		U	U
Strategy: Protect, restore, and manage an additional 380 acres of native grassland habitat within Illinois River Refuge Complex Focus Areas through voluntary partnership agreements.			U
NATIVE SAVANNAS			
Objective: By 2019, the Refuge Complex will protect, restore, and manage 200 acres of high quality native savanna habitat for listed species, waterfowl and other migratory birds, upland game species, and native biological diversity (currently the Refuge Complex protects or manages no savanna habitat).		U	U
Strategy: Create, restore, or enhance contiguous blocks of a savanna landscape dominated by old-growth oaks, black walnut, hickories, or other upland mast-producing trees with a canopy cover between 10% and 40% and an open understory dominated by native grasses and forbs with a shrub component for Northern Flicker, Red-headed Woodpecker, Black-billed Cuckoo, Yellow-billed Cuckoo, and other species. Plant mast-producing trees and shrubs typical of the historic Central Illinois savanna landscape and / or open up portions of the existing heavily forested landscape, especially on bluffs and areas of rolling topography. Maintain an open understory through periodic burning, mowing, or light grazing activities. Maintain a mature oak component in select savanna restoration units to provide nesting cavities for Red-headed Woodpeckers. Enhance and maintain a warm-season grass component in select savanna restoration units to provide nesting cover for Field Sparrows. Maintain a mature oak-hickory-walnut component in savanna restoration units to provide nesting cavities for Red-headed Woodpeckers. Maintain a warm-season grass component in savanna restoration units to provide nesting cover for Field Sparrows.		U	U
Objective: Protect, restore, and maintain 200 acres of existing or restorable native savanna habitat within the Chautauqua-Emiquon Focus Area (approximately 15 acres per year).			U
Strategy: Complete restoration and protection through voluntary partnership agreements.			U
NATIVE FORESTS			
Objective: By 2019, the Refuge Complex will protect and manage 4,500 acres of high quality native forest habitat (e.g., upland hardwood, bottomland hardwood) for listed species, waterfowl and other migratory birds, and upland game species.	U		
Objective: By 2019, the Refuge Complex will protect and manage 6,000 acres of high quality native forest habitat (e.g., upland hardwood, bottomland hardwood) for listed species, waterfowl and other migratory birds, and upland game species.		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: Create, restore, enhance, and manage large contiguous blocks of native bottomland forests (aiming for a minimum of 500 contiguous acres) capable of providing high quality breeding habitat for forest species of concern (e.g. Cerulean Warbler, Wood Thrush, Veery, Yellow-billed Cuckoo, Pileated Woodpecker). Manage native forest land for structural and plant species diversity. Ensure healthy soil and water resources. Maintain large mature stands of oak forest with a diverse, dense understory component, to provide nesting habitat for Yellow-billed Cuckoos, Chestnut-sided Warblers, and Wood Thrush.		U	U
Strategy: Restore and manage an additional 200 acres of bottomland forest habitat within the Emiquon Refuge (Wilder Tract).		U	U
Objective: Protect, restore, and manage an additional 1,300 acres of existing or restorable native forest habitat within the Meredosia Focus Area (approximately 100 acres per year).			U
Strategy: Complete restoration and protection through voluntary partnership agreements.			U
WETLANDS			
Objective: Continue to protect and manage 6,000 acres of high quality wetland habitat characteristic of the historic Illinois River Corridor (e.g., hemi-marshes, moist soil habitats, wet prairie, side channels, backwater lakes, tributary streams).	U		
Objective: By 2017, protect and manage 10,000 acres of high quality wetland habitat characteristic of the historic Illinois River Corridor (e.g., hemi-marshes, moist soil habitats, wet prairie, side channels, backwater lakes, tributary streams).		U	U
Strategy: Maintain a mosaic of hemi-marsh habitat in permanent water bodies for waterfowl, Common Moorhen, Black Tern; shallow water marshes for teal and shorebirds.		U	U
Strategy: Restore and maintain an additional 700 acres of hemi-marsh habitat at the South Globe Drainage District.		U	U
Strategy: Maintain an abundance of moist soil habitat on Refuge Complex land for waterfowl and shore birds.		U	U
Strategy: Restore and maintain 60 acres of moist soil habitat at Emiquon NWR (Proehl Tract).		U	U
Strategy: Restore and maintain 105 acres of moist soil/wet meadow habitat at Emiquon NWR (Wilder Tract).		U	U
Strategy: Restore and maintain 300 acres of moist soil habitat on the North Globe Drainage District (when an adequate interest in the land is purchased) on Emiquon NWR.		U	U
Strategy: Maintain wet prairie swales in grassland areas with standing water less than 3 inches deep to provide breeding habitat for King and Black Rail and additional habitat for shorebirds, herons, egrets, and other rail species on the Refuge Complex.		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: Restore and maintain 53 acres of wet prairie habitat at Meredosia NWR (Klineschmidt Tract).		U	U
Strategy: Restore and maintain side channel and oxbow habitat for fish and mussels, including spawning, nursery, and overwintering habitat through active and passive management (e.g., selective dredging, bank stabilizations, wave control structures). Ensure adequate summer and winter thermal regulation within riparian and aquatic zones. Provide an amount and distribution of woody debris along shorelines and side channels characteristic of natural aquatic and riparian ecosystems for this area.		U	U
Strategy: Restore and maintain 3.5 miles of side channel habitat at the LaGrange Side Channel on Chautauqua NWR.		U	U
Strategy: Restore and maintain 80 acres of oxbow habitat at Emiquon NWR.		U	U
Strategy: Maintain diverse and productive vegetative communities in backwater lakes (e.g., functional littoral zones) for the benefit of waterfowl and native fish populations.		U	U
Strategy: Protect, restore and maintain 100 acres of backwater lake habitat on Liverpool Lake on Chautauqua NWR.		U	U
Strategy: Construct and maintain five islands in the North Pool of Lake Chautauqua to enhance waterfowl nesting and reduce wave erosion (minimum 150 feet from shore). The aim of this project is to re-establish roughly 400 acres of littoral zone in the lake.		U	U
Strategy: Restore and maintain 360 acres of backwater lake habitat at Weis Lake through island construction, construction of sediment control structures, and selective dredging.		U	U
Strategy: Restore and maintain 300 acres of backwater lake habitat at Billsbach Lake through selective dredging and repair of the natural levee.		U	U
Strategy: Protect, restore, and manage 700 acres of backwater lake habitat on Clear Lake through partnerships with the State and local landowners.		U	U
Strategy: In partnership with others, restore 20 miles of tributary stream habitat along Crow Creek and the Spoon River. Ensure private landowners in these areas have viable options to finance and complete the work. Continue to provide technical assistance and financial incentives to landowners through the Partners for Fish and Wildlife Program.		U	U
Strategy: Through the Midwest Natural Resources Group, the Navigation Study, the Ecosystem study, and the Comprehensive Plan for the Upper Mississippi River System and other planning efforts coordinate interagency water management efforts on the Illinois River to establish a water management strategy in the Illinois River Corridor that enhances wetland functions and values.			U
Strategy: Participate in coordinating data acquisition and policy development for addressing impacts of non-point source pollution on the rivers aquatic resources.		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: Through partnerships, maintain 50 wood duck boxes on Refuge land in a manner to achieve a 75 percent occupancy rate.		U	U
VISITOR SERVICES MANAGEMENT GOAL			
Provide the public abundant high quality wildlife-dependent public use opportunities on Refuge Complex land, including hunting, fishing, wildlife observation and photography, environmental education, and interpretation			
WILDLIFE-DEPENDENT RECREATION			
Objective: Enhance the public's understanding and appreciation of the natural world by supporting wildlife observation and photography.	U		
Strategy: Construct three new interpretive trails in three different plant communities found or restored at Emiquon NWR.	U	U	U
Objective: Provide hunting opportunities, at 2003 visit levels, that are compatible with the Refuge Complex purpose.	U		
Strategy: Construct two photo and hunting blinds and access trails for wildlife observation and hunting opportunities.	U	U	U
Objective: Provide quality recreational fishing opportunities, at 2003 visit levels, that are compatible with the primary Refuge Complex purpose.	U		
Strategy: Construct accessible fishing platform at Chautauqua NWR.	U	U	U
Objective: Refuge stakeholders will appreciate the high quality recreational opportunities afforded by the Refuge Complex such that the Refuge Complex becomes recognized as a premier destination to participate in natural resource based recreation.		U	U
Strategy: Expand auto-tour route access times during peak migrations and throughout the summer months.		U	U
Strategy: Create additional viewing opportunities along Chautauqua dike system, including an auto tour route, five pull-offs, and a primitive access site off the auto tour route to the Illinois River (Old Levee Access).		U	U
Strategy: Develop a pull-off area at the Globe Drainage District area at Emiquon NWR.		U	U
Strategy: Amend hunting plan to include big game hunting on Liverpool Lake and Meredosia Island.		U	U
Strategy: Open and provide access for public hunting and other wildlife dependent recreational uses at Emiquon NWR.		U	U
Strategy: Evaluate new hunting opportunities on existing and newly acquired lands. In 15 years, an estimated 4,000 additional acres could be opened to public hunting.		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: Open the east side of upper Lake Chautauqua to bank fishing year-round.		U	U
Strategy: Develop five new parking lots at Emiquon NWR to accommodate deer and waterfowl hunters		U	U
Strategy: Provide accessible facilities (blind) for waterfowl and deer hunting on Emiquon NWR		U	U
Strategy: Promote National Fishing Day events in coordination with Illinois DNR and other partners		U	U
Strategy: As land acquisition progresses, review and revise the sport fishing plan for all units in the Refuge Complex.		U	U
Strategy: Develop a visitor services step-down management plan by April 2005 that evaluates existing public use facilities, identifies additional facilities needed to provide high quality compatible public use, and sources of funding for development and maintenance of facilities.		U	U
Strategy: Provide 2 accessible bank fishing facilities for visitors on the Chautauqua NWR North Pool and at Meredosia NWR.		U	U
Strategy: Construct a boat ramp at Goofy Ridge to accommodate access to the North Pool of Lake Chautauqua and the Illinois River via Goofy Ridge ditch.		U	U
Strategy: Develop a loop trail at Meredosia NWR incorporating the existing trail.		U	U
ENVIRONMENTAL EDUCATION AND INTERPRETATION			
Objective: Provide structured on-site environmental education programs to 2,077 students annually.	U		
Objective: Provide structured on-site environmental education programs to 2,500 students annually.		U	U
Strategy: Coordinate with existing organizations (i.e. Dickson Mounds, Western Illinois university, Environmental Education Association of Illinois) to develop teacher workshops that orient teachers to the Refuge resources and environmental education materials. Work with local school superintendents to arrange on-site visits. Coordinate with Dickson Mounds, City of Havana, Illinois DNR with relevant/related programs and projects (i.e. link with Illinois River Valley Project). Enhance the Refuges ability to accommodate large group visits (i.e. tour buses, school groups). Coordinate with resource agency staff (i.e. NRCS, IDNR) to develop a full-day Conservation/Natural Resource day for area grade school students.		U	U
Strategy: Recruit and hire one Park Ranger to coordinate Public Use program.		U	U
Strategy: Develop 3 site-specific learning trunks and resource materials for local educators and youth leaders.		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Strategy: In partnerships with local teachers, county naturalists, and youth organizations, develop curriculum and monitoring programs focusing on Refuge water quality and watershed issues.		U	U
Strategy: Update general brochure to include Refuge management, themes, and natural highlights.		U	U
Strategy: Develop interpretive signage and Refuge orientation message on 5 kiosks throughout Illinois River Refuges (2 existing at Chautauqua, 1-Meredosia, 1-Emiquon, 1 - Cross dike)		U	U
Strategy: Develop a portable interpretive display that highlights Illinois River management, themes, and natural resource highlights (similar to that of Harvesting the River).		U	U
Strategy: Develop permitted/prohibited signage for 5 kiosks throughout Illinois River National Wildlife Refuge and Fish Complex		U	U
Strategy: Develop interpretive signage for 5 stops along Chautauqua Lake auto tour		U	U
Strategy: Develop a kiosk at the cross dike parking area that interprets messages about wetlands and water management.		U	U
Strategy: Develop bathroom facilities at the headquarters to handle groups and individual visitors.		U	U
Strategy: Convert the existing headquarters maintenance shop to visitor contact station (which includes exhibits/multi-purpose space, and sales outlet) when new maintenance shop is constructed.		U	U
Strategy: Develop interpretive materials and programs that incorporate refuge themes, issues, history, and management programs. Utilize area resource professionals and develop a series of public programs highlighting Refuge Complex themes (Bird Migration, Illinois River/Wetland Function/Hydrology, Heritage/ Human-Wildlife Interactions).		U	U
Strategy: Continue to work with the Heartland Water Resource Planning Committee to develop an educational wing at the proposed Illinois River Museum in Peoria.		U	U
Strategy: Conduct a feasibility study/site design for a Illinois River National Wildlife and Fish Refuge Complex Visitor Center near Dickson Mounds Museum.		U	U
OUTREACH			
Objective: Maintain the Complex's ability to welcome visitors and relate the mission of the Refuges, the U.S. Fish & Wildlife Service, and the National Wildlife Refuge System.	U		
Strategy: Continue existing outreach activities, including presentations to local school groups and local conservation groups both on and off the refuges and to refuge visitors, and provide tours of the refuges.	U		

