Crab Orchard National Wildlife Refuge

Comprehensive Conservation Plan (CCP) and Environmental Impact Statement (EIS)

Williamson, Jackson, and Union Counties, Illinois

Proposed action: Adopt and implement a comprehensive conservation plan that will guide management for the next 15 years.

Lead agency: U.S. Department of the Interior, Fish and Wildlife Service

Responsible Official: Robyn Thorson, Regional Director

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Abstract: The National Wildlife Refuge System Improvement Act of 1997 requires the U.S. Fish and Wildlife Service to develop and implement a Comprehensive Conservation Plan for all national wildlife refuges. Five alternative approaches to management, including a Preferred Alternative and a No Action (Current Management) Alternative, were considered for Crab Orchard National Wildlife Refuge. The five alternatives are described and evaluated in the Final EIS. All alternatives would achieve the Refuge's purposes of wildlife conservation, agriculture, recreation, and industry. Under all alternatives, group camps and most non-wildlife dependent recreation would remain; technical rock climbing would be prohibited; a modified recreational fee structure would be implemented; a 14-day camping limit would be instituted; management of sport fish populations would continue; use of prescribed fire would increase; and the agricultural acres would not change by more than 5 percent. All alternatives would maintain necessary food for a significant population of wintering Canada Geese. Alternative A would continue the present course of management. Alternative B would reduce habitat fragmentation and emphasize wildlife-dependent recreation. A land exchange with Southern Illinois University would be a significant part of this alternative. Alternative C would emphasize management of open lands and consolidate and improve recreation facilities. Alternative D would emphasize management of forest lands and consolidate and improve recreation facilities. Alternative E, the preferred alternative, would reduce habitat fragmentation and consolidate and improve recreation facilities. Conflicts among water users would be addressed by increasing areas designated as no-wake zones and better enforcement of current use zoning regulations. The quality of campgrounds and marinas would be increased by consolidating and improving them. The agricultural program would remain pretty much intact and its economic effect continued. The industrial program would continue to support the munitions manufacturing industry. By encouraging other industries to locate in nearby industrial parks, the economic effect of the industry would remain in the local economy, and the needs of the industry would be met more efficiently. With goal, objective, and strategies formalized to better improve communication between the Refuge and the community, we would do a better job of talking with and listening to the community.

Reader's Guide

The U. S. Fish and Wildlife Service is required to prepare and then manage Crab Orchard National Wildlife Refuge (NWR) consistent with a Comprehensive Conservation Plan (CCP). The CCP provides 15 years of guidance for Refuge management and boundary modification. The CCP also provides a framework for adaptive management through the steps of implement, monitor, evaluate, and revise. Step-down plans will be required to provide additional details as certain programs outlined in the CCP are implemented.

This document combines both a Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS). The next step in the planning process is a decision by the Regional Director, Midwest Region, U.S. Fish and Wildlife Service, Fort Snelling, Minnesota, on which alternative in the Final EIS will become the final management plan for the Refuge. This decision is made after a required 30-day minimum waiting period and recorded in a formal Record of Decision. A decision is expected in late September.

We will then publish a stand-alone CCP made up of Chapter 1, the selected alternative from Chapter 2, Chapters 3, 5, 6 and the appendices. The three most important Appendices to review in this draft include Appendix A: Goals, Objectives, Strategies, and Implementation, Appendix J: Compatibility Determinations, and Appendix L: Land Protection Plan. Another key section to review is Section 2.5.1.8 Operational Policies, which presents proposed changes in Refuge operations. We have provided the following chapter and appendix descriptions to assist you in locating and understanding the various components of this combined document.

Chapter 1, Purpose of and Need for Action, includes legal and policy guidelines, the regional and ecosystem context of the Refuge, a brief history of the Refuge, Refuge Goals, and a discussion of the issues identified early in the planning process.

Chapter 2, Alternatives, Objectives, and Strategies, describes five possible management alternatives. Each alternative represents a potential comprehensive conservation plan for Crab Orchard NWR. Alternative A describes the current management direction on the Refuge. Alternative E, the Preferred Alternative, presents the objectives and strategies of the proposed Draft Comprehensive Conservation Plan. Some features are common to all alternatives. The common features are described before the detailed alternative descriptions.

Chapter 3, Affected Environment, describes the existing physical and biological environment, public use, special management areas, industrial and agricultural use, cultural resources, and socioeconomic conditions.

Chapter 4, Environmental Consequences, describes the potential impacts of each of the five alternatives on the resources and conditions outlined in Chapter 3.

Chapter 5, List of Preparers, lists the persons involved in writing this document.

Chapter 6, Consultation and Coordination, presents a summary of public involvement and who is receiving this Draft CCP/EIS.

Chapter 7, Response to Comments Received on the Draft EIS/CCP. The Refuge received nearly 2,000 comments on the Draft EIS/CCP. In this chapter, we note all of the topics raised in these comments and respond to them, including noting how we changed the EIS in response to a comment.

Appendix A, Goals, Objectives, Strategies, and Implementation, pulls together in one place the objectives and strategies of the preferred alternative – the heart of the CCP. Also included are discussions of projects and personnel needed to implement the CCP.

Appendix B, Glossary, contains acronyms, abbreviations, and definitions of terms used in this document.

Appendix C, Laws and Orders, contains brief descriptions of the more pertinent laws and executive orders applicable to management of the Refuge.

Appendix D, Species Lists, contains lists of birds, reptiles, amphibians, fish, mammals, and vascular plants of Crab Orchard NWR.

Appendix E, State-listed Species Potentially Found at Crab Orchard NWR, contains species listed by the Illinois Endangered Species Protection Board as endangered or threatened.

Appendix F, Bibliography, contains the bibliographic references cited or consulted while preparing this document.

Appendix G, Public Law 80-361, contains a copy of the law that established Crab Orchard NWR.

Appendix H, Summary of Public Comment, summarizes public reaction to four concepts that we were considering as preliminary management alternatives in September 2001. We presented the concepts in a project update mailed to over 1,400 persons.

Appendix I, Letter Outlining the Exchange Proposal, contains a copy of a letter from Southern Illinois University that outlines the use the University would make of Fish and Wildlife Service property if a proposed land exchange were to take place. The proposed land exchange would be a major component of Alternative B.

Appendix J, A list of Compatibility Determinations that were reviewed as part of the Draft EIS.

Appendix K, Refuge Operating Needs System (RONS) and Maintenance Management System (MMS) lists, describes the larger projects that would be pursued if the preferred alternative is developed into a Comprehensive Conservation Plan. RONS refers to new initiatives and MMS describes maintenance of existing facilities.

Appendix L, Land Protection Plan, describes a proposal to adjust the authorized boundaries of the Refuge, which would permit acquisition of land from willing sellers and improve the efficiency of management in the long-term. The intent of the detailed plan is to inform neighbors, landowners, and the interested public of the Service's proposal and protection priorities.

Appendix M, Objectives and Strategies by Alternative, is a large table that displays the differences and similarities of each alternative in the details provided by objectives and strategies. We constructed this appendix so the reader could more easily compare the alternatives presented in Chapter 2 in detail.

Appendix N, Wildlife-Habitat Matrix, displays the table of values that was used in estimating the effects of habitat change on species that occur at Crab Orchard NWR and are of particular management concern to the Service's region. The values in the table reflect how important a particular habitat is to a species.

Crab Orchard

National Wildlife Refuge

Final Environmental Impact Statement / Comprehensive Conservation Plan

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Executive Summary

Introduction

The U.S. Fish and Wildlife Service is required to prepare and implement a Comprehensive Conservation Plan (CCP) for each unit in the National Wildlife Refuge System. We developed this document as part of preparing a plan for Crab Orchard National Wildlife Refuge.

Located in southern Illinois, Crab Orchard National Wildlife Refuge (NWR) was established in 1947 for wildlife, agriculture, recreation and industry. The Refuge consists of 43,888 acres. Figure 1 shows the location of the Refuge.

We are preparing an Environmental Impact Statement (EIS) as part of the comprehensive conservation planning process. Preparation of the EIS establishes scientific data on which we can base our selection of a management direction and it provides an opportunity for residents, communities, state agencies and governments, and non-government organizations to express their ideas on Refuge management. The EIS will establish a management direction for the Refuge for the next 15 years, and it will assure that this direction best achieves the Refuge's purposes, vision and goals; contributes to the mission of the National Wildlife Refuge System; is consistent with principles of sound fish and wildlife management; and addresses relevant mandates and major issues developed during scoping.

For Crab Orchard National Wildlife Refuge, there is a need to resolve the inconsistencies between the purposes of the Refuge as stated in its establishing legislation and the mission of the Refuge System. There is a need to specify the priority species of management concern and allocate habitat components among them. There is a need to recognize the recreational demands of the public and the Refuge's role in fulfilling those demands. Also, there is a need to improve the relations between the community and the Refuge.

We, the U.S. Fish and Wildlife Service, have thoughtfully considered how we should manage the Crab Orchard NWR. We have drafted a recommended management plan for the next 15 years. The highlights of our proposed plan are:

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Provide for wintering Canada geese at approximately current levels.

Continue current management of resident fish and wildlife.

Recommend an additional 120 acres for Wilderness designation.

Propose the acquisition of lands that are surrounded by the Refuge and some land along the boundary from willing sellers.

Reduce forest and grassland fragmentation to benefit certain birds.

Improve the quality of recreation through consolidation and improvement of facilities,

Eliminate area designations.

Maintain the existing group camps.

Limit camping stays to 14 days.

Simplify the recreational fee structure.

Officially designate a trail through the Wilderness for hiking and equestrian use.

In the rest of this summary we describe the steps that led us to our recommended approach and a further discussion about our approach. The details of our process and results are in the body of the Final Environmental Impact Statement and Comprehensive Conservation Plan.

Figure 1: Location of Crab Orchard NWR

Steps in Formulating Our Plan

Our planning process began in 1999 when we discussed what issues we thought needed to be addressed and how the planning process should be organized. Our planning team consists of refuge staff, regional office planning staff, representatives from other programs within the Fish and Wildlife Service, and representatives from the Illinois Department of Natural Resources. Sometimes we asked other experts to help us address a particular topic.