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Objective: Refuge stakeholders will feel connected to the Refuge, and will actively participate in the stewardship of the Refuge, the National Wildlife Refuge System, and the ecosystems within the Illinois River Corridor.		U	U
Strategy: Develop a comprehensive communication strategy for the Refuge Complex (communication step-down plan) by 2005.		U	U
Strategy: In partnership with Emiquon Audubon, the Friend's of Illinois River, and The Natural Conservancy, promote Chautauqua NWR and Emiquon NWR as international wildlife viewing destinations.		U	U
Strategy: Build cooperative relationship with local media and submit 12 news releases per year to area papers that highlight management activities and wildlife happenings on the Refuge Complex. Advertize special events that promote wildlife viewing opportunities throughout the Refuges (e.g., Migratory Bird Day, Eagle days, National Wildlife Refuge Week, National Fishing Week)		U	U
Strategy: Maintain Illinois River Refuge website and highlight Refuge Complex activities monthly.		U	U
Strategy: Explore technology to develop real-time video of Lake Chautauqua.		U	U
Strategy: Provide 4 Refuge tours throughout the year for special quests (city/agency officials)		U	U
Strategy: Promote special public programs through the Chamber of Commerce Calendar of Events.		U	U
Strategy: Promote a "Refuge happenings" show on Radio Station WDUK		U	U
Strategy: Continue to support stewardship efforts of the Friends of the Illinois River and the Emiquon Audubon Society		U	U
Strategy: Explore Cooperating Associating Agreement with Emiquon Audubon		U	U
Strategy: Develop projects that fosters community ownership and directly benefits the Illinois River Refuges.		U	U
Strategy: Promote citizen involvement and increase community ownership in the Refuge through stewardship work days.		U	U
Strategy: Coordinate volunteer efforts with The Nature Conservancy and the IDNR EcoWatch program.		U	U
Strategy: Continue internship program or coordinate with Western Illinois University Peace Corps Fellowship program		U	U
Strategy: Coordinate with IDNR in conducting volunteer monitoring of Refuge resources (i.e. frog and toad surveys).		U	U
Strategy: Provide information that orients and informs visitors of recreational opportunities on Illinois National Wildlife Refuges and surrounding areas.		U	U

Table 1: Alternatives Described by Goals, Objectives and Strategies (Continued)

Description	Alternative		
	1	2	3
Objective: Land owners within Refuge Focus Areas will have a greater awareness of conservation and restoration potential on their lands.			U
Strategy: Work with Natural Resources Conservation Service and other organizations to disseminate information to land owners.			U
ADMINISTRATION GOAL			
Provide leadership and support at the Refuge, ecosystem, and landscape scales that is pro-active in addressing a wide-range of conservation opportunities and issues			
LAW ENFORCEMENT			
Objective: Continue to enforce laws for which the Service is responsible on the Refuge Complex, including the Archeological Resources Protection Act of 1979; the Lacey Act (1981 amendments); the Endangered Species Act; the Migratory Bird Treaty Act; the Migratory Bird Hunting and Conservation Stamp Act; and the National Wildlife Refuge Administration Act, including state laws governing hunting, fishing, and motor vehicle use.	U	U	U
Objective: Increasing compliance of state and Federal regulations on Refuge land will be a priority for the Refuge throughout the life of this CCP.		U	U
Strategy: Revise Refuge visitor regulations for consistency and compatibility.		U	U
Strategy: Continually increase the public's knowledge of Refuge visitor regulations and the boundaries of Fish and Wildlife Service lands, throughout the life of this CCP.		U	U
Strategy: Add one full-time law enforcement officer by 2007.		U	U
Strategy: Upgrade radio systems to meet Federal narrow-band digital standards by 2005.		U	U
Strategy: Upgrade patrol vehicles to meet State and Federal emergency vehicle standards by 2004.		U	U
Objective: Continue to serve as leader, facilitator, and source of information for natural resource issues along the Illinois River.	U	U	U
Strategy: Actively participate in partnership activities.	U	U	U
Strategy: Emphasize partnerships within Refuge Focus Areas			U

Table 2: Summary of Alternatives

Goal	Alternative 1	Alternative 2	Alternative 3
<p>WILDLIFE MANAGEMENT Perpetuate listed species, waterfowl and other migratory birds, and native fish and mussels within the Illinois River Corridor while restoring and preserving the biological integrity, diversity, and environmental health of the Refuge Complex.</p>	<ul style="list-style-type: none"> ■ Protect Bald Eagle and Decurrent False Aster occurring on Refuge Complex land. 	<ul style="list-style-type: none"> ■ Protect Bald Eagle and Decurrent False Aster occurring on Refuge Complex land. ■ Encourage colonization of Indiana bats. ■ Restore and maintain native fish and mussel species diversity on Refuge Complex land. ■ Increased wildlife monitoring ■ Convert pine plantations to upland hardwood forest 	<ul style="list-style-type: none"> ■ Protect Bald Eagle and Decurrent False Aster occurring on Refuge Complex land. ■ Encourage colonization of Indiana bats. ■ Inventory listed species and their habitats throughout the Illinois River Corridor ■ Restore and maintain native fish and mussel species diversity on Refuge Complex land. ■ Enhance aquatic nuisance species control throughout the Illinois River Corridor. ■ Maximum wildlife monitoring ■ Convert pine plantations to upland hardwood forest ■ Working with partners and private land owners within Refuge Focus Areas to promote biological integrity

Table 2: Summary of Alternatives (Continued)

Goal	Alternative 1	Alternative 2	Alternative 3
<p>HABITAT MANAGEMENT Provide the most productive habitat possible within the Illinois River Corridor for the benefit of listed species, waterfowl and other migratory birds, native fish and mussels, and native biological diversity.</p>	<ul style="list-style-type: none"> ■ Manage 200 acres of native grassland. ■ No savanna habitat. ■ Manage 4,500 acres of native forest. ■ Manage 6,000 acres of wetland habitat. 	<ul style="list-style-type: none"> ■ Manage 1000 acres of native grassland. ■ Manage 200 acres of savanna habitat on the Refuge Complex. ■ Manage 6,000 acres of native forest. ■ Manage 10,000 acres of wetland habitat. 	<ul style="list-style-type: none"> ■ Manage 1000 acres of native grassland. ■ Manage 200 acres of savanna habitat on the Refuge Complex and 200 acres within Refuge Focus Areas. ■ Manage 6,000 acres of native forest. ■ Restore 1,300 acres of native forest habitat with Refuge Focus Area. ■ Manage 10,000 acres of wetland habitat.
<p>VISITOR SERVICES AND MANAGEMENT Provide the public with abundant and high-quality public use opportunities on Refuge land, including hunting, fishing, wildlife observation and photography, and environmental education and interpretation.</p>	<ul style="list-style-type: none"> ■ Provide opportunities for wildlife dependent recreation at current levels. ■ Continue existing outreach activities with presentations on and off the Refuge and tours on the Refuge. 	<ul style="list-style-type: none"> ■ Enhance opportunities for wildlife dependent recreation through increased facilities and areas open to hunting and fishing. ■ Expand outreach activities with media, new technology, volunteer, and partnership efforts. 	<ul style="list-style-type: none"> ■ Enhance opportunities for wildlife dependent recreation through increased facilities and areas open to hunting and fishing ■ Work with others to disseminate information to the land owners in the Refuge Focus Area. ■ Expand outreach activities with media, new technology, volunteer, and partnership efforts.
<p>REFUGE ADMINISTRATION Provide leadership and support to federal, state, local, and private partners at the Refuge, ecosystem, and landscape scales that is proactive in addressing a wide range of conservation opportunities and issues.</p>	<ul style="list-style-type: none"> ■ Continue to enforce applicable federal laws on the Refuge Complex at present levels. ■ Continue partnerships at levels present in 2003. 	<ul style="list-style-type: none"> ■ Increase capability to allow greater enforcement and visitor education. ■ Continue partnerships at levels present in 2003. 	<ul style="list-style-type: none"> ■ Increase capability to allow greater enforcement and visitor education. ■ Emphasize partnerships that apply to the Refuge Complex and Focus Areas.

Chapter 3: Affected Environment

The Refuge Complex is located along 124 miles of the Illinois River. The Refuges that make up the Complex have a current approved boundary that includes about 19,900 acres. The Service owns about 12,000 acres within the approved boundary. The following section briefly describes the Illinois River Corridor in the area of the Refuge Complex. More detail is included in Chapter 3 of the CCP.

The Illinois River Basin drains about 30,000 square miles in three states –Wisconsin, Indiana, and Illinois. Historically, the Illinois River system supported a diverse system of braided channels, riparian lands, side channels, sloughs, islands, sandbars, and backwater lakes. Development and agricultural use have increased the flows and sediment deposition in the Illinois River Valley. Many of the backwater lakes, side channels and sloughs associated with the Illinois River Corridor have filled in.

The “Illinois Waterway,” which connected Lake Michigan to the Illinois River, raised the river’s average water level, average flows and the frequency and severity of floods. Today the river is largely constrained by dams, locks and levees. The U.S. Army Corps of Engineers maintains locks and dams on the Illinois River Waterway, which allow the transport of nearly 60 percent of the Illinois’ annual commodity tonnage, including grain, coal, and petroleum products by barge. Recreation is an important economic activity associated with the Illinois River Corridor. Popular activities include boating, camping, fishing, hunting, wildlife observation and photography. There are seven state parks, nine conservation areas, four waterfowl management areas, and three national wildlife refuges located along the river that provide the public recreation opportunities.

Twenty eight species of waterfowl are known to use the Refuge Complex, including Trumpeter Swans and Tundra Swans. In addition to waterfowl, wetlands along the Illinois River provide habitat for over 30 species of shorebirds and 10 species of gulls and terns. Two hundred and sixty four species of birds have been documented on Refuge Complex land.

The Illinois River Corridor serves as a temporary home to hundreds of thousands of waterfowl who feed and rest on their annual spring and fall migrations. The middle Illinois River valley, stretching from about Hennepin, Illinois, to Beardstown, Illinois, was historically one of the most important areas for migrating waterfowl in all of North America. Although many of the most significant areas have been greatly altered over the years by drainage and cropping of wetlands within the floodplain, shallow bottom land lakes, sloughs, marshes and side channels remain, but most are in a degraded state. The Illinois River and associated wetlands provide some of the most significant areas of Wood Duck production and mid-migration mallard habitat in the Mississippi Flyway. The breeding Wood Duck population in the valley is estimated at over 20,000. Peak Mallard populations have exceeded one million ducks.

Within the upper reaches of the Illinois River, fish species diversity is rather low. The middle river has historically been the most productive area of the river because of the availability of backwaters that support diverse and productive populations. However, as lakes fill with sediment and aquatic vegetation is killed off, native fish populations decline and other more hardy species, such as carp, predominate. The lower river from Beardstown, Illinois, to Grafton, Illinois, features roughly the same mix of fish species as the middle river, but population numbers are smaller. There are approximately 102 species of fish, 37 species of mollusks, and 10 species of crustaceans found in the vicinity of the Refuge Complex.

Bottomland or floodplain forests within the Illinois River Corridor occupy low-lying areas along the river in relationship to their elevation and distance from water. While once rich in forests, the river's forests today consist, for the most part, of narrow strips along the edges of the riverbanks.

Three main types of prairie historically occurred in the Illinois River Corridor. They are 1) prairie (black soil, silt-loam prairies, including dry-mesic prairie, mesic prairie, wet mesic prairie, and wet prairie), 2) sand prairie, and 3) hill prairie. Concerns associated with native grasslands include loss, fragmentation, fire suppression, hydrologic cycle maintenance, exotic and invasive species, and development. Today, many prairie remnants are islands surrounded by row-crop fields and other development. Further, much of the remaining tallgrass prairie habitat in the area is highly fragmented and dominated by human activity.

Prior to European settlement, oak savanna covered approximately 27-32 million acres of the Midwest. Over 99 percent of the original savanna has been lost, and mid-western oak savanna ranks among the rarest ecosystems in the world. Prior to European settlement, savanna was a likely feature of the Illinois River landscape. Today, few savannas remain.

Threatened and Endangered Species: There are eight federally listed and 80 state-listed threatened and endangered species that historically have been identified on or near the Refuge Complex. These include three threatened plants (decurrent false aster, Mead's milkweed, and prairie white-fringed orchid); one endangered mollusk (Higgin's eye pearlymussel); one endangered bird (Least Tern), one threatened bird (Bald Eagle); and one endangered mammal (Indiana bat). Only the Bald Eagle and decurrent false aster have been documented on the Refuge Complex. The Indiana bat may occur on habitat associated with Meredosia NWR.

Archaeological and Cultural Values: Archaeological studies have identified sites and potential sites on and near the Refuge Complex. The Cameron-Billsbach unit has high potential for containing prehistoric sites. Chautauqua NWR has many known prehistoric sites. Emiquon NWR is in an area of many known important archeological sites. There is archeological evidence within the Refuge Complex of each major period for the past 12,500 years. The recognized tribal interests in the areas of the Refuge Complex are confined to the historic period. No National Register properties are located within the Refuge Complex.

Chapter 4: Environmental Consequences

This chapter evaluates three alternatives on the basis of environmental consequences or impacts relative to the significant issues identified in Chapter 1. The chapter is organized by alternative.

4.1 Impacts Common to All Alternatives

4.1.1 Unavoidable Adverse Impacts

Under Alternatives 1, 2, and 3, the potential development of access roads, dikes, control structures, visitor parking areas, and reclamation of former building sites could lead to local and short-term negative impacts to plants, soil, and some wildlife species. Greater public use of the Refuge Complex may result in increased littering, noise, and vehicle traffic.

4.1.2 Short-Term Use Versus Long-Term Productivity

The local, short-term uses of the environment under all alternatives include habitat restoration and enhancement activities for the benefit of Service trust resources. All alternatives could include the development of additional public use facilities to further the public's understanding and appreciation of the natural world. The resulting long-term effect of these alternatives includes increased protection of threatened and endangered species, increased waterfowl and songbird production, and long-term recovery of a myriad of species dependent on quality wetland and grassland habitats. In addition, local and regional people will gain long-term opportunities for wildlife-dependent recreation and education.

4.1.3 Irreversible and Irretrievable Commitments of Resources

Funding and personnel commitments by the Service or other organizations under all alternatives would be unavailable for other programs. Fee-title acquisition of lands by the Service would make them "public lands" and preclude other use of these lands in accordance with individual desires. Traditional land uses may change since uses on Service lands must be shown to be compatible with the purposes for which the land is acquired. Any lands purchased will lose their potential for future development by the private sector as long as they remain in public ownership. Structural improvements that are purchased with any land may be declared surplus to government needs and sold and/or demolished on site.

4.1.4 Drainage

It is Service policy not to impede the flow of waters from other lands, even if that flow passes through lands acquired by the Service. The Service will not cause any artificial increase of natural water levels, width, or flow of waters without ensuring that impacts would be limited to those lands in which the Service acquires an appropriate management interest.

4.1.5 Flood Control

Under all of the alternatives, flooding frequency and duration would be expected to remain the same. Population growth, sedimentation, runoff, and urban development are all expected to increase in the Illinois River Basin. Over time, these processes could increase flood peaks and subject more property (including Refuge Complex land) to damage at higher monetary costs.

4.1.6 Crop Depredation

Under all of the alternatives the Service will continue to reduce crop depredation on neighboring private land from wandering geese. This will be accomplished by working with adjacent landowners (who make a request) by loaning propane cannon, developing and maintaining natural vegetative barriers and/or fencing between Refuge Complex wetlands and adjacent farm fields to control field depredation by geese in coordination with the U.S. Department of Agriculture Animal and Plant Health Inspection Services program of Wildlife Services.

4.1.7 Maintenance of Roads and Existing Right-of-Ways

State, county, and townships retain maintenance obligations for roads and their rights-of-way under their jurisdiction within refuge boundaries. Some township roads may be suited for abandonment (but not necessarily closure) and their maintenance assumed by the Service. Any such abandonments would only be with the consent of the appropriate governing body. Existing rights-of-ways and terms of other easements will continue to be honored. New rights-of-ways and easements will be considered in relation to Refuge System regulations and likely impacts of the rights-of-way or easement to Refuge resources. The Refuge Complex will cooperate with state, county and township officials in the maintenance of roads that cross the Refuge. Roadside mowing will be completed in accordance with state and local laws.

4.1.8 Agricultural Land

All alternatives would likely result in some reduced acreage of agricultural land when existing cropland is converted to wetland, grassland, forest, or savanna. Under all alternatives, we estimate that approximately 5,000 additional acres of row crop agricultural land could be acquired by the Service and restored to native cover over the next 15-20 years. In the long term, the habitat restored over this land would serve to protect and rebuild soils. Moreover, restoration would not be irreversible if it is determined that it is in the best public interest, at some future date, to again cycle these lands back to agricultural use. Commercial or residential development, however, represents destruction of the topsoil and a much longer term impact on the agricultural land base.