In late 2000 we asked citizens for their ideas on what the plan should include and the issues that should be addressed. We gave citizens the opportunity to comment at open houses and through written comments. In three meetings early in 2001, we asked a diverse group of stakeholders to identify and prioritize issues facing the Refuge. Then, we formed special work groups made up of the planning

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team and subject area experts. We asked the groups to review the past vision and goals and to draft new goals for the next 15 years.

In April 2001, we considered the issues that had been raised, the new goals, rules and regulations, and what we thought could reasonably be accomplished in 15 years, and we developed four alternative management concepts. We described the management concepts in a newsletter that we sent to everyone on the planning mailing list in September 2001. We invited citizens and stakeholders to comment on the concepts.

Using the comments that we received, land cover data analysis, and other data, we modified and refined the concepts – which became the alternatives described in Chapter 2 of the Environmental Impact Statement. After we had the alternatives well defined, we estimated the consequences of implementing each alternative. That analysis is described in Chapter 4 of the Environmental Impact Statement. After comparing the consequences of each alternative, we chose one alternative to develop into a Comprehensive Conservation Plan, which is presented in Appendix A of the Environmental Impact Statement. Following the close of the comment period for the Draft Environmental Impact Statement in January 2006, we reviewed the comments we received and revised the document when it was warranted.

Issues Addressed in Our Plan

Citizens brought up many of the issues, and we identified some others. We organized the issues into major topics – wildlife conservation, recreation, refuge purposes, recreational boating, role in regional economy, communication between refuge and community, and Wilderness.

Wildlife Conservation

From comments submitted by the public and the State of Illinois, we knew that we had to address how we intended to provide for wintering Canada geese. In the past we considered reducing the amount of croplands that we provide for geese. Local citizens, particularly waterfowl hunters, and the Illinois Department of Natural Resources were critical of a reduction of croplands. Early in the planning process we decided that we would continue to provide close to the current amount of cropland for wintering geese. We think that more food will be available for geese than they will use in most years. In our proposed plan we provide for 'worst case scenario' conditions of poor crop years and large migrations of geese. In the plan we propose to provide approximately 1,760 acres of corn, 880 acres of winter wheat, and 1,760 acres of clover each year for the geese on the average. We also plan to actively manage 500 acres of moist-soil habitat for geese, ducks, shorebirds, and other waterbirds.

As the primary federal agency providing for migratory birds, we want to identify and manage for those birds that are particularly important. Within our eight-state region we have identified the species that are the priority species for us. There are also collaborative efforts among several groups to provide a coordinated approach toward bird conservation across the North and South American continents. We looked at how Crab Orchard NWR might contribute toward these efforts and concluded that the Refuge would contribute by providing unfragmented forest and grassland to benefit species that need these kinds of habitat. In our planning process we looked at three alternative ways to provide unfragmented habitats. In one of our alternatives we looked at maximizing the unfragmented forest habitat. In another alternative we looked at maximizing the unfragmented grassland habitat. In the third alternative we looked at making small changes in the current habitat cover to gain larger,

unfragmented blocks of both forest and grassland habitats. We chose this third alternative as our proposed course of action.

In comparing our different approaches to habitat, we were surprised by how little difference there was in land cover among alternatives. The difference in core acres (the acres that are particularly beneficial to area-sensitive birds) of mixed hardwood upland forest between an alternative where we emphasized grasslands and where we emphasized forests was only 476 acres, which is a very small percentage of the Refuge. We expect that natural succession will greatly contribute to changes in land cover over time. Our role may be only to speed up that succession in some cases.

The management activities that we propose in our plan to benefit forest and grassland birds include, among other things: reforestation of selected areas, accelerated succession of pine plantations to native hardwoods, removal of woody fencerows and roadside vegetation, control of invasive species, and conversion of fescue pastures to native, warm-season grasses and more desirable cool-season grasses.

The Bald Eagle is the only federally designated threatened species known to occur on the Refuge. The Indiana bat, which is federally classified as endangered, is known to occur in proximity to the Refuge. We constructed a goal, objective, and strategies for the protection of these species in our plan. We will follow established management guidelines for the bald eagle, and we will coordinate with the Ecological Services staff of the Fish and Wildlife Service to avoid possible impacts to Indiana bats from our management activities.

Our planning requirements and past land transactions caused us to look at the desirability and need for acquiring interests in lands adjacent to the Refuge. In the past we have had neighbors who wanted to sell their land to the Service and a purchase had biological benefits to the Refuge. We analyzed each purchase individually. But, this tract-by-tract analysis is inefficient and does not provide for an overall, cumulative analysis of possible land transactions. We propose in our plan to acquire interests, from willing sellers only, in approximately 4,242 acres of land either completely surrounded by or adjacent to the Refuge as part of a boundary modification. The boundary modification would allow the acquisition of inholdings from willing sellers and move segments of the boundary to coincide with roads that would better define the limits of the Refuge (see

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Figure 2). The boundary modification would increase the efficiency of management, reduce incompatible land uses, and enhance public use opportunities.

Recreation

The recreation issue was made up of several parts and elicited the most comments from the public. Citizens were concerned about the loss of recreational opportunities and lack of support for recreation by the Refuge. At Crab Orchard NWR, we have had a difficult time meeting people's expectations and providing for certain kinds of recreation that are not traditionally a part of Service activities. Also, we are obligated by a 1997 law to facilitate wildlife-dependent recreation on national wildlife refuges, if possible. We examined two alternatives to doing a better job of providing recreation. One alternative calls for what we consider a major change at Crab Orchard – exchanging part of the Refuge with developed recreation facilities to Southern Illinois University for undeveloped land that the University owns adjacent to the Refuge. In the other alternative we considered how we could do a better job of providing recreation without the land exchange. In this second alternative we thought that it would be necessary to consolidate the facilities that we have and improve them. We do not think that it is likely that we could support high quality facilities at all of the sites that currently exist.

During our initial analysis, we considered the alternative with the land exchange as our "working" preferred alternative. We thought that the University would be able to offer better swimming, camping, boating, and picnicking facilities than we have been able to. We also thought that the University

Figure 2: Crab Orchard NWR Proposed Boundary Modification and Other Assorted Public Lands

would be able to develop a hotel and resort complex that is beyond the capabilities of the Refuge. By having the University provide the majority of the non-wildlife oriented recreation, we thought that we would be able to provide better quality wildlife-dependent recreation – hunting, fishing, wildlife observation and photography, environmental education, and interpretation.

We abandoned the alternative with the land exchange, however, when we confronted the difficulties of implementing the exchange. If we exchange land, Federal regulations require that the land involved in the exchange be of approximately the same value. Our preliminary appraisal estimates indicated that the Federal property in the proposed exchange would exceed the value of the Southern Illinois University property by as much as $20 million. The proposed exchange could only be accomplished with Congressional action, which we did not want to pursue. We thought that the exchange would be politically sensitive and that the likelihood for its resolution in the political process would be lengthy and out of our control. Rather than pursue a course with an uncertain timetable and outcome, we chose the alternative to consolidate and improve our recreational facilities, which we can implement within our current authority.

We plan to make visitors feel more welcome by improving our signs, kiosks, and facilities. We propose to work with the administrators of the group camps on the Refuge to emphasize the mission of the National Wildlife Refuge System in their programs. We plan to reduce the campground at Devils Kitchen Lake to primitive campsites only because the current site is too steep and there are no better alternatives on the lake. In order to reduce conflicts among recreational boaters, we propose to prohibit water skiing east of Wolf Creek Road and expand no-wake zones on Crab Orchard Lake. (See Figure 3.)

We also propose changing the classification of areas on the Refuge. When the Refuge was established we published a classification of lands indicating where wildlife would be emphasized and where recreation would take place. We propose to do away with the past classification of areas and treat the entire Refuge as one unit, which will allow more balanced management responsibilities across all portions of the Refuge. Only the industrial area will be designated as "restricted access."

During the planning process we examined our current way of doing business and saw a need for revision and additional explicitness for some topics. We propose to restrict length of camping stays to 14 days. This is a change from the unlimited length stays that are now permitted. We think limiting the length of stays is more equitable and will lead to higher quality camping experiences. We also propose to simplify the recreational fee system, and make it consistent with national standards to the extent practicable. We have not explicitly addressed scuba diving or rock climbing in past regulations, and some visitors who have engaged in these activities have been unsure of their legality. Because neither of these activities are wildlife-dependent public uses, and are available on nearby public areas, we propose to prohibit them on the Refuge.

The Haven and the Crab Orchard Boat & Yacht Club are available only to a limited segment of the general population. The facilities and activities at these clubs amount to private use of public land. Our long-term goal is to make these areas available to a broader portion of the public. During the length of the planning period established for this Refuge CCP (next 15 years), the Refuge Staff will work collaboratively with the Egyptian Past Commanders Club to evaluate the effectiveness of this facility in achieving the purpose of Haven's establishment, and to make recommendations for its future use.

We will extend the lease of the Crab Orchard Boat & Yacht Club for two years after the approval of the Refuge CCP. After the lease expires, we will convert the operation of the club facilities to a concession contract. This would end what amounts to private use of public land and make the facilities available to a wider portion of the public. Horseback use has been occurring on the Refuge without official recognition by our regulations.

Glenn Smart

Figure 3: Recreational Use Zoning, Crab Orchard Lake

Horseback riders want to ride through the Refuge as part of the River-to-River Trail, but a trail through the Refuge has not been officially designated or recognized. We have been concerned about trail erosion caused by horses. In the plan we propose to officially designate a horse trail through the Crab Orchard Wilderness and take measures to actively control erosion. We would prohibit horseback riding elsewhere on the Refuge.

Recreational Boating

When we distributed our initial thoughts about draft conceptual alternatives, we proposed to prohibit gas motors on Devils Kitchen Lake. Our intent was to further reduce the sounds of motors on the lake. We received a number of comments stating that this would unnecessarily reduce anglers' access to the lake. In order to accommodate these concerns, we propose to only prohibit gas motors in Grassy Creek and the eastern arm of Devils Kitchen Lake from the mouth of Grassy Creek south to the Refuge boundary. The portion of the lake south of Line Road No. 6 boat ramp will be designated a no-wake zone. We think this compromise allows anglers with gas motors access to most of the lake and still reduce the sound of motors on a portion of the lake.

Refuge Purposes

An issue that has been a challenge to us and was mentioned by some citizens was the lack of support for the four original purposes of the Refuge and the concern that the purposes might be seen as incompatible with the mission of the National Wildlife Refuge System due to recent legislation and changing policies. Conflicts between the Refuge purposes and the mission of the National Wildlife Refuge System are dealt with in the National Wildlife Refuge System Improvement Act of 1997. In the case of conflict between the purposes of a refuge and the mission of the System, the conflict is to be resolved in a manner that protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission of the System. We think that, overall, we are meeting the intent of the law.

We think that the activities associated with the original purposes of the Refuge are compatible. The compatibility determinations found in Appendix J of the Draft Environmental Impact Statement formalize our thoughts regarding these activities and their compatibility. We determined that all existing activities are compatible.

We considered how we should manage for the agricultural and industrial purposes of the Refuge for the next 15 years. The agricultural program is closely tied to providing food for wintering geese and other wildlife. As we thought about how the agricultural program might be improved, we investigated possible ways to make it more beneficial to wildlife and ways to use better management practices. We learned that in fitting the agricultural program with our wildlife conservation goals, our alternatives varied by small percentages in how many acres were devoted to row crops, pasture, and hayfields. Currently about 4,500 acres are farmed as row crops. We looked at alternatives that ranged from 4,300 to 4,800 acres of row crops. Our proposed plan would maintain about 4,400 acres in row crops. Currently about 1,000 acres of pasture are grazed. All the alternatives we looked at would maintain those acres. Currently about 700 acres are hayed. We looked at alternatives that ranged from 500 to 700 acres of hayfields. Our proposed plan would maintain about 600 acres in hay fields.

We do not plan to make large changes in the number of acres that are a part of the agricultural program. Rather, we propose to place greater emphasis on conservation practices that would provide more benefits to wildlife and improve water quality. We plan to address erosion with buffer strips and discontinue farming in wetlands. We plan to permit cooperator farmers to harvest corn remaining in the field in the spring. To better protect nesting birds, we plan to limit mowing of clover and hayfields until after August 1. We propose to change pastures from fescue grass to other cool-season and native warm-season grasses with higher wildlife value. We will divide existing pastures into three or four paddocks and cattle will be rotated among the paddocks during the season. We will ask for technical oversight

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from the Natural Resource Conservation Service and the University of Illinois Extension for our agricultural program.

Industry on the Refuge was identified by the public as an issue only in the context of its contribution to the regional economy. We were concerned about how to manage industry because of past contamination and the aging infrastructure of buildings, roads, water, and sewer lines. Most of the manufacturing and storage buildings are reaching the limits of their expected lifetime. The buildings require a lot of maintenance and refurbishing to meet today's standards. Recently, several industrial parks have been developed nearby that offer amenities not available on the Refuge.

Of the industries on the Refuge, the munitions industry is in a unique position of requiring widely spaced facilities for safety reasons. By providing a safe area for munitions manufacture, the Refuge is able to contribute to and support the national defense. We plan to continue to provide an area for defense munitions manufacture. We will encourage new industrial expansion in the neighboring industrial parks with newer facilities. We plan to maintain water and sewer infrastructure sufficient for current industrial tenants. We will expect industrial tenants to bring their facilities up to prescribed safety, health, environmental and maintenance standards under all new leases. Our intent is to consolidate the areas occupied by industry. We considered discontinuing the use of facilities as they were vacated, which would hasten the move of non-munitions industry off the Refuge. However, we did not think this would be an efficient use of resources. So, if tenants do not renew leases, we plan to seek suitable tenants for facilities that meet standards of occupancy.

Refuge's Role in the Local Economy

In the early stages of planning we learned that several citizens perceive recreation, agriculture, and industry on the Refuge as important to the economy of Southern Illinois. We asked a technical expert to help us determine the role of the Refuge in the local economy and the possible effects the alternatives that we were considering might have on the local economy. The general finding is that the Refuge contributes millions of dollars to the economy of Jackson and Williamson Counties, but the contribution is a small percentage of the total economy. The impacts of the Refuge operating budget and the recreation that occurs on the Refuge account for less than 1 percent of the total economy and employment in the two-county study area. The Refuge crop value is more than 10 percent of the total Williamson County crop value. Grazing value on the Refuge is about 8 percent of the grazing value for Williamson County. For commercial and industrial space, the Refuge accounts for just over one percent of industrial/commercial site acreage in the Greater Marion area.

Communication With the Community

As we began planning it was apparent to us that the Refuge administration could do a better job of communicating with the community. Our observation was confirmed by comments made by citizens during open houses and focus groups. Because the topic is important to us and the successful accomplishment of the Refuge mission, we established a goal that addressed the understanding of the Refuge by the community and staff receptiveness to concerns of the public. We plan to improve our communication with the public by regularly reviewing comments from the public, providing reports on the "State of the Refuge," and supporting selected community events.

Wilderness

Our refuge planning policy requires us to examine existing Wilderness and the potential for designating additional lands as Wilderness. We recommend that the Wilderness Management Plan that was approved in 1985 be reviewed for possible revision. The plan will need to be revised if horseback use is to be officially recognized as an appropriate use in the Wilderness. We reviewed the entire Refuge for possible additions to the Wilderness. We identified two tracts that total 120 acres and are surrounded by Wilderness and meet the criteria for Wilderness Study Areas. We propose that these tracts be recommended for Wilderness designation by the U.S. Congress.

Affected Environment

This section reviews the main points of the physical and social environment and current management of Crab Orchard National Wildlife Refuge. For a more complete and detailed description, see Chapter 3 of the Draft Environmental Impact Statement.

Physical Environment

Low relief, broad valleys, and relatively well-developed drainage systems characterize the northern portion of the Refuge. The southern portion consists of narrow ridges dissected by deep, narrow valleys with steep slopes and numerous sandstone outcrops. Water quality, drainage modification, shoreline erosion and sedimentation remain ongoing concerns for water bodies on the Refuge. Refuge waters are impacted by agricultural runoff, wastewater treatment effluent, urban runoff, stream channelization, and industrial contaminants.

Crab Orchard Lake, which was created in 1938, is the oldest, largest, and most heavily used lake on the Refuge. Created for water supply and recreation purposes, it is no longer used as a source for industrial or drinking water. Little Grassy Lake was impounded in 1950 as a recreation resource and today is most commonly used for sport fishing. Devils Kitchen Lake was impounded in 1959 as a recreation resource and today is most commonly used for sport fishing. Devils Kitchen is one of the deepest and clearest lakes in Illinois.

Following World War II and the transfer of the War Department's Illinois Ordnance Plant to the Department of the Interior, explosives production continued to be the principal industry on the property. New industries moved into buildings formerly used by wartime companies. A number of locations on the Refuge were contaminated with hazardous substances as a result of handling and disposal methods that were once considered acceptable. Approximately $85 million has been spent so far for investigation and clean up of contaminated sites. Investigation and cleanup are continuing at several sites in existing and former industrial areas. These activities are expected to continue into the foreseeable future.

Habitat

The landcover of the Refuge area has changed dramatically in the last 200 years. The area that is now the Refuge was 90-95 percent forest prior to European settlement. During the late 1800s and the first half of the 1900s, nearly all of the area was either logged for timber or cleared and converted to other uses, particularly agriculture. By the 1930s, the soils in the area were depleted and eroding. Starting in 1938, the Resettlement Administration acquired 32,000 acres of the land along Crab Orchard Creek in an effort to prevent further degradation. Additional clearing and development occurred with the establishment of the Illinois Ordnance Plant during World War II. The changes in Refuge landcover since 1807 can be summarized as follows: the original hardwood forest was converted to open habitats of agricultural fields and open water by the 1930s. The forests that exist today are pine plantations or hardwood forest in an earlier seral stage than the forests of the past. Savannah (7 percent of original area) and native prairie (1 percent of original area) have been completely converted to other habitats. The overall result has been the fragmentation of the hardwood forest and an increase in aquatic habitats with the construction of

the lakes. The current land cover for the Refuge is displayed in Figure 4. .

About 56 percent of the Refuge is covered by forest. Examples of wildlife that use Refuge forests are deer, squirrels, raccoons, hawks, owls, and a variety of forest bird species. A Refuge goal has been to manage for productive oak-hickory forest dominated by native species. Management activities have included tree planting, prescribed burning, thinning, and control of exotic and invasive plants.

About 2 percent of the Refuge is covered by shrubland. Examples of wildlife that use shrubland are deer, rabbit, loggerhead shrike, Bell's vireo, and field sparrow. Most Refuge shrubland is the result of abandoning farm and industrial areas.

About 4 percent of the Refuge is covered by grassland. Examples of wildlife that use grassland are deer, rabbit, northern bobwhite, grasshopper sparrow, loggerhead shrike, dickcissel, and eastern meadowlark. The majority of Refuge grassland is managed pasture (55 percent) and hay (35 percent) with the remainder (10 percent) represented by planted, native warm-season grasses. Management activities have included planting agricultural land to native grasses, prescribed fire, mowing, control of exotic and invasive plants, and fertilizing

Before European settlement, there was little wetland habitat in the area. Most wetland habitat on the Refuge consists of man-made ponds and lakes. Wetlands cover about 6 percent of the Refuge. Examples of wildlife that use wetlands are Canada geese, other waterfowl, herons, raccoons, turtles, frogs, and other amphibians and reptiles. The majority of the wetlands are bottomland hardwood forests (1,900 acres) and moist-soil units (450 acres).

About 20 percent of the Refuge is covered by open water, almost all of it in man-made reservoirs. Open water serves as habitat for warm-water sport fish, waterfowl and other waterbirds. Management activities include maintenance of dams, levees, and water control structures, and manipulation of water levels.