Several landowners adjacent the Refuge Complex have expressed sincere concern for the impact that the restoration of wetlands could have on their neighboring farms. The Service is committed to limiting the impact of its restoration activities to Service-owned or managed lands. Regional studies may provide some guidance, but it is likely that site-specific hydrological evaluations will be necessary prior to acquisition for many properties. We will also draw from our own experience and the experience of other organizations and individuals conducting wetland restoration in the Illinois River Basin.

The Service is also aware of concerns expressed by some agri-business people over the potential for reducing agricultural land in a county below some sustainable threshold. Since land acquisition for the Refuge Complex will occur over a long period of time (15-20 years or more), communities will have a reasonable time period to adapt to the proposed land use changes. As previously stated, current development in the Illinois River Basin is increasing, and its impact on farmland will likely be much greater than that of the Refuge Complex in the coming decades.

The Service shares the concern of the agricultural community about the loss of prime farmland soils. It is important to note that the definition of prime farmland is a soil-based definition. Therefore, land defined as prime farmland can have many different land uses, e.g., forest, wetland, pasture, or row crop. We feel the Refuge Complex contributes to the maintenance of prime farmland soils because, as stated previously, Refuge land protects, preserves, and builds soil. The most serious and irreversible threat to prime farmland soils is development and urban sprawl.

4.1.9 Use of Prescribed Fire as a Habitat Management Tool

The Refuge Complex's Fire Management Plan provides additional detail beyond what is described in this section and will be adopted through this Environmental Assessment.

4.1.9.1 Social Implications

A prescribed burn on the Refuge will be a direct benefit to the public in creating recreational opportunities through increased wildlife populations for hunting and observation. If a wildland fire occurs on or near the Refuge, the areas that were prescribed burned and the firebreaks intended for prescribed burning will help in controlling the fire.

Smoke from a Refuge fire could impair visibility on roads and become a hazard. All efforts will be taken to assure that smoke does not impact smoke-sensitive areas such as roads and local residences. The impact of smoke can be lessened through management actions, which include: use of road guards and a pilot car, signing, altering ignition techniques and sequence, halting ignition, suppressing the fire, and use of local law enforcement officers to control traffic. Burning will be done only when the smoke will not be blown across the community or when the wind is sufficient enough not to cause heavy concentrations.

Combustion of fuels during prescribed fire operations may temporarily impact air quality, but the impacts are mitigated by small burn unit size, direction of winds, and distance from population centers. In the event of wind direction changes, mitigative measures will be taken to assure the public safety and comfort. Refuge staff will work with neighboring agencies and state air quality personnel to address smoke issues that require additional mitigation. The fire prescription portion of the Prescribed Fire Plan describes specific measures to deal with smoke management problems for each unit.

Any smoke from the Refuge may cause some public concern. This concern will be reduced through a concerted effort by Refuge personnel to inform the local citizens about the prescribed burning program, emphasizing the benefits to wildlife and the safety precautions that are taken. Interpretive programs, explaining the prescribed burning program, will also be conducted on and off the Refuge.

4.1.9.2 Cultural and Archaeological Resources

There may be archaeological sites within prescribed burn units. When these units are burned, it is doubtful that the fire will have any adverse impact on the sites. The fire will be only a temporary disturbance to the vegetation in the area and in no way destroy or reduce the archaeological value, since artifacts are buried beneath the surface. No known sites will be impacted by prescribed burning operations.

4.1.9.3 Flora

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 ground forbs remaining and most of the higher brush, such as oak sprouts, will be bare of leaves. Trees may be scorched up to 10 feet above the ground. Because of wet ground conditions or discontinuous fuel, there may be areas up to 1 acre in size in the burn that are untouched by the fire.

In late spring, grasses and forbs will begin to grow within a few days of the burn. The enriched soil will promote rapid growth such that after 2 or 3 weeks the ground will be completely covered. In some cases, young trees will re sprout. The bases of the trees as well as the burned slash and stumps will be partially or completely covered by the new growth. Some of the less fire resistant trees will show signs of wilting and may succumb within a month or two. After one season of regrowth, most signs of the prescribed burn will be difficult to detect without close examination. After 2 or 3 years it will be virtually impossible to detect signs of the fire.

Other signs of the burn will remain for longer periods. The firebreaks will be maintained and remain visible to realize their benefit in a wildland fire situation and in future prescribed burns. Vehicle tracks through the burn are visible on the freshly burned ash and may be longer lived if the vehicle became stuck or created ruts in the ground. Travel across the burn area will be kept to a minimum. Vehicle travel is necessary in some instances, such as lighting the fire lines or quickly getting water to an escape point. A fire plow will be used only in the event that a break over occurs and cannot be controlled by any other method. The deep trench of the plow would leave a very long lived scar. This trench could be repaired by filling, which would eliminate it from view after 5 to 10 years.

4.1.9.4 Listed Species

All prescribed fires will be at least one-half mile from known Bald Eagle nests. The decurrent false aster will be managed consistent with guidance from its recovery plan. Prescribed fires will also occur outside of the breeding season of Indiana bats. We conducted a Section 7 review concurrent with the review of the draft CCP. The Section 7 review examined the prescribed fire program along with the CCP.

4.1.9.5 Soils

The effect of fire to the soil is dependent largely on the fire intensity and duration. On areas with high fuel loads, a slow backing fire is usually required for containment and desirable results. The intense heats generated by a slow backing fire will have a greater effect on the soils than fast, cool head fires used on farm fields and wildlife openings. 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 of the burn units.

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 the normal decomposition process. Fire will greatly speed up the process. 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 above it has any significant adverse affect. Fire of this type has little total effect on the soil, and in most cases would be beneficial.

4.1.9.6 Escaped Fire

The possibility exists that any prescribed fire may escape into the surrounding 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 type, and insufficient knowledge of fire behavior are a factors that can lead to a loss of control. An escaped fire can turn into a very serious situation. On the Refuge's natural lands, an escaped fire would cause less severe damage than on land where buildings, equipment, and land improvements would be damaged. Many of the prescribed burn areas are well within the Refuge and of minimal threat to private or other improved lands. We will exercise extreme care, careful planning, and adherence to the unit prescription when we conduct all prescribed burns. We will place an extra emphasis on care when burning areas that are near to developed areas or the Refuge boundary.

If a prescribed fire jumps a firebreak and burns into unplanned areas, there is a high probability of rapid control with minimal adverse impact. The network of firebreaks and roads will greatly assist in rapid containment. In most cases, all of the Refuge fire fighting equipment will be immediately available at the scene and nearby water sources identified. The county 911 dispatchers will always be notified of a prescribed burn. Thus, maximum numbers of experienced personnel and equipment will be immediately available for wildland fire suppression activities.

4.1.9.7 Water Quality

While not a primary objective of the Refuge Complex, water quality improvements in the Illinois River Corridor would be realized under all alternatives (surface and sub-surface) primarily as a result of conversion of previously developed land to natural habitats (e.g., wetlands, prairies, savannas, forests)(approximately 5,000 acres). Although this would occur over a relatively long period of time (at least 15-20 years), the ultimate result would be a reduction in sediments and farm chemicals entering the waterways. Restoring and developing wetlands as well as certain uplands would increase the water filtration and ground water recharge capabilities within the area. Stabilizing riverbanks would decrease erosion.

4.1.10 Land Acquisition by the U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service acquires lands and interests in lands consistent with legislation or other Congressional guidelines and Executive Orders, for the conservation of fish and wildlife and to provide wildlife-dependent public use for educational and recreational purposes. The Service policy is to acquire land only when other protective means, such as zoning or regulation, are not appropriate, available, or effective. When the Service acquires land, it acquires fee title (all property rights) only if lesser property interests such as conservation easements, leases, or cooperative agreements are not suitable to achieve resource objectives. Under all alternatives landowners will in no way be coerced into selling their land or any interest in their land.

4.1.10.1 Landowner Rights

None of the future management alternatives considered in this document propose expanding the currently authorized boundaries for any of the Illinois River Refuges. However, Emiquon NWR and Meredosia NWR still have lands remaining to be acquired within their approved boundaries. Service or other agency control of access, land use practices, water management practices, hunting, fishing, and general use next to any tracts owned by the Service is limited only to those lands in which the Service or other entities have acquired that ownership interest (the Service acquires land through purchase, donation, or other means of conveyance). Any landowners adjacent to lands owned by the Service retain all the rights, privileges, and responsibilities of private land ownership.

4.1.11 Mosquito Control

Over time people have expressed concern that the development of a wetlands will increase the incidence of disease transmitted by mosquitoes. Commonly referred to as the “swamp syndrome,” this concern is based on assumptions that since mosquitoes are common in swamps, more swamps (wetlands) means more mosquitoes and more mosquitoes means more disease. It is not a simple issue to understand since there is much misinformation upon which assumptions are based that lead to faulty conclusions. It is also an emotional issue involving legitimate concern for personal health and safety. To analyze the stated concern that the proposed project will increase the risk of disease due to an increase in mosquitoes due to an increase in wetland habitat, requires a basic understanding of the mechanism of disease transmission by mosquitoes.

For mosquitoes to offer a disease threat to humans certain prerequisites are necessary:

- The disease causing organism (pathogen) must be present in the area.
- There must be a host animal that carries the pathogen.

- The specific species of mosquito capable of transmitting the pathogen must be present.
- Habitat conditions that support reproduction of the problem species of mosquito must be present.

Many of the diseases spread by mosquitoes have been eliminated. Malaria is a good example. In the 1920s and 1930s the Wabash River Valley in Indiana was a notorious area for malaria. However, the last serious outbreak of malaria occurred near Terre Haute in the 1950s. A combination of factors led to control and near elimination of this disease. The species of mosquito most responsible for spreading malaria was *Anopheles quadrimaculatus*. As swamps were drained and waters became more polluted with organic wastes, the offending mosquito decreased because it was very intolerant of pollution which was concentrated from drainage. The use of screening in homes and spraying DDT also became very widespread after World War II.