About 10 percent of the Refuge is covered by cropland. Examples of wildlife that use cropland are deer, Canada goose, northern bobwhite, and turkey. Management activities include mowing, disking, planting, herbicide and fertilizer application, and harvesting.

Invasive, exotic and noxious weed species are relatively abundant on the Refuge. These species are

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quite diverse and are found in most Refuge habitats, including agricultural fields, lakes and ponds.

Current Role of Fire

We use prescribed fire to manipulate vegetation in a safe and cost-effective manner. Our principal purpose is to improve the wildlife habitat conditions in the southern pine plantations. Prescribed burning also reduces hazardous fuels, encourages oak and hickory and discourages sugar maple. Burning improves the condition of the understory. And, although burning is not undertaken for these purposes, burning enhances the aesthetics of the forest by making the understory more open and improves access for both habitat management and recreation.

Areas identified as “fallow herbaceous fields” are old fields that have been invaded by low, woody vegetation and vines and are in an early seral stage. We use fire to maintain the openings and habitat diversity of these lands.

Tallgrass prairie has been established on several areas on the Refuge. Prescribed fire stimulates growth of the grasses, increases seed germination and growth of forbs, creates open ground for wildlife, retards encroachment of woody vegetation, and reduces the fuel load.

Wildlife

Forty-three species of mammals have been recorded in or near the Refuge. Whitetailed deer, Virginia opossum, raccoon, rabbits, squirrels, beaver, and coyote are commonly seen on the Refuge.

Two-hundred sixty-nine species of birds have been recorded in or near the Refuge. Herons, Can-

Figure 4: Current Land Cover Type, Crab Orchard NWR

ada geese and other waterfowl, raptors, wild turkey, and songbirds are commonly seen on the Refuge.

Refuge records indicate that there were only about 2,200 Canada geese on the Refuge in 1947. Establishing a large, wintering population was a priority of early Refuge management. Refuge staff kept pinioned or penned geese as a decoy flock to attract migrating geese and emphasized production of corn and other grains in the Refuge farm program to provide food for wintering geese. Canada geese quickly responded; in 1948 the peak count on the Refuge was 24,000. The average peak count from 1947 to 2001 was 82,000.

Twenty species of amphibians and 28 species of reptiles have been recorded on the Refuge. Cricket frog, Fowler's toad, bullfrog, painted turtle, eastern box turtle, racer, and diamondback water snake are commonly seen on the Refuge. Prior to dam construction, fish habitat in the area consisted primarily of the larger, named streams. Over the last half-century, most fish habitat has been provided by the three large lakes and eight smaller manmade impoundments. Fish management on the Refuge has emphasized mixed-species, warm-water sport fish. Since 1995, the fisheries on the Refuge have been managed cooperatively by Illinois Department of Natural Resources (IDNR) and the Refuge.

Monitoring

We, along with staff from the IDNR and volunteers, survey wildlife use. We use the survey information in Refuge management. Others use the information to support state and national conservation efforts.

Public Use Resources and Trends

Swimming, boating, picnicking, dog trials, camping, hunting and fishing were a part of the Crab Orchard Creek Project before the establishment of Crab Orchard National Wildlife Refuge. A wide spectrum of recreational activities continue to occur on and around Crab Orchard, Devils Kitchen and Little Grassy lakes. The activities include boating, water skiing, swimming, camping, picnicking, hunting, fishing, wildlife observation, environmental education, environmental interpretation, horseback riding, and photography. Public use facilities include campgrounds, marinas, boat ramps, fishing piers, beaches, picnic areas, hiking trails, auto tour, visitor center, environmental education complex, observation decks, and photo blinds.

Small game, big game, and migratory waterfowl are hunted on the Refuge. Most hunting occurs within approximately 23,000 acres open to all hunting activities in accordance with State hunting seasons. Hunting includes muzzle loader, archery, shotgun and pistol deer hunting, waterfowl hunting, archery and shotgun wild turkey hunting, small game hunting, game bird hunting and furbearer hunting.

Fishing is one of the more popular visitor pastimes on the Refuge. People fish in Crab Orchard, Little Grassy and Devils Kitchen Lakes. The main species of fish sought by the anglers are largemouth bass, crappie, bluegill and channel catfish. Five fishing tournaments are held annually on the Refuge's three lakes under special use permit. The three major lakes receive a lot of visits from fishing clubs hosting club events called “fish-offs” – an organized club fishing event of 20 boats or fewer. The Refuge registered over 130 fish-offs in 2001 and more occur without being registered.

At one time camping was allowed throughout open areas of the Refuge. Because of litter and trash problems, we restricted camping to a concession-operated campground on each of the three major lakes. Crab Orchard Campground began operation in 1964 as a concession. Little Grassy and Devils Kitchen Campgrounds are concession-operated campgrounds and marinas. Crab Orchard Boat & Yacht Club, a private organization, operates a marina and a campground.

Wildlife observation is the most popular activity occurring on the Refuge, and there are many good observation areas on the Refuge. Points of interest, trails, auto tours and viewing blinds have been developed in an effort to encourage and enhance wildlife viewing. Refuge volunteers maintain seven trails that are open to the general public and one trail that is provided for educational purposes only. Numerous fire trails have served as hiking trails on the Refuge.

Boating has long been a popular activity on the Refuge. When Crab Orchard Lake was completed in 1938, it was the largest man-made lake in Illinois. The Refuge offers boating on Crab Orchard, Devils Kitchen, and Little Grassy lakes. Crab Orchard Lake has 14 public boat launching facilities; three ramps are provided on Devils Kitchen Lake; four are provided at Little Grassy Lake.

At one time the Refuge supported six public beaches -- four on Crab Orchard Lake and one each on Devils Kitchen Lake and Little Grassy Lake. Today swimming is allowed in Crab Orchard and Little Grassy lakes and prohibited in Devils Kitchen Lake.

From the late 1940s through the 1960s, picnicking was a very popular activity on the Refuge. Today picnicking is encouraged in four locations on the Refuge. The areas vary in size, character and type of use.

Four group camps are located on Little Grassy Lake. The camps operate under a cooperative agreement with the Refuge. About 20,000 campers participate in group camping activities on the Refuge each year. The Refuge provides educational assistance to area teachers, educators, and Refuge group camps.

Refuge staff, interns, and volunteers present both on-site and off-site environmental educational programs to area school groups. Educational materials (books, posters, videos, and other supplies) are maintained by the Refuge and are available for loan to area educators.

Interpretive programs are given by Refuge staff and volunteers to school, civic and other groups. The programs are presented through automobile tours, talks and walks. Some of the better attended programs include Bald Eagle tours, wildflower walks and owl prowls. The Refuge also presents its interpretive message through bulletin boards, signs and wayside exhibits. The Visitor Center consists of an information and exhibit area, conference room, book store and office space for visitor services staff. The Williamson County Tourism Bureau also occupies office space in the building.

The Refuge maintains an extensive system of roads within its boundaries. According to a 2001 survey of Refuge roads completed by the U.S. Department of Transportation, the Refuge maintains 38 miles of paved surface roads and 17 miles of gravel roadway for a total of 55 roadway miles.

Wilderness

Congress designated the Crab Orchard Wilderness as a unit of the National Wilderness Preservation System in 1976. The 4,050-acre wilderness was the first in the State of Illinois. The Crab Orchard Wilderness is located in the extreme southern portion of the Refuge bordering the shores of Devils Kitchen and Little Grassy lakes.

Industry

When the War Department and Soil Conservation Service lands were transferred to the Department of the Interior in 1947, approximately 1.6 million square feet of space suitable for industrial leasing were included in the transfer. The industrial complex currently consists of about 1.2 million square feet. The Refuge collects about $500,000 in rental receipts each year. Rental receipts are returned to the Refuge and are used as part of its operation and maintenance budget.

Agriculture

The Refuge began farm management in 1948. The original focus of management was to: 1) reclaim farmland that had been fallow during ordnance plant operations, 2) improve soil fertility, 3) improve farm practices, 4) emphasize establishment of pasture, and 5) use crops to help establish a wintering flock of Canada geese. Current row crop management emphasizes soil protection and integrated pest management. Management consists of crop rotation, no-till planting, higher weed tolerance, restricted use of herbicides, and no insecticide use. The current grazing program consists exclusively of cattle grazing on fescue pastures. The current hay program consists of improved timothy fields and unimproved fields that are mostly old fescue pastures.

Archaeological and Cultural Values

About 1,000 acres of the Refuge have been subjected to controlled and reported archeological survey and investigation. One hundred and thirty-six prehistoric sites have been reported on the Refuge. In the 1930s farmsteads and small towns covered the Refuge area. Documents indicate at least 28 farmsteads and habitations, 34 cemeteries, three churches, 12 schools, and two towns existed within the Refuge boundaries.

Crab Orchard NWR

Socioeconomic Environment

Williamson County population grew at a faster rate than the state but substantially less than the U.S. from 1980 to 2000. Jackson County lost population during this period.

We defined a study area for estimating the economic effects of the recreational, agricultural and commercial use of the Refuge as Williamson and Jackson counties. Most visitors to the Refuge (about 89 percent) come from within a 50-mile radius of the Refuge, and about 90 percent of these visitors come from Williamson and Jackson counties. We estimated the economic impacts of refuge uses and expenditures on the economy and taxes. The impacts are large dollar figures, but a small portion of the total economy.

Current Staff and Budget

The Refuge has a staff of about 30 people. Based on the annual average Refuge budget between 1996 and 2000, the Refuge budget includes $1.4 million in salaries and $770,937 in non-salary expenditures.

Partnerships

The Refuge has many partnerships with local, state, and national organizations. These partnerships benefit the Refuge in many ways, including fostering good community relations and enhancing Refuge habitats and wildlife populations. In addition, the Refuge has many dedicated friends and volunteers that assist with a wide variety of tasks. The Refuge needs the help and support of partners, friends, and volunteers to accomplish its mission.

Alternatives Considered

The five alternative approaches to management that we considered are summarized in the following paragraphs and table. For a more extended and detailed discussion of the alternatives, see Chapter 2 of the Draft Environmental Impact Statement .

Our Preferred Alternative

In selecting a preferred alternative, we considered environmental, economic, and social factors and our ability to accomplish the alternatives. We based our decision on how well the goals of the Refuge were met by each alternative and the environmental consequences of each alternative. We selected Alternative E as our preferred alternative.

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Alternative E will fulfil our statutory mission and responsibilities, and we have adequate authority to implement it.

By focussing on relatively small alterations in land cover, we can gain benefits for both forest and grassland area-sensitive bird species at a reasonable cost. In our preferred alternative, as in all alternatives, we intend to provide food to support a significant population of wintering Canada geese.

The conflicts experienced among water users is addressed by increasing areas that are no-wake zones and a recognition that we need to do better enforcement of current use zoning regulations.

The agricultural program on the Refuge and its economic effect will remain pretty much intact. The industrial program will continue to support the munitions manufacturing industry and current tenants. By encouraging other industries to locate in nearby industrial parks, the economic effect of the industry will remain in the local economy, and the needs of the industry will be met more efficiently. Finally, with a goal, an objective, and strategies formalized to better improve communication between the Refuge and the community, we think we will be able to do a better job of informing and listening to the community.

Alternative A: Current Management (No Action)

Under this alternative the current management activities at the Refuge would continue. The Refuge would continue to provide sufficient habitat for the needs of wintering geese. All current recreation uses and patterns on the Refuge would continue. Current industrial policies would remain in place and the Refuge would provide facilities for the exist-

ing tenants at fair market value rental rates. The amount of agricultural land would remain fairly constant. However some loss may occur through installing buffer strips needed for soil and water protection.

Alternative B: Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis With Land Exchange

Through the years the Refuge has been criticized for its lack of support of the recreational purpose of the Refuge. Recreation on the Refuge drew the greatest number of comments during the scoping of issues. When the Refuge was established, the Director of the Service assured Congress that the Service would be able to manage for the four purposes of the Refuge. In 50 years of management, the Service has not been able consistently to provide facilities and management for quality non-wildlife-dependent recreational experiences. Providing for swimming, picnicking, and power boating does not fit well with the capabilities and resources of the Service. Under this alternative the non-wildlife-dependent recreation that would remain the responsibility of the Refuge would be guided by the philosophy of "consolidate and improve." Over the last decade habitat fragmentation has been identified as a significant result of changing land use. Habitat fragmentation is known to have negative effects on biological diversity.

Under this alternative, management emphasis would be on reducing habitat fragmentation and reconciling conflicts between the Refuge's recreation purpose and the Refuge System mission by focusing on wildlife-dependent recreation on the Refuge while still providing a full spectrum of recreational activities in the area.

Some of the current management activities at the Refuge would be modified to provide greater benefits to wildlife. The main point of this alternative is to offer increased recreational opportunities by exchanging land in the developed northwestern portion of the Refuge for undeveloped land at another location.

The Refuge would update the industrial use policy with the intent of not promoting expansion and consolidating the areas occupied by industrial tenants. The Service would seek not to compete with neighboring industrial parks. If an industrial tenant were to leave the Refuge and their facilities were suitable for occupancy, the Refuge would make them available for new tenants. The amount of row crops would decrease slightly. Current acreage of hay fields and pastures would remain about the same. All mowing of pastures, hay fields, and clover fields would take place after August 1 to protect nesting birds. The Refuge would convert fescue pastures to other cool-season and native warm-season grasses over a period of 15 years and modify grazing regimes to benefit grassland birds.

Alternative C: Open Land Management: Consolidate and Improve Recreation

Both grassland and forest species are negatively affected by habitat fragmentation. Under this alternative the Refuge would take advantage of the lands that are already open and increase the size of existing large blocks of open land for grassland dependent species, especially birds. The Refuge recognizes that improvements in the recreation program are needed. Under this alternative the Refuge would satisfy the Refuge's recreation purpose as much as possible within Service budget priorities and expanding emphasis on wildlife-dependent recreation.

Under this alternative cropland and grassland would increase slightly. Pasture and hayfield management would change to provide more emphasis on habitat quality for grassland birds. The Refuge would manage one large forest block to benefit area-sensitive forest birds. To enhance non-wildlife-dependent recreational activities, the Refuge would consolidate marinas and picnic areas, upgrade existing boat ramps and designate times and places for the various types of boating activities. Camping capacity would be reduced, the quality of camping facilities would be upgraded and a 2-week maximum stay policy would be implemented. A spectrum of recreational opportunities ranging from more developed recreation at Crab Orchard Lake to less developed opportunities at Devils Kitchen Lake would be provided. If an industrial tenant left the Refuge, the Refuge would not seek a new tenant for the vacant facility. The amount of row crops would increase slightly.

Alternative D: Forest Land Management: Consolidate and Improve Recreation

Under this alternative the Refuge would take advantage of the natural tendency and historical prevalence of forests in the area and increase the size of large blocks of forests for forest interior species, especially birds. The Refuge would manage two large forest blocks to benefit area sensitive forest birds. The Refuge would maintain some early successional habitat. Pasture and hayfield management would change to provide more emphasis on habitat quality for grassland birds, along with an emphasis on cattle production on pastures. To enhance non-wildlife-dependent recreational activities, the Refuge would consolidate marinas and picnic areas, upgrade existing boat ramps and designate times and places for the various types of boating activities. Camping capacity would be reduced, the quality of camping facilities would be upgraded and a 2-week maximum stay policy would be implemented. If an industrial tenant left the Refuge, the Refuge would not seek a new tenant for the vacant facility. The amount of row crops and hay fields would decrease slightly. The Refuge would increase forage diversity and use rotational grazing in pastures to increase cattle production.

Alternative E: Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative)

This alternative has the same habitat, industrial, and agricultural programs as Alternative B and the same recreation management program as Alternative C.

Under this alternative, management emphasis would be on reducing habitat fragmentation by making small changes in the current habitat cover to gain larger, unfragmented blocks of both forest and grassland habitats (see Figure 4). Some of the current management activities at the Refuge would be modified to provide greater benefits to wildlife.

The Refuge would update the industrial use policy with the intent of not promoting expansion and consolidating the areas occupied by industrial tenants. The Service would seek not to compete with neighboring industrial parks. If an industrial tenant were to leave the Refuge and their facilities were

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suitable for occupancy, the Refuge would make them available for new tenants. The amount of row crops would decrease slightly. Current acreage of hay fields and pastures would remain about the same. All mowing of pastures, hay fields, and clover fields would take place after August 1 to protect nesting birds. The Refuge would convert fescue pastures to other cool-season and native warm-season grasses over a period of 15 years and modify grazing regimes to benefit grassland birds.

The Refuge would satisfy the Refuge's recreation purpose as much as possible within Service budget priorities and expanding emphasis on wildlife-dependent recreation. To enhance non-wildlife-dependent recreational activities, the Refuge would consolidate marinas and picnic areas, upgrade existing boat ramps and designate times and places for the various types of boating activities. Camping capacity would be reduced, the quality of camping facilities would be upgraded and a 2-week maximum stay policy would be implemented. A spectrum of recreational opportunities ranging from more developed recreation at Crab Orchard Lake to less developed opportunities at Devils Kitchen Lake would be provided.

Environmental Consequences Associated with Each Alternative

We estimated the consequences of each alternative in detail. For a full discussion of the analysis, please see Chapter 4 of the Final Environmental Impact Statement. We have summarized the effects

of each alternative in the following table and have described the effects in short phrases to ease comparison among alternatives. The recreational effects under Alternative B include the combined effects of lands managed by the Service and former Refuge lands that would be managed by SIU under a land exchange. Thus, the effects for increased developed recreation reflect increases that would occur on SIU lands under Alternative B.

Summary of the Potential Environmental Impacts Associated with Each Alternative

	Alternative A Current Management (No Action)	**Alternative B Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis**	**Alternative C Open Land Management: Consolidate and Improve Recreation**	**Alternative D Forest Land Management: Consolidate and Improve Recreation**	**Alternative E Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative)**
Threatened & Endangered Species					
Bald Eagle:	Minor increase in nesting habitat	Minor increase in nesting habitat	Minor increase in nesting habitat, alternative with highest habitat values	Minor increase in nesting habitat	Minor increase in nesting habitat
Indiana bat:	Minor increase in potential habitat	Minor increase in potential habitat	Minor increase in potential habitat, alternative with lowest habitat values	Minor increase in potential habitat, alternative with highest habitat values	Minor increase in potential habitat
Resident Fish & Wildlife	Minimal impacts	Minimal impacts	Minimal impacts	Minimal impacts	Minimal impacts
Canada Geese	Minor decrease in habitat, alternative with highest production of potential goose food	Minor decrease in habitat, along with Alternative E, lowest production of potential goose food	Minor decrease in habitat	Minor decrease in habitat, higher production of potential goose food than Alternative C	Minor decrease in habitat, along with alternative B, lowest production of potential goose food
Waterbirds	Minimal impacts	Minor increase in habitat	Minor increase in habitat	Minimal impacts	Minor increase in habitat
Grassland Birds	Decrease in habitat (36%), improved nesting conditions	Decrease in habitat (43%), much improved nesting conditions	Decrease in habitat (36%), much improved nesting conditions	Decrease in habitat (43%), improved nesting conditions	Decrease in habitat (43%), much improved nesting conditions
Area-Sensitive Forest Birds	Increase in habitat (8%)	Increase in habitat (9%), improved nesting conditions	Increase in habitat (7%)	Increase in habitat (9%), improved nesting conditions	Increase in habitat (9%), improved nesting conditions
Shrub Land Birds	Decrease in habitat (26%)	Decrease in habitat (26%)	Decrease in habitat (26%)	Decrease in habitat (26%)	Decrease in habitat (26%)
Invasive Species	Most species increase	Most species increase	Most species increase	Most species increase	Most species increase
Agricultural Uses	No acreage change, minor restriction in agricultural practices	Minor acreage decrease, changes in some agricultural practices	Minor acreage increase, changes in some agricultural practices, alternative with largest amount of agricultural land	Minor acreage decrease, addition of practices beneficial to agriculture, alternative with least amount of agricultural land	Minor acreage decrease, changes in some agricultural practices
Wilderness	Minor increase in wilderness designation	Minor increase in wilderness designation	Minor increase in wilderness designation	Minor increase in wilderness designation	Minor increase in wilderness designation