The *Anopheles quadrimaculatus* mosquito population decreased, access to people decreased, fewer and fewer people became carriers and eventually the malaria pathogen disappeared or reached such low levels that it was rarely present in other host animals. Even though the problem mosquito is still present under suitable habitat conditions, it no longer provides a serious threat because host animals rarely carry the pathogen in their blood. Today, when occasional cases of malaria are reported, it can almost always be traced back to the presence of returning war veterans, foreign travelers or illegal aliens residing temporarily in local communities.

Mosquitoes have always been present in the Basin and will continue to be there. The larvae are an important part of the food chain for many species of fish and wildlife. The adults also serve as important pollinators of plants. Under all Action alternatives, Service biologists would work cooperatively with the State Department of Health and County Health Departments to assist in administering a mosquito monitoring program where Service lands may be involved. The monitoring program will maintain an awareness of potential problems which will lead to actions that control the problem.

4.1.12 County Tax Revenues and Refuge Revenue Sharing Payments

Since all alternatives involve the acquisition of land from willing sellers within approved units of the Refuge Complex, there may be some impact to the area's tax base. The Refuge Revenue Sharing Act of June 15, 1935, as amended, provides for annual payments to counties or the lowest unit of government that collects and distributes taxes based on acreage and value of National Wildlife Refuge System lands located within the county. The monies for these payments come from two sources: (1) net receipts from the sale of products from National Wildlife Refuge System lands (oil and gas leases, timber sales, grazing fees, etc.) and (2) annual Congressional appropriations. Annual Congressional appropriations, as authorized by a 1978 amendment, were intended to make up the difference between the net receipts from the Refuge Revenue Sharing Fund and the total amount due to local units of government. Annual payments are calculated based on which of the following formulas, as set out in the Act, provides the largest return: (1) \$.75 per acre; (2) 25 percent of the net receipts collected from refuge lands in the county; or (3) three-quarters of 1 percent of the appraised value. In Illinois, 3/4 of 1 percent of the appraised value always brings the greatest return to the taxing bodies. Using this method, lands are re-appraised approximately every 5 years to reflect current market values.

While the Service does not pay taxes, it does make an annual Refuge Revenue Sharing payment to the counties where Service-owned land is present. Since these payments are based on land value, an acre of land valued at \$1,000 would generate a \$7.50 payment each year, or \$7,500 per million of land value (at full entitlement). In the counties where the Refuge Complex holds land, Refuge Revenue Sharing payments at full entitlement are roughly equal to or exceed what taxes would be if lands had remained in private ownership. As such, there would be minimal tax consequences to the

counties as a result of Service acquisition of land. In recent years, Revenue Sharing payments have fallen short of full entitlement.

4.1.13 Climate Change

The increase of carbon within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. 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."

The land is a tremendous force in carbon sequestration. Terrestrial biomes of all sorts are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric carbon monoxide. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. Preserving natural habitat for wildlife is the heart of any long range plan for national wildlife refuges. The actions proposed in all alternatives in this document would preserve or restore land and water, and would enhance carbon sequestration. Since Alternative 3 has the greatest potential for restoration and conservation of land, this alternative would have the greatest positive effect on carbon sequestration, especially through the development of grasslands and forest cover. All of the habitat management actions in this document (regardless of alternative) would positively contribute toward efforts to mitigate human-induced global climate changes.

4.1.14 Environmental Justice

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

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

Within the spirit and intent of Executive Order 12898, no minority or low income populations would be impacted by any Service action under any Alternative.

4.1.15 Archaeological and Cultural Resource Values

Under all alternatives, where acquisition and management of land would occur, the Service would take into consideration impacts on historic properties and other cultural resources (e.g., activities, projects, and uses). Nevertheless, some loss could still occur. Any development (e.g., dikes, roads, buildings, etc.) would only be carried out after a thorough review or survey of possible cultural resources likely to be disturbed, and plans for avoidance or minimizing impacts are in place. The Service will inform state Historic Preservation Officers of any acquisition of lands and structures. Structures considered to meet the criteria for the National Register will be maintained until the Service's Regional Historic Preservation Officer can complete an evaluation and appropriate

mitigation is accomplished. Buildings and other structures will be maintained until the Service can consider how the historic property can be retained and used for Refuge purposes.

A description of undertakings for all Refuge Complex land would be provided by the Refuge Complex Manager to the Regional Historic Preservation Officer who will analyze the undertaking for potential effects on historic properties. The Refuge Complex Manager will inform the Regional Historic Preservation Officer of each undertaking during early planning. The Regional Historic Preservation Officer will enter into consultation with state Historic Preservation Officers and other parties as appropriate. No undertakings will proceed until the Section 106 process is complete. Also, the Refuge Complex Manager will, with the assistance of the Service's Regional Historic Preservation Officer, develop a program for conducting Section 110 inventory surveys, and will attempt to obtain funding for those surveys. The Refuge Complex Manager will similarly involve the Regional Historic Preservation in other cultural resources issues on the Refuge Complex.

4.2 Alternative 1 – No Action

4.2.1 Wildlife Management Issues

4.2.1.1 Listed Species

Populations of listed species are expected to remain stable or increase under this alternative. Periodically lowering water levels on large impoundments to benefit migrating waterfowl would lower populations of fish used as food by nesting Bald Eagles. Bald Eagles primarily use the Refuge as a wintering ground and benefit from increased numbers of prey (waterfowl) produced by these same management actions. The decurrent false aster is expected to be protected from human disturbance by physical barriers that will restrict vehicle and foot traffic. No impacts are anticipated for other federally listed species.

4.2.1.2 Migratory Birds

Under this alternative, 200 acres of native grassland, 4,500 acres of native forest, and 6,000 acres of wetlands would be protected and managed on the Refuge Complex. This is expected to produce 50 breeding pairs of dabbling ducks, 550,000 goose use-days during spring and fall migration, and 1,400 Wood Ducks. Restoration, protection, and management of upland and lowland habitats on the Refuge Complex would improve conditions for many nesting and migrating waterfowl and songbirds, and contribute to the long-term recovery of some neotropical migrant populations.

As more grasslands are established, nesting success would increase as birds disperse their nests over a larger area, thus creating a larger area that predators must search. Additional resting and feeding habitats (wetlands) would disperse staging birds over a larger area and decrease the chance of catastrophic accident or disease, such as avian botulism. Additional feeding habitats on the Refuge Complex would help ensure that migrating ducks arrive on wintering areas and on their northern breeding grounds in better reproductive condition.

4.2.1.3 Fish and Mussels: Diversity and Disease

Native fish and mussel habitat and populations are likely to continue to decline under this alternative. No change is expected in biological diversity and abundance. Wildlife depredation would remain at its present low levels, and be handled on a case-by-case basis. A project to improve water level manipulation on Lake Chautauqua soon will be completed, and will help in reducing conditions favorable to avian botulism.

4.2.2 Habitat Management Issues

Existing wetland, forest, and grassland habitats would be maintained, but quality may be degraded by increased presence of exotic and nuisance species. Populations of wildlife associated with these habitats are expected to remain stable.

The Service will pursue purchasing lands from willing sellers where drainage is affected by oxbow habitat restoration.

Sedimentation of the Illinois River Corridor would continue at present levels.

4.2.3 Visitor Services Management Issues

Recreational opportunities would remain at present levels, but facilities would be improved to meet safety standards. Public awareness of the Refuge Complex and its mission likely would be unchanged.

The quality of waterfowl hunting would remain at present levels. The Refuge Complex would continue to be managed to provide sanctuary and food for migrating waterfowl. This would not include management practices intended to prolong the stay of migrating waterfowl, such as manipulating pools to delay ice formation.

4.3 Alternative 2 – Refuge Focus

4.3.1 Wildlife Management Issues

4.3.1.1 Listed Species

Populations of listed species are expected to remain stable or increase under this alternative. Periodically lowering water levels on large impoundments to benefit migrating waterfowl would lower populations of fish used as food by nesting Bald Eagles. Bald Eagles primarily use the Refuge as a wintering ground and benefit from increased numbers of prey (waterfowl) produced by these same management actions. The decurrent false aster is expected to be protected by physical barriers and its population to remain stable or increase. Forest restoration would improve habitat conditions for the Indiana bat within the Refuge Complex, and encourage colonization. There would be increased knowledge of the status and distribution of listed species through inventory and assessment done in cooperation with state and federal biologists. No impacts are anticipated for other federally listed species.

4.3.1.2 Migratory Birds

Under this alternative, 1,000 acres of native grassland, 200 acres of native savanna, 6,000 acres of native forest, and 10,000 acres of wetlands would be protected and managed on the Refuge Complex. This is expected to increase the number of dabbling ducks from its current level of 50 breeding pairs to 200 breeding pairs, and diving ducks to 20 breeding pairs. It would maintain 550,000 goose use-days during spring and fall migration. Restoration, protection, and management of additional upland and lowland habitats on the Refuge Complex would improve conditions for many nesting and migrating waterfowl and songbirds, and contribute to the long-term recovery of some neotropical migrant populations beyond levels in Alternative 1. The diversity and breeding pair populations of grassland, savanna, forest, and wetland bird species of concern are expected to increase.

As more grasslands are established, nesting success would increase as birds disperse their nests over a larger area, thus creating a larger area that predators must search. Additional resting and feeding habitats (wetlands) would disperse staging birds over a larger area and decrease the chance of catastrophic accident or disease, such as avian botulism. Additional feeding habitats on

the Refuge Complex would help ensure that migrating ducks arrive on their northern breeding grounds in better reproductive condition.

4.3.1.3 Fish and Mussels: Diversity and Disease

Native fish and mussel habitat and populations are expected to increase, and aquatic nuisance species to decrease under this alternative. Biological diversity and abundance are expected to increase as native habitats are restored, exotic and invasive species are controlled or eliminated, and additional lands are acquired. Wildlife depredation would remain at its present low levels, and be handled on a case-by-case basis. A project to improve water level manipulation on Lake Chautauqua soon will be completed, and will help in reducing conditions favorable to avian botulism.