Summary of the Potential Environmental Impacts Associated with Each Alternative (Continued)

	Alternative A Current Management (No Action)	**Alternative B Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis**	**Alternative C Open Land Management: Consolidate and Improve Recreation**	**Alternative D Forest Land Management: Consolidate and Improve Recreation**	**Alternative E Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative)**
Industrial Uses	Minimal impacts	Minimal impacts	Minor decreases in facilities	Minor decreases in facilities	Minimal impacts
Hunting	Minimal impacts	Increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality
Fishing	Minimal impacts	Increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality
Wildlife Viewing & Photography	Minimal impacts	Increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality
Interpretation and Environmental Education	Minimal impacts	Increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality	Minor increase in opportunities and quality
Swimming	No change	Increased opportunities provided by SIU	Minimal impacts	Minimal impacts	Minimal impacts
Camping	Minimal impacts	Increased opportunities provided by SIU	Fewer campsites, improved facilities, 14-day stay limit	Fewer campsites, improved facilities, 14-day stay limit	Fewer campsites, improved facilities, 14-day stay limit
Picnicking	Minor improvements	Increased opportunities provided by SIU	Minor improvements	Minor improvements	Minor improvements
Motor boating / Sail boating	Minimal impacts	Minor restrictions in use (zoning)	Restrictions in use (zoning)	Minimal impacts	Minor restrictions in use (zoning)

Summary of the Potential Environmental Impacts Associated with Each Alternative (Continued)

	Alternative A Current Management (No Action)	**Alternative B Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis**	**Alternative C Open Land Management: Consolidate and Improve Recreation**	**Alternative D Forest Land Management: Consolidate and Improve Recreation**	**Alternative E Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative)**
Waterskiing	Minimal impacts	Reduction in area open	Reduction in area open	Reduction in area open	Reduction in area open
Marinas	Minimal impacts	Increases in facilities provided by SIU	Decreases in facilities	Decreases in facilities	Decreases in facilities
Group Camps	Minimal impacts	Increased costs to camps, limits on expansion, increased environmental education	Increased costs to camps, limits on expansion, increased environmental education	Increased costs to camps, limits on expansion, increased environmental education	Increased costs to camps, limits on expansion, increased environmental education
Private Clubs	Minimal impacts	SIU management	Tradition of Boat & Yacht Club would end. After 2 years the opportunities at site would be available to wider segment of the public.	Tradition of Boat & Yacht Club would end. After 2 years the opportunities at site would be available to wider segment of the public.	Tradition of Boat & Yacht Club would end. After 2 years the opportunities at site would be available to wider segment of the public.
Horseback Riding	Minimal impacts	Fewer opportunities	Fewer opportunities	No horseback riding	Fewer opportunities
Water Quality	Minimal impacts	Minor improvements	Minor improvements	Minimal impacts	Minor improvements
Communication	Improved	Improved	Improved	Improved	Improved
Volunteers	Minimal impacts	Improved	Improved	Improved	Improved
Cultural Resources	No Impacts	No Impacts	No Impacts	No Impacts	No Impacts
Economics	No change in economic effect.	Small increase in economic effect.	Minor increase in economic effect.	Minor increase in economic effect.	Minor increase in economic effect.
Environmental Justice	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.
Climate Change	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.
Air Quality	Minimal impacts	Minimal impacts	Minimal impacts	Minimal impacts	Minimal impacts

Chapter 1: Purpose of and Need for Action

1.1 Introduction

The U.S. Fish and Wildlife Service is mandated by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, to prepare and implement a Comprehensive Conservation Plan (CCP) for each unit in the National Wildlife Refuge System. This Environmental Impact Statement provides environmental information to Service officials and the general public before decisions are made and actions are taken as required by the National Environmental Policy Act of 1969, as amended.

Bernie Angus

1.2 Proposed Action

The proposed action is to implement a Comprehensive Conservation Plan for the Crab Orchard National Wildlife Refuge (NWR) (Figure 1 and Figure 2) that will guide management for the next 15 years. The action includes consolidating and improving the refuge's recreation facilities. The action also includes management activities that will reduce the fragmentation of forest and grassland habitats. The proposed management direction is further defined in the Comprehensive Conservation Plan (Appendix A) and Land Protection Plan (Appendix L).

1.3 Purpose of Action

The purpose of the Environmental Impact Statement is to select a management direction for Crab Orchard National Wildlife Refuge for the next 15 years that best achieves the Refuge's purposes, vision and goals, contributes to the mission of the National Wildlife Refuge System, is consistent with principles of sound fish and wildlife management, and addresses relevant mandates and major issues developed during scoping. An additional purpose is to fully document the Refuge's recent Fire Management Plan in compliance with the National Environmental Policy Act (NEPA). Through this Environmental Impact Statement (EIS), we are presenting the Fire Management Plan to the public and approving it.

1.4 Need for Action

For Crab Orchard National Wildlife Refuge, there is a need to meet the Refuge purposes of recreation, industry and agriculture as much as possible within the National Wildlife Refuge System that emphasizes its mission of wildlife conservation. This need has proven difficult to meet in the past because the purposes of the Refuge, which outrank the mission of the Refuge System, often conflict with wildlife conservation and compete unfavorably in the budgeting process. There is a need to specify the priority wildlife species of management concern and, within budget constraints and other limitations, reduce habitat fragmentation. There is a need to

Figure 1: Crab Orchard National Wildlife Refuge

Figure 2: Location of Crab Orchard NWR

recognize the recreational demands of the public, and within budget constraints and the Refuge mission, attempt to meet this demand. There is a need to address the conflicting demands of wildlife- and non-wildlife-dependent recreation. There is a need to improve the relations between the community and the Refuge. In addition, a 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 Comprehensive Conservation Plan for all national wildlife refuges.

1.5 Decision to be Made

The Regional Director for the Great Lakes/Big Rivers Region of the U.S. Fish and Wildlife Service will select an alternative to implement as the Crab Orchard National Wildlife Refuge Comprehensive Conservation Plan. The Regional Director's decision will be made with an understanding of the environmental consequences of all alternatives considered.

1.6 Overview of the Planning Process

Our planning process follows eight basic steps described in the Service's planning policy. The steps are:

Preplanning: Planning the Plan
Initiate Public Involvement and Scoping
Review Vision Statement and Goals and Determine Significant Issues
Develop and Analyze Alternatives, Including the Proposed Action
Prepare Draft Plan and NEPA Document
Prepare and Adopt Final Plan
Implement Plan, Monitor, and Evaluate
Review and Revise Plan

The Refuge began pre-planning for the CCP in 1999. There were initial discussions among the staff on issues to be addressed and data that would be necessary during planning. A planning team was formed that consisted of Refuge staff, regional office planning staff, representatives from other programs within the Fish and Wildlife Service, and representatives from the Illinois Department of Natural Resources. Geographic Information System (GIS) data were assembled and organized.

In late 2000, the Refuge began collecting public input through a series of open house and focus group meetings. In October 2000, more than 300 citizens attended three open house meetings hosted by the Refuge staff. In January 2001, the Refuge staff invited 39 diverse stakeholders to attend three focus group meetings to discuss and prioritize issues facing the Refuge. The Refuge began officially accepting written comments in January 2000. The public represented by the comments include a variety of interests and organizations, including on-Refuge industrial and agricultural businesses; educational institutions; recreational organizations (i.e. hunting, fishing, and youth camps); environmental and conservation organizations; federal, state and local government entities and many private citizens.

In early 2001, the planning team formed special topic work groups to deal with the Refuge purposes. The groups included members of the planning team and subject area experts from within the Service and State. The groups reviewed the existing vision and goals for the Refuge and drafted new goals for the next 15 years.

In April 2001, using all of the comments received, considering the goals and all of the rules and regulations that must be followed and considering the given needs, the planning team developed four alternative management concepts. The four concepts were: Existing Management; Land Exchange; Open Land Management; and Forest Land Management. These management concepts were presented to the public in a project update, which was mailed to everyone on the planning mailing list, and people were invited to comment on the concepts. Based on the comments received and land cover data analysis, the alternatives were refined and made more specific.

The alternatives and a more fully developed section of planned programs for the proposed Comprehensive Conservation Plan are contained in this document.

1.7 Legal and Policy Guidelines

In addition to the Refuge's establishing legislation (Appendix G), several laws, executive orders, and regulations govern its administration. See Appendix C for a list and discussion of the guiding laws and orders.

1.7.1 Wilderness Review

Refuge planning policy mandates that wilderness reviews be conducted through the comprehensive conservation planning process (Fish and Wildlife Service manual, 602 FW 3). The wilderness review process consists of three phases: inventory, study, and recommendation. In the inventory phase we look at Service-owned lands and waters within the Refuge that are not currently designated wilderness and identify those areas that meet the criteria for wilderness established by Congress. The criteria are size, naturalness, opportunities for solitude or primitive recreation, and supplemental values. Areas that meet the criteria are called Wilderness Study Areas (WSAs). In the study phase we develop and evaluate a range of management alternatives for the WSAs to determine if they are suitable for recommendation for inclusion in the National Wilderness Preservation System. In the recommendation phase we forward the suitable recommendations in a Wilderness Study Report that moves from the Director through the Secretary and the President to Congress.

1.8 National Wildlife Refuge System Mission, Goals and Principles

The U.S. Fish and Wildlife Service is the principal federal agency responsible for conserving, protecting and enhancing fish, wildlife and plants and their habitats for the continuing benefit of the American people. The Service manages the 95-million-acre National Wildlife Refuge System of more than 540 national wildlife refuges, thousands of small wetlands and other special management areas. It also operates 66 national fish hatcheries, 64 fishery resource offices and 78 ecological services field stations. The agency enforces Federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

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

1.8.1 Mission of the National Wildlife Refuge System

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

1.8.2 Goals of the National Wildlife Refuge System

The administration, management, and growth of the System are guided by the following goals:

To fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.

To conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.