4.3.2 Habitat Management Issues

Within the Refuge Complex, grassland, savanna, forest, and wetland habitats would be increased beyond existing levels. Degradation of these habitats would be slowed through control of exotic and nuisance species. Populations of wildlife associated with these habitats are expected to increase above levels in Alternative 1.

The Service will pursue purchasing lands from willing sellers where drainage is affected by oxbow habitat restoration.

Sedimentation of the Illinois River Corridor would continue at present levels.

4.3.3 Visitor Services Management Issues

Opportunities for wildlife dependent recreation would increase above present levels. Recreational facilities would be improved to meet safety and accessibility standards. Increased outreach activities would improve visibility and knowledge of the Refuge Complex and its mission within local communities beyond levels in Alternative 1.

The quality of waterfowl hunting likely would improve because of increased amounts of restored and protected habitats. The Refuge Complex would continue to be managed to provide sanctuary and food for migrating waterfowl. This would not include management practices intended to prolong the stay of migrating waterfowl, such as manipulating pools to delay ice formation.

4.4 Alternative 3 – Refuge Resource Area Focus (Preferred Alternative)

4.4.1 Wildlife Management Issues

4.4.1.1 Listed Species

Populations of listed species are expected to remain stable or increase under this alternative. Periodically lowering water levels on large impoundments to benefit migrating waterfowl would lower populations of fish used as food by nesting Bald Eagles. Bald Eagles primarily use the Refuge as a wintering ground and benefit from increased numbers of prey (waterfowl) produced by these same management actions. The decurrent false aster is expected to be protected by physical barriers and its population to remain stable or increase. Forest restoration would improve habitat conditions for the Indiana bat within the Refuge Complex, and encourage colonization. There would be increased knowledge of the status and distribution of listed species through inventory and assessment done in cooperation with state and federal biologists. No impacts are anticipated for other federally listed species.

We conducted a Section 7 review concurrent with the review of the draft CCP. The Section 7 review examined the proposed actions of the preferred alternative.

4.4.1.2 Migratory Birds

Under this alternative, 1,000 acres of native grassland, 200 acres of native savanna, 6,000 acres of native forest, and 10,000 acres of wetlands would be protected and managed on the Refuge Complex. This is expected to increase the number of dabbling ducks from its current level of 50 breeding pairs to 200 breeding pairs, and diving ducks to 20 breeding pairs. It would maintain 550,000 goose use-days during spring and fall migration. Restoration, protection, and management of additional upland and lowland habitats on the Refuge Complex would improve conditions for many nesting and migrating waterfowl and songbirds, and contribute to the long-term recovery of some neotropical migrant populations beyond levels in Alternative 1 and the same as Alternative 2. The diversity and breeding pair populations of grassland, savanna, forest, and wetland bird species of concern are expected to increase.

As more grasslands are established, nesting success would increase as birds disperse their nests over a larger area, thus creating a larger area that predators must search. Additional resting and feeding habitats (wetlands) would disperse staging birds over a larger area and decrease the chance of catastrophic accident or disease, such as avian botulism. Additional feeding habitats on the Refuge Complex would help ensure that migrating ducks arrive on their northern breeding grounds in better reproductive condition.

4.4.1.3 Fish and Mussels: Diversity and Disease

Native fish and mussel habitat and populations are expected to increase, and aquatic nuisance species to decrease under this alternative. Biological diversity and abundance are expected to increase as native habitats are restored, exotic and invasive species are controlled or eliminated, and additional lands are acquired. Increased connectivity of Refuge Complex habitats with those in surrounding Refuge Focus Areas also are expected to increase biological diversity and abundance beyond levels in Alternatives 1 and 2. Wildlife depredation would remain at its present low levels and be handled on a case-by-case basis. A project to improve water level manipulation on Lake Chautauqua soon will be completed, and will help in reducing conditions favorable to avian botulism.

4.4.2 Habitat Management Issues

Within the Refuge Complex, restoration and protection of grassland, savanna, forest, and wetland habitats would be increased beyond existing levels. Additional acres of grassland, savanna, and forest habitats would be restored on lands within the Refuge Focus Areas. Degradation of these habitats would be slowed through control of exotic and nuisance species on the Refuge Complex and increased conservation efforts within Refuge Focus Areas. Populations of wildlife associated with these habitats are expected to increase above levels in Alternatives 1 and 2.

The Service will pursue purchasing lands from willing sellers where drainage is affected by oxbow habitat restoration.

Sedimentation of the Illinois River Corridor would decrease slightly below present levels because of conservation efforts within the Refuge Focus Areas.

4.4.3 Visitor Services Management Issues

Opportunities for wildlife dependent recreation would increase above present levels. Recreational facilities would be improved to meet safety and accessibility standards. Increased outreach activities as well as conservation efforts within Refuge Focus Areas would improve visibility and knowledge of the Refuge Complex and its mission within local communities beyond levels in Alternatives 1 and 2.

The quality of waterfowl hunting likely would improve because of increased amounts of restored and protected habitats. The Refuge Complex would continue to be managed to provide sanctuary and food for migrating waterfowl. This would not include management practices intended to prolong the stay of migrating waterfowl, such as manipulating pools to delay ice formation.

4.5 Cumulative Effects

Cumulative effects (or impacts) are those effects on the environment resulting from incremental consequences of the alternatives when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these actions. Accurately summarizing cumulative effects is difficult in that while one action increases or improves a resource in an area, other unrelated actions may decrease or degrade that resource in another area.

Over many years the cumulative effects of wetland drainage, conversion of native prairies into crop land, and the clearing of bottomland forests and savannas have been severe on listed species, waterfowl and other migratory birds, and native biological diversity, both at the local, state, and national levels.

Of the estimated 221 million acres of wetland habitat present in the lower 48 states at the time of colonial America, only 103 million acres remain (47 percent). Draining, dredging, filling, leveling, and flooding have reduced wetlands by 50 percent or more in 22 states, and 10 states have lost 70 percent or more (Dahl 1990). The recent trend in wetland loss across America developed in three phases. From the 1950s to the mid-1970s, agricultural conversions accounted for 87 percent of all wetland losses. Much of this drainage work was subsidized with Federal funds to encourage increased production of commodity crops. From the mid-1970s to the mid-1980s, wetland losses were more evenly distributed between agricultural land use and “other” land use with agriculture accounting for an estimated 54 percent of wetland losses. During this period, the average annual loss of wetlands was approximately 290,000 acres (Dahl, 1991). Since the mid-1980s, indications are that wetland losses are slowing due to programs protecting wetlands and a growing public recognition of the values of wetlands.

Of the 8,212,000 acres of wetlands that existed in Illinois, only 15 percent remain. With intensifying agriculture, rapidly expanding urban pressures, and increasing industrialization, the quantity of high quality wetland habitat continues to decline in Illinois. The total wetlands in the Illinois River Corridor prior to European settlement was approximately 350,000 acres. Less than 170,000 acres remain, primarily due to drainage for development. State and federal management areas protect approximately 16,500 acres of palustrine-type wetlands. Another 16,000-plus acres are estimated to be protected by private hunt clubs, many of which have the ability to manage water levels and provide waterfowl feeding and resting functions. Environmental Management Program (HREP) funding over the past 6 years within this area has exceeded \$29 million. Funds are approved and construction is scheduled on two sites, estimated at \$6 million, and planning is under way on another \$10 million of work, all of which will greatly enhance the quality of foraging habitat for migrating waterfowl within the Illinois River Valley.

The original tallgrass prairie, which extended from western Indiana to the eastern part of Kansas, Nebraska, and North and South Dakota and south to Oklahoma and Texas, has been virtually eliminated throughout its historic range. Recent surveys suggest that 82.6 to 99.9 percent declines in the acreage of tallgrass prairie have occurred in 12 states and one Canadian province since European settlement. By 1976, less than 1/100th of one percent, or 2,352 acres, of high-quality original prairie remained in the Prairie State, and four of every five that remained were less than 10 acres in size (Illinois DNR, 1994). Loss of prairie within project area combined with changes in natural processes have had negative consequences for many grassland plants and associated animals.

Prior to European settlement, oak savanna covered approximately 27-32 million acres of the Midwest (Nuzzo 1985). This same author indicates that in 1985, only 113 sites (2,607 acres) of high-quality oak savanna remained. Nationwide, over 99 percent of the original savanna has been lost, and mid-western oak savannas are among the rarest ecosystems in the Nation. The once widespread oak savannas have become one of the nation's more endangered ecosystems (Noss et al. 1995). Development has destroyed, fragmented, and disrupted natural processes needed to maintain quality oak savanna ecosystems. Currently, there are remnants of low quality savanna within and around the Refuge Complex. The long-term effect of landscape-scale loss of savanna has yet to be determined.

The consequences of intensive conversion of wetlands, prairies, and oak savannas has resulted in declines in migratory birds populations, water quality degradation in lakes, rivers, and the Gulf of Mexico, and probable increased flood frequency and intensity along mainstem rivers and their major tributaries.

For years following the initial conversion of native Midwestern prairies, many prairie-dependent wildlife species remained relatively stable through their ability to colonize agricultural grasslands. However, 20th century agricultural grassland loss has followed a similar path of decline as native prairie loss in the 19th century. In many parts of the Midwest, agricultural grasslands are at their lowest level in more than 100 years

Consequently, grassland-dependent birds have shown steeper, more consistent, and geographically more widespread declines (25-65 percent) than any other group of North American birds (Samson and Knopf 1994). Other grassland associated mammals, insects, and microorganisms are threatened with a similar fate. Currently there are 55 grassland species in the U.S. considered threatened or endangered (Samson and Knopf 1994). Species experiencing serious declines that utilize the Refuge include the Bobolink, Henslow's Sparrow, Grasshopper Sparrow, Vesper Sparrow, Savannah Sparrow, Lark Sparrow, Field Sparrow, Dickcissel, Eastern Meadowlark, and American Bittern. All of the alternatives have the potential to reverse many of the above mentioned population declines (at least locally) for many bird species by restoring and managing additional wetlands, prairies, and oak savanna habitat within the Refuge Complex, and Illinois River Focus Areas (Alternative 3 only).

All of the alternatives offer opportunities for additional actions relating to the protection, restoration, and management of habitat for the benefit of Service trust resources. These other actions, if initiated by other federal agencies, the state, local communities, non-governmental organizations or private individuals, could be coordinated with the Service through cooperative agreements, mutual aid agreements, matching challenge grants, etc. or through technical assistance between cooperators. Typical cumulative actions that could be taken by these other entities include the acquisition of land in fee title, acquisition of conservation easements or access rights-of-way, protection of water quality, cleanup of contaminants, implementation of various agricultural management practices and techniques, management of private lands for wildlife and timber stand improvement through county and state programs, protection of endangered species through the Endangered Species Act and state laws and regulations, management of resource uses by the states and non-governmental organizations, management of non-game species by the state, predator and damage control by USDA's Animal and Plant Health Inspection Service and the state, implementation of grants through the Endangered Species Act, Federal Clean Water Act, Federal Reclamation Act and to the state through the Federal Aid in Fish and Wildlife Restoration Program and to private landowners through the Service's Partners for Wildlife program, to name a few. These cooperative actions are all possible, and the chances for initiating any of these cooperative actions by others may increase by the mere presence of the Refuge and Refuge staff in the area.

In the final analysis, the integrity of the natural resource values encompassed within the state and country (all inclusive) will depend on actions taken by others. Refuge Complex land is a small portion of the total acreage within the state and nation.

Cumulative effects on property taxes paid to the local taxing bodies (townships, county, school districts) by the Service and others would likely be neutral (or even slightly positive) since the taxing bodies have discretion in adjusting their revenue stream in order to account for their expenses. While the Service does not pay taxes, it does make an annual Refuge Revenue Sharing payment to the counties where Service-owned land is present. Since these payments are based on land value, an acre of land valued at \$1,000 would generate a \$7.50 payment each year, or \$7,500.00 per million of land value (at full entitlement). In the counties where the Refuge Complex own land, refuge revenue sharing payments at full entitlement roughly equal what taxes would be if lands had remained in private ownership.

Further, the presence of a national wildlife refuge is often considered an asset to an area contributing to the quality of life. Not only does it offer public recreation potential and greatly enhance the educational opportunities of the local schools, it serves as an attraction for people looking to relocate from urban areas. Therefore it can be expected that as more people relocate to the county (due in part to the presence of a Refuge), taxable real estate such as new homes, hobby farms, and other land improvements will increase, thereby increasing the local private property tax base.

As natural habitats in the area are destroyed and fragmented into smaller parcels by new development activities, acquisition and management of land as a national wildlife refuge will represent a compensating factor to make up for the loss. Long-term environmental benefits would be gained from habitat protection and enhancement resulting from Service activities in this area. Biodiversity, including numbers and variety of non-game species, would be enhanced. As more of the area becomes protected and managed, the more important and recognized it will become for natural resource values and as a special place for people to find enjoyment and educational benefits.

The trend in demand for wildlife-dependent recreation (e.g., wildlife observation) is expected to continue into the foreseeable future, due in part to the increasing population of retirement-age Americans. As the number of visitors to the Refuge Complex increases, private enterprises would be likely to develop support facilities and services such as campgrounds, motels, restaurants, sporting goods stores, etc. to meet the increased demand. Visits to the Refuge Complex could result in additional on-site facilities such as a visitor center, parking areas, trails, observation towers, etc. These new facilities both on and off site could reduce available habitat and create localized damage to vegetation, soil compaction and erosion, while increasing the chance of wildlife disturbance and disturbance to other visitors. These potential negative effects could be minimized through careful planning and management. Popular activities on site-specific areas could be controlled to reduce impacts through proper design, site selection and construction technique or by restructuring participation through registration and fee systems. Although control of development would be exercised on Refuge land, off-site development would be controlled by other state and federal regulations such as the Clean Water Act.

Restoration of cropland found in existing Refuge units to wildlife habitat would have minimal effects on total county employment, population, and the unemployment rate. Willing seller landowners would be appropriately compensated while their employees, suppliers and brokers could experience some income reduction. Cumulative loss of crop land in any county area due to refuge development and other things such as road construction, commercial and residential development, and other factors would not jeopardize the agriculture infrastructure in any county.

Table 3: Summary of Consequences

Environmental Issue	Alternative 1 No Action	Alternative 2 Refuge Focus	Alternative 3 Refuge/Resource Area Focus
WILDLIFE MANAGEMENT ISSUES			
Protect listed species	<ul style="list-style-type: none"> ■ No change 	<ul style="list-style-type: none"> ■ Indiana bats encouraged to colonize on Refuge Complex through forest restoration ■ More knowledge of listed species through increased inventory and assessment in the river corridor 	<ul style="list-style-type: none"> ■ Same as Alternative 2
Perpetuate waterfowl and other migratory birds	<ul style="list-style-type: none"> ■ No change—50 breeding pairs of dabbling ducks ■ 550,000 goose use-days during spring and fall migration 	<ul style="list-style-type: none"> ■ 200 breeding pairs of dabbling ducks ■ 20 breeding pairs of diving ducks; 550,000 goose use-days during spring and fall migration ■ increased species diversity and breeding pairs of grassland, oak savanna, forest, and wetland bird species 	<ul style="list-style-type: none"> ■ Same as Alternative 2
Recover native fish and mussels	<ul style="list-style-type: none"> ■ No change 	<ul style="list-style-type: none"> ■ Fish and mussels benefit from aquatic nuisance control, monitoring, and restoration efforts 	<ul style="list-style-type: none"> ■ Same as Alternative 2

Table 3: Summary of Consequences (Continued)

Environmental Issue	Alternative 1 No Action	Alternative 2 Refuge Focus	Alternative 3 Refuge/Resource Area Focus
Safeguard biological integrity, diversity, and environmental health	<ul style="list-style-type: none"> ■ No change 	<ul style="list-style-type: none"> ■ Increase due to forest conversion, control of exotic and invasive plants, continued land acquisition 	<ul style="list-style-type: none"> ■ Greatest increase due to forest conversion, control of exotic and invasive plants, continued land acquisition, increased connectivity of lands, and greater conservation efforts in the focus areas
Wildlife are creating crop depredation	<ul style="list-style-type: none"> ■ Wildlife depredation is not severe or widespread and is dealt with on a case by case basis. 	<ul style="list-style-type: none"> ■ Same as Alternative 1 	<ul style="list-style-type: none"> ■ Same as Alternative 1
Avian botulism as a problem on Lake Chautauqua	<ul style="list-style-type: none"> ■ Project to alleviate this problem is underway and will be complete prior to completion of CCP. 	<ul style="list-style-type: none"> ■ Same as Alternative 1 	<ul style="list-style-type: none"> ■ Same as Alternative 1
HABITAT MANAGEMENT ISSUES			
Loss of wetlands	<ul style="list-style-type: none"> ■ Existing wetlands maintained 	<ul style="list-style-type: none"> ■ 4,000 more acres of wetland restored and managed on the Refuge complex 	<ul style="list-style-type: none"> ■ Same as Alternative 2
Loss of native forest	<ul style="list-style-type: none"> ■ Existing forest maintained 	<ul style="list-style-type: none"> ■ 1,500 more acres of native forest restored and managed on the Refuge Complex 	<ul style="list-style-type: none"> ■ 2,500 more acres of native forest restored and managed on Refuge Complex and in the Focus Areas
Loss of native grasslands	<ul style="list-style-type: none"> ■ Existing grasslands maintained 	<ul style="list-style-type: none"> ■ 800 more acres of grasslands restored and managed on the Refuge Complex 	<ul style="list-style-type: none"> ■ 1,180 more acres of grasslands restored and managed on Refuge Complex and in the Focus Areas

Table 3: Summary of Consequences (Continued)

Environmental Issue	Alternative 1 No Action	Alternative 2 Refuge Focus	Alternative 3 Refuge/Resource Area Focus
Loss of native savanna	<ul style="list-style-type: none"> No change—no savanna on the Refuge Complex 	<ul style="list-style-type: none"> 200 acres of savanna created and restored on the Refuge Complex 	<ul style="list-style-type: none"> 400 acres of savanna created and protected on Refuge Complex and in the Focus Areas
Habitat is being degraded	<ul style="list-style-type: none"> Degradation continues at current rate 	<ul style="list-style-type: none"> Degradation is slowed through increased control of exotic and nuisance species on the Refuge Complex 	<ul style="list-style-type: none"> Degradation is slowed the greatest amount through increased control of exotic and nuisance species on the Refuge Complex and increased conservation efforts in the Focus Areas
Oxbow restoration on Emiquon NWR is affecting drainage on local land	<ul style="list-style-type: none"> The Service will pursue purchasing affected lands from willing sellers. 	<ul style="list-style-type: none"> Same as Alternative 1 	<ul style="list-style-type: none"> Same as Alternative 1
Sedimentation is filling in areas in Illinois River Corridor	<ul style="list-style-type: none"> Sedimentation will be unchanged. 	<ul style="list-style-type: none"> Same as Alternative 1 	<ul style="list-style-type: none"> Sedimentation will decrease slightly due to work within Focus Areas
VISITOR SERVICES MANAGEMENT ISSUES			
Recreational opportunities identified by the public	<ul style="list-style-type: none"> No change in recreational opportunities 	<ul style="list-style-type: none"> More opportunities for wildlife-dependent recreation on the Refuge Complex. Approximately 4,000 more acres open to hunting; more bank fishing and a boat ramp; auto-tour route open more with more pull-outs; more interpretive signs and materials. 	<ul style="list-style-type: none"> Same as Alternative 2

Table 3: Summary of Consequences (Continued)