To perpetuate migratory bird, interjurisdictional fish, and marine mammal populations.

To conserve a diversity of fish, wildlife, and plants.

To conserve and restore where appropriate representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.

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

1.8.3 Guiding Principles of the National Wildlife Refuge System

We are land stewards, guided by Aldo Leopold's teachings that land is a community of life and that love and respect for the land is an extension of ethics.

We seek to reflect that land ethic in our stewardship and to instill it in others.

Wild lands and the perpetuation of diverse and abundant wildlife are essential to the quality of the American life.

We are public servants. We owe our employers, the American people, hard work, integrity, fairness, and a voice in the protection of their trust resources.

Management, ranging from preservation to active manipulation of habitats and populations, is necessary to achieve Refuge System and U.S. Fish and Wildlife Service missions.

Wildlife-dependent uses involving hunting, fishing, wildlife observation, photography, interpretation, and education, when compatible, are legitimate and appropriate uses of the Refuge System.

Partnerships with those who want to help us meet our mission are welcome and indeed essential.

Employees are our most valuable resource. They are respected and deserve an empowering, mentoring, and caring work environment.

We respect the rights, beliefs, and opinions of our neighbors.

Figure 3: U.S. Fish & Wildlife Service Ecosystem Units

1.9 Ecosystem Goals

1.9.1 Upper Mississippi River/Tallgrass Prairie Ecosystem

The Service has adopted an ecosystem approach to conservation and designated 53 ecosystem units (Figure 3). The ecosystem units delineate portions of the landscape where the Service and its partners can set ecosystem-wide resource goals and work together to achieve these goals.

The Refuge is located in the Upper Mississippi River/Tallgrass Prairie Ecosystem (Number 23), an ecologically diverse area encompassing 186,133 square miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. An ecosystem team has identified the following goals in response to resource management challenges and opportunities:

Goal 1:Protect, restore, and enhance populations of native and trust species and their habitats.

Goal 2:Restore natural ecosystem processes, including hydrology and sediment transport to maintain species and habitat diversity.

Goal 3:Promote environmental awareness of the ecosystem and its needs with emphasis on sustainable land use management.

Goal 4:Identify water quality problems affecting native biodiversity and habitat of trust species.

Goal 5:Reduce conflicts between fish and wildlife needs and other uses.

1.9.2 Goals and Objectives for Other Landscape Level Plans

1.9.2.1. Migratory Bird Conservation Initiatives

Over the last decade, bird conservation planning has evolved from a largely local, site-based focus to a more regional, landscape-oriented perspective. Significant challenges include locating areas of high-quality habitat for the conservation of particular guilds and priority bird species, making sure no spe-

cies are inadvertently left out of the regional planning process, avoiding unnecessary duplication of effort, and identifying unique landscape and habitat elements of particular tracts targeted for protection, management and restoration. Several migratory bird conservation initiatives have emerged to help guide the planning and implementation process. Collectively, they comprise a tremendous resource as Crab Orchard NWR engages in comprehensive conservation planning and its translation into effective on-the-ground management.

The North American Waterfowl Management Plan

Signed in 1986, the North American Waterfowl Management Plan (NAWMP) outlines a broad framework for waterfowl management strategies and conservation efforts in the United States, Canada, and Mexico. The goal of the NAWMP is to restore waterfowl populations to historic levels. The NAWMP is designed to reach its objectives through key joint venture areas, species joint ventures, and state implementation plans within these joint ventures.

The Refuge is in the Upper Mississippi River-Great Lakes Region Joint Venture. One of 12 habitat-based joint ventures, this Joint Venture encompasses the states of Michigan and Wisconsin in their entirety, plus portions of Minnesota, Iowa, Nebraska, Kansas, Missouri, Illinois, Indiana and Ohio. The goal of this Joint Venture is to increase populations of waterfowl and other wetland wildlife by protecting, restoring and enhancing wetland and associated upland habitats within the Joint Venture region.

The objectives of this Joint Venture are:

1. Conserve 9,118,884 acres of habitat capable of supporting an annual breeding duck population of 1,542,000, under average environmental conditions, by the year 2013.

   The breeding duck population objective for Illinois is 20,000, which is a 365 percent increase over the average breeding population of 4,300 birds.

2. Conserve 532,711 acres of habitat on migration focus areas capable of supporting 266 million duck use days during annual fall migration, under average environmental conditions, by the year 2013.

   The migration habitat objective (acres of managed wetland habitat) for the Southern Illinois Focus Area is 77,950 acres, which is a 34 percent increase over the 58,171 acres available in 1998.

3. When consistent with Objectives 1 and 2, contribute to the protection and/or increase of habitats for wetland and associated upland wildlife species in the Joint Venture, with emphasis on declining non-waterfowl migratory birds.

Partners In Flight

Formed in 1990, Partners in Flight (PIF) is concerned with most landbirds and other species requiring terrestrial habitats. Partners in Flight has developed Bird Conservation Plans for numerous Physiographic Areas across the U.S. (see http://www.partnersinflight.org). These plans include priority species lists, associated habitats, and management strategies. Reflecting the local physiography, the northern portion of Crab Orchard NWR lies within PIF Physiographic Area 31, the Prairie Peninsula Physiographic Area. The southern portion of the Refuge lies within PIF Physiographic Area 14, the Interior Low Plateaus Physiographic Area.

U. S. Shorebird Conservation Plan and the North American Waterbird Conservation Plan

The U. S. Shorebird Conservation Plan and the North American Waterbird Conservation Plan are plans that address the concerns for shorebird and waterbirds. These plans have corresponding regional plans that cover the Upper Mississippi Valley/Great Lakes Region, which includes the Refuge. These regional plans contain more specific information about the species priorities and habitat conservation needs of birds using the Refuge. These plans are available at http://www.shorebirdplan.fws.gov and http://www.nacwcp.org.

North American Bird Conservation Initiative

In a continental effort, the Partners in Flight, North American Waterfowl Management, U. S. Shorebird Conservation, and the North American Waterbird Conservation plans are being integrated under the umbrella of the North American Bird Conservation Initiative (NABCI) (http://www.nabci-us.org). The goal of NABCI is to facilitate the delivery of the full spectrum of bird conservation through regionally-based, biologically-driven, landscape-oriented partnerships (see http://www.dodpif.org/nabci/index.htm). The NABCI strives to integrate the conservation objectives for all birds in order to optimize the effectiveness of management strategies. NABCI uses Bird Conservation Regions as its planning units. Bird Conservation Regions are becoming increasingly common as the unit of choice for regional bird conservation efforts; Crab Orchard NWR lies within Bird Conservation Region 24, Central Hardwoods.

Each of the four bird conservation initiatives has a process for designating conservation priority species, modeled to a large extent on the PIF method of calculating scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance (at a particular scale, e.g. Physiographic Areas or Bird Conservation Regions), and population trend. These scores are often used by agencies in developing lists of bird species of concern; e.g., the U. S. Fish and Wildlife Service based its assessments for its 2002 list of nongame Birds of Conservation Concern primarily on the PIF, shorebird, and waterbird status assessment scores.

1.9.2.2. Region 3 Fish and Wildlife Resource Conservation Priorities (January 2002)

The Resource Conservation Priorities list is a subset of all species that occur in the Region and was derived from an objective synthesis of information on their status. The list includes all federally listed threatened and endangered species and proposed and candidate species that occur in the Region; migratory bird species derived from Service-wide and international conservation planning efforts; and rare and declining terrestrial and aquatic plants and animals that represent an abbreviation of the Endangered Species program's preliminary draft "Species of Concern" list for the Region.

Although many species are not included in the priority list, this does not mean that we consider them unimportant.

The list includes 99 species or populations for the Service's Upper Mississippi River/Tallgrass Prairie Ecosystem. Approximately 45 of the listed species inhabit the Refuge or immediate vicinity.

1.10 Brief History of Refuge Establishment, Acquisition, and Management

President Franklin D. Roosevelt authorized the Crab Orchard Creek Project in 1936 as a Works Progress Administration (WPA) project. The project was "proposed largely as a recreational and conservation program for water, soil and forestry conservation." Several benefits were envisioned for the project: "(1) it will materially aid in eliminating economic and social distress, (2) create the largest recreational area in the state of Illinois, (3) conserve a large water supply and eliminate flooding of privately-owned lands, (4) conserve existing forests, (5) control soil erosion." (Preliminary Plan for Land Acquisition, Crab Orchard Creek Project, 1936)

In late 1937, the U.S. Department of Agriculture Soil Conservation Service assumed administration of the Project. From 1937 to 1942, the federal government purchased 32,000 acres within the Project area from private landowners. Over 80 percent of the acquired land had been cleared and used for agricultural crops and grazing. Civilian Conservation Corps (CCC) workers planted more than 4.6 million trees in the area from 1938 to 1941. The Crab Orchard Lake dam was completed in 1941. Crab Orchard Lake was the largest lake in Illinois at that time. In 1942 the Department of War appropriated 10,223 acres of the Crab Orchard Creek Project land and purchased an additional 12,352 acres to build the Illinois Ordnance Plant. Between 5,000 and 8,000 people worked at the plant, known as Ordill, manufacturing bombs and anti-tank mines during World War II.

Crab Orchard National Wildlife Refuge was established on August 5, 1947, by Public Law 80-361. This Act of Congress transferred 22,575 acres from the Department of War (Illinois Ordnance Plant) and 21,425 acres from the Soil Conservation Service (Crab Orchard Creek Project) to the Secretary of the Interior.

The Crab Orchard Creek Project proposed dams for Little Grassy Creek and Grassy Creek to store water and prevent siltation of Crab Orchard Lake.

Figure 4: Protected Lands in Southern Illinois

The dam that created Little Grassy Lake was completed in 1950. The dam that created Devils Kitchen Lake was completed in 1959.

Congress designated a 4,050-acre portion of the Refuge as the Crab Orchard Wilderness in 1976.