Environmental Issue	Alternative 1 No Action	Alternative 2 Refuge Focus	Alternative 3 Refuge/Resource Area Focus
Recreational facilities need improvement for safety and universal accessibility	<ul style="list-style-type: none"> ■ Improvement of facilities to meet safety standards. 	<ul style="list-style-type: none"> ■ Safety standards met and increased opportunities due to increases in accessible hunting blinds and bank fishing facilities 	<ul style="list-style-type: none"> ■ Same as Alternative 2
Refuge Complex needs increased visibility and understanding of its mission	<ul style="list-style-type: none"> ■ No change 	<ul style="list-style-type: none"> ■ Increased knowledge of the Refuge Complex among local communities due to increased outreach 	<ul style="list-style-type: none"> ■ Greatest increase in knowledge of the Refuge complex among local communities and landowners due to increased outreach and activities in the Focus Areas
The quality of waterfowl hunting in the area is seen as a function of management on the Refuge Complex.	<ul style="list-style-type: none"> ■ Service policy is to avoid management practices, such as manipulating pools to delay ice formation, intended to prolong the stay of migrating waterfowl. The Refuge Complex will be managed to provide sanctuary and food for migrating waterfowl consistent with this policy. 	<ul style="list-style-type: none"> ■ Same as Alternative 1 	<ul style="list-style-type: none"> ■ Same as Alternative 1
Other Issues			
Fire Management	<ul style="list-style-type: none"> ■ Fire managed for minimal impact from smoke and ground disturbing activities. 	<ul style="list-style-type: none"> ■ Same as Alternative 1 	<ul style="list-style-type: none"> ■ Same as Alternative 1
Cultural Resources	<ul style="list-style-type: none"> ■ Impacts of management activities minimized through reviews and surveys. 	<ul style="list-style-type: none"> ■ Same as Alternative 1 	<ul style="list-style-type: none"> ■ Same as Alternative 1

Table 3: Summary of Consequences (Continued)

Environmental Issue	Alternative 1 No Action	Alternative 2 Refuge Focus	Alternative 3 Refuge/Resource Area Focus
Environmental Justice	■ No minority or low-income populations will be disproportionately impacted.	■ Same as Alternative 1	■ Same as Alternative 1
Climate Change	■ Positive contributions toward mitigating human-induced global climate change.	■ More positive contributions toward mitigating human-induced global climate change.	■ Most positive contributions toward mitigating human-induced global climate change.

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Chapter 7: Glossary of Terms

<i>Alluvial</i>	Of and/or relating to river and stream deposits
<i>Amphibian</i>	A class of carnivorous, ectotherms (body temperature regulated by outside heat sources) whose living members have a moist, glandular skin that is permeable to water and gases. Most amphibians have a well-defined aquatic, larval stage in their life cycle and then undergo metamorphosis into adults. Depending on the species, adults may occupy aquatic or terrestrial habitats. Frogs, toads, and salamanders are examples.
<i>Biological Diversity</i>	The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur.
<i>Biological Integrity</i>	Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.
<i>Biomass</i>	The weight of all life in a specified unit of environment or an expression of the total mass or weight of a given population, both plant and animal.
<i>Bloom</i>	A readily visible concentrated growth or aggregation of plankton (plant and animal).
<i>Community</i>	All the groups of organisms living together in the same area, usually interacting or depending on each other for existence.
<i>Cumulative Effects</i>	Those effects on the environment that result from the incremental effect of the action when added to the past, present, and reasonable foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.
<i>Dissolved Oxygen</i>	Amount of oxygen dissolved in water.
<i>Drainage Basin</i>	An area mostly bound by ridges or other similar topographic features, encompassing part, most, or all of a watershed.
<i>Ecology</i>	The study of the relations between organisms and the totality of the biological and physical factors affecting them or influenced by them.
<i>Ecological Integrity</i>	The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions.

<i>Ecosystem</i>	An ecological system; the interaction of living organisms and the nonliving environment producing an exchange of materials between the living and nonliving.
<i>Ecosystem Approach</i>	A strategy or plan to manage ecosystems to provide for all associated organisms, as opposed to a strategy or plan for managing individual or clusters of species.
<i>Ecosystem Management</i>	Management of an ecosystem that includes all ecological, social, and economic components which make up the whole of the system.
<i>Effects</i>	Effects, impacts, and consequences, as used in the environmental assessment, are synonymous. Effects may be direct, indirect, or cumulative.
<i>Endangered Species</i>	Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.
<i>Environmental Analysis</i>	An analysis of alternative actions and their predictable short-term and long-term environmental effects, incorporating physical, biological, economic, and social considerations.
<i>Environmental Assessment</i>	A systematic analysis of site-specific or programmatic activities used to determine whether such activities have a significant effect on the quality of the physical, biological, and human environment and whether a formal environmental impact statement is required; and to aid an agency's compliance with the National Environmental Policy Act when no environmental impact statement is necessary.
<i>Environmental Health</i>	Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.
<i>Eutrophication</i>	The intentional or unintentional enrichment of water.
<i>Fauna</i>	All the animals of a particular region or a particular era.
<i>Flora</i>	All the plants of a particular region or a particular era.
<i>Food Chain</i>	The dependence of organisms upon others in a series of food. The chain begins with plants or scavenging organisms and ends with the largest carnivores.
<i>Goals</i>	Broad statements of direction; end results or positions to be achieved.
<i>Hardness</i>	A measurement of the content of dissolved calcium and magnesium in water.
<i>Historic Conditions</i>	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.

<i>Hydrology</i>	The science of water in the hydrological cycle, the sun-driven movement of water between aquatic and terrestrial environments and the atmosphere, including evapotranspiration, condensation, precipitation, and runoff.
<i>Impoundment</i>	A natural or artificial body of water that is held back by a dam.
<i>Interdisciplinary Team</i>	A group of individuals with varying areas of expertise assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and propose action.
<i>Invertebrate</i>	An animal without a backbone or internal bony skeleton. Insects, crustaceans, worms, corals, and molluscs are examples.
<i>Mesic</i>	Describing an environment having moderate rainfall and moderately moist, well-drained soils. Mesic plants are those that require moisture.
<i>Monitoring</i>	A process of collecting information to evaluate if an objective and/or anticipated or assumed results of a management plan are being realized (effectiveness monitoring) or if implementation is proceeding as planned (implementation monitoring).
<i>National Environmental Policy Act</i>	An Act passed by the U.S. Congress in 1969 to declare a national policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts that prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the nation, and establishes a Council on Environmental Quality.
<i>Native</i>	With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.
<i>Natural Conditions</i>	Conditions thought to exist from the end of the Medieval Warm Period to the advent of the industrial era (app. 950AD to 1800AD), based upon scientific study and sound professional judgement.
<i>Objectives</i>	Intermediate-term targets necessary for the satisfaction of Refuge goals; quantifiable measures that serve as indicators against which attainment, or progress toward attainment, of goals can be measured.
<i>pH</i>	A measure of the relative concentration of hydrogen ions in a solution; indicating the acidity or alkalinity of the solution. A pH value of 7 indicates a neutral solution; values that are greater than 7 are basic, and those below 7 are acidic. Vinegar has a pH of 3; ocean water has a pH of approximately 8.
<i>Reptile</i>	A class of vertebrates whose skin is dry, lacking in glands, and covered with scales. Claws are present and skull, limb bones, vertebrae, muscles, and so forth are stronger and more advanced than those of amphibians.

Egg fertilization is internal, there is no larval stage, and eggs have a protective, hard shell.

<i>Riparian Area</i>	A geographic area containing an aquatic ecosystem and the adjacent upland areas that directly affects it. This includes floodplain, and associated woodland, rangeland, or other related upland areas. Pertaining to the banks of streams, lakes, wetlands, or tidewater.
<i>Riparian Zones</i>	Terrestrial areas where the vegetation complex and micro-climate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.
<i>Savanna</i>	A community that was historically bordered by the prairies of the west and the deciduous forests of the east. It is a community type that falls in the middle of a continuum from prairie to forest. Savannas characteristically have less than 50 percent tree crown cover.
<i>Sedge</i>	A grass-like plant, usually having a three-sided stem and clearly three-ranked leaves. The pistil, a female flower part, is surrounded by a sac-like or flask-shaped structure called the <i>perygium</i> .
<i>Sedimentation</i>	The settling-out or deposition of suspended materials.
<i>Sensitive Species</i>	Those plant or animal species for which population viability is a concern as evidence by a significant current or potential downward trend in population numbers, distribution, density, or habitat capability.
<i>Species Richness</i>	The number of different species in a given area.
<i>Stakeholder</i>	Any group or individual who is affected by or who can affect the future of the Refuge.
<i>Step-Down Management Plans</i>	Tactical plans that describe in detail specific strategies and implementation schedules for management functions (e.g., habitat management, public use, fire, safety, etc).
<i>Strategic Framework</i>	A pattern of purposes, policies, programs, actions, decisions, or resource allocations that describe what the Refuge is, what it does, and why it does it.
<i>Strategies</i>	Step-down approaches that could be used to meet Refuge goals and objectives; provide direction for defining and coordinating operational tasks to effectively perform the Refuge's purpose.
<i>Succession</i>	A gradual change from one community to another and characterized by a progressive change in species structure, an increase in biomass and organic matter accumulation, and a gradual balance between community production and community respiration.

<i>Threatened Species</i>	Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.
<i>Total Dissolved Solids</i>	A measure of the total quantity of dissolved substances contained in water or effluent, including organic matter, minerals, and other inorganic substances.
<i>Viable Population</i>	A viable population is one which has such numbers and distribution of reproductive individuals as to provide a high likelihood that a species will continue to exist and be well-distributed throughout its range.
<i>Warm Season Grasses</i>	A grass that grows most during the warmest seasons of the year.
<i>Watershed</i>	The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a water body.
<i>Watershed Analysis</i>	A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis is a stratum of ecosystem management planning applied to watersheds.
<i>Watershed Restoration</i>	Actions taken to improve the current conditions of a watershed to restore degraded habitat, and to provide long-term protection to natural resources, including riparian, terrestrial, and aquatic resources.
<i>Watershed Treatments</i>	Specific actions or tools to satisfy the goals and objectives of a watershed project. These may include establishing permanent vegetation on sensitive areas within the watershed (riparian buffers, stream bank stabilization, erosion-prone areas); establishing permanent wildlife habitat for dependent species (warm/cool season grasses, wetlands, sediment retention, erosion, or water control structure basins, field/farmstead windbreaks, shelter rows, and winter food plots); and encouraging Best Management Practices (BMP's) on agricultural lands (strip-cropping systems, terraces, diversions, contour farming, cropland protective cover, conservation tillage, feedlot and manure management).