Since the Refuge was established, the Service has acquired and divested several parcels of land. In 1959, the Refuge transferred 921 acres of land located in its southeast corner to the U.S. Department of Justice for construction of a maximum security prison. In 1969, the Refuge acquired several scattered tracts of land in exchange for 160 acres that is now the site of the John A. Logan College. In a 1974 exchange, the Refuge acquired 15 acres of State of Illinois land in the vicinity of Little Grassy Fish Hatchery. In a 1979 exchange, Southern Illinois University acquired the current site of Touch of Nature Environmental Center and the Refuge acquired land south of Little Grassy Lake. Through the years the Refuge has purchased a few scattered parcels. In 2000, the Refuge used Natural Resource Damage Assessment funds to purchase 216 acres on its western edge. Several small land exchanges are pending.

In addition to Crab Orchard NWR, a variety of other state and federal agencies manage land in the vicinity of the Refuge. Figure 4 illustrates these protected lands.

1.10.1 Recent Refuge Management Activities

1.10.1.1. Wildlife and Fish Habitat

Refuge biologists use various techniques to maintain and enhance wildlife habitat. They manipulate water levels in moist soil management units and seed tallgrass prairie species to reestablish native grasslands. Silvicultural treatments such as thinning, regeneration cutting, and improvement cutting are used in forest habitats to alter species

composition and increase growing space. Trees are also planted to reduce forest fragmentation. Biologists use prescribed fire in pine and hardwood forests and grasslands. Biologists monitor wildlife populations and, in cooperation with the Illinois Department of Natural Resources staff, monitor fish populations in the lakes and ponds, stock game and prey fish, and enhance fishing opportunities by placing discarded Christmas trees to increase underwater structure. Trapping nuisance beavers in the closed area is authorized by special use permit. Biologists monitor and apply treatments for control of invasive plants and animals.

1.10.1.2. Agriculture

The Refuge agriculture program includes about 4,500 acres of row crops (rotation of corn, soybeans, clover) tended by cooperative farmers, about 800 acres of hay fields harvested under special use permits, and about 1,000 acres of pasture grazed under special use permits. The principal goal of the agriculture program is to provide habitat for wintering Canada geese.

1.10.1.3. Recreation

The Refuge receives an estimated 1.1 million recreational visits annually. To accommodate the wide variety of recreational uses, the Refuge operates a visitor information center, environmental education sites, hiking trails, four campgrounds, five marinas, boat launch ramps, picnic areas, swimming beaches, auto tour route, and observation deck. The Refuge offers many opportunities for fishing, hunting, environmental education, interpretation, and wildlife observation and photography. In addition, the Refuge permits camps under cooperative agreements to Girl Scouts, Boy Scouts of America, United Methodist Church and Southeastern Illinois Presbytery. Law enforcement officers provide safety and security for visitors and Refuge resources.

1.10.1.4. Industry

The Refuge leases 1.2 million square feet of facilities that are used for manufacturing, cold storage, and explosives storage. In support of the industrial operations, the Refuge also maintains extensive transportation and utility infrastructure. The Refuge provides water and waste water services to an adjacent college campus and water service to the federal prison.

1.10.1.5. Wilderness

The Refuge staff disseminates wilderness use information to visitors, controls vehicle access and patrols and conducts informal monitoring to protect the resources of the 4,050-acre Crab Orchard Wilderness.

1.10.1.6. Contaminants

The Service's Ecological Services branch has Environmental Contaminants staff co-located at the Refuge who manage the investigation, monitoring, and remediation activities associated with sites contaminated with hazardous chemicals. The Refuge is on the U.S. Environmental Protection Agency's National Priority List of hazardous waste sites.

1.10.1.7. Archaeological and Cultural Resources

The Refuge Manager ensures historic properties are identified and protected as much as possible while achieving Refuge purposes and the Refuge System mission. The manager is guided by several historic preservation laws and regulations. Early in the planning of all projects, the Refuge Manager asks the Regional Historic Preservation Officer (RHPO) to initiate the Section 106 process, which is a set of procedures specified in the National Historic Preservation Act. Then the manager informs the public about the project and its cultural issues through presentations, meetings, and media notices. The manager asks for comments from the public and local officials. Any comments relevant to cultural issues are reported to the RHPO.

Archeological investigations and collecting on the Refuge are performed only in the public interest. Qualified archeologists perform the work under an Archaeological Resources Protection Act permit issued by the Regional Director. Refuge personnel take steps to prevent unauthorized collecting. If unauthorized collecting is detected, Refuge officers cite violators or take other appropriate action and report the violations to the RHPO.

Guided by a Scope of Collection Statement dated November 1992, the Refuge manages museum collections that contain archeological artifacts, art work, historical items and documents, and zoological specimens. To date, twelve archeological investigations have produced in excess of 55,400 artifacts from Refuge lands. The artifacts are stored at 7 repositories, although most are kept at the Center for Archaeological Investigations at Southern Illinois University, Carbondale, under a cooperative agreement.

1.11 Refuge Purposes

Public Law 80-361 mandated that the lands transferred from the Department of War and Soil Conservation Service be administered by the Secretary of the Interior through the Fish and Wildlife Service "for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes specified in this Act."

An additional purpose was acquired when Congress designated the 4,050-acre Crab Orchard Wilderness in 1976. The establishing legislation for the Wilderness (Public Law 94-557) states that "wilderness areas designated by this Act shall be administered in accordance with the applicable provisions of the Wilderness Act...". The purposes of the Wilderness Act (Public Law 88-577) are additional purposes of that part of the Refuge that is within the Crab Orchard Wilderness. The purposes of the Wilderness Act are to secure an enduring resource of wilderness, to protect and preserve the wilderness character of areas within the National Wilderness Preservation System (NWPS), and to administer the NWPS for the use and enjoyment of the American people in a way that will leave these areas unimpaired for future use and enjoyment as wilderness.

1.12 Refuge Vision Statement

The planning team considered the past vision statement and emerging issues and drafted the following vision statement as the desired future state of the Refuge:

> The citizens of Southern Illinois recognize the staff of Crab Orchard National Wildlife Refuge as government employees who listen and care and who meet significant management challenges in a sensible way. Within the Fish and Wildlife Service, Crab Orchard National Wildlife Refuge is recognized not for its exceptions, but for its exceptional management. The Refuge is held as an example of an area once contaminated that is now clean and safe for humans and wildlife. The viewer of a satellite photograph can easily distinguish the Refuge with its large blocks of habitat and its clean water lakes from the surrounding fragmented and developed landscape. Wildlife thrives. Farmers take pride in their operations on the Refuge because they use model conservation practices, benefit wildlife, and make money. The Refuge and the community are proud to contribute to the Nation's defense through the industry that is hosted on the Refuge. In Southern Illinois where a spectrum of outdoor recreation opportunities ranges from the highly developed to the primitive, the Refuge is known for high quality wildlife-dependent opportunities.

1.13 Refuge Goals

Based on the purposes of the Refuge, the mission of the National Wildlife Refuge System and ecosystem considerations, the planning team established the following Refuge goals for the next 15 years.

1.13.1 Wildlife Conservation Goals

Canada Geese:

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

Forest, Early Successional and Grassland Birds:

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

Ducks, Shorebirds, and Other Waterbirds:

Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

Threatened and Endangered Species:

Maintain or enhance populations of federal and, where compatible, state threatened and endangered species that occur at or near Crab Orchard National Wildlife Refuge.

Water Quality:

Maintain or enhance quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.

Resident Fish and Wildlife:

Maintain or enhance resident fish and wildlife populations consistent with management activities for federal trust resources in cooperation with the Illinois Department of Natural Resources (DNR). Maintain a mixed-species, warm-water sport fishery in cooperation with the Illinois DNR.

1.13.2 Recreation/Public Use Goals

Hunting, Fishing, Wildlife Observation and Photography, Interpretation and Environmental Education:

Hunters, anglers, viewers and photographers of wildlife, general visitors and students will enjoy high quality experiences through a variety of opportunities that promote an understanding and appreciation of natural and cultural resources and their management.

Customer Service:

Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.

Volunteers and Support Groups:

Volunteers and Refuge support groups will be stewardship partners and strong advocates for the Refuge.

Other Land and Water-based Recreation:

Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge.

1.13.3 Agricultural Goal

Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.

1.13.4 Industrial Goal

Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards.

1.13.5 Wilderness Goal

Protect the ecological integrity, preserve the wilderness character, restore natural conditions to the extent practicable and provide opportunities for solitude and primitive recreation within the Crab Orchard Wilderness.

1.13.6 Protection Goal

Protect the integrity of Refuge biological and cultural resources and the health and safety of visitors, industrial workers, farmers, and Service staff.

1.13.7 Outreach Goal

Visitors, cooperators, tenants, and local residents will understand Refuge goals, issues and activities. Service personnel will understand the expectations and concerns of the general public by being receptive to their feedback.

1.14 Planning Issues

The Service first began soliciting public comment regarding the Comprehensive Conservation Plan in October 2000. Three public meetings were held using the "open house" format. The Service invited people to drop in at their convenience to talk informally with Refuge staff, view exhibits, and fill out comment forms. The dates, times and locations of the meetings were announced in local papers and special mailings. The first meeting was held Thursday, October 19, 2000, at Southwestern Illinois College, Redbud, Illinois. Twenty-two members of the public and two news media representatives attended. The second meeting was held Friday, October 20, 2000, at the Marion Hotel & Conference Center, Marion, Illinois. One-hundred and thirty five members of the public plus seven members of the media attended. The third meeting was held Saturday, October 21, 2000, at the Crab Orchard Refuge Visitor Center. One-hundred and fifty-nine people attended.

At the open houses, on the Service's Region 3 website, and via the media, people were encouraged to provide written comments on how they wanted the Refuge to be managed. Hundreds of letters and comments were received. Some letters covered one specific interest, others spoke to several interests (Mangi Environmental Group, 2001).

Three focus group meetings were held at the Refuge Visitor Center on January 24 and 25, 2001. Invitations were extended to about 60 stakeholders that had demonstrated a long-standing interest in the Refuge. Additionally, some people were contacted

by the invited participants and attended the meetings. In all, 39 people attended the focus group meetings. Each focus group generated and prioritized a list of issues (Mangi Environmental Group, 2001).

During scoping, many issues or concerns were identified by the public. The issues and concerns ranged from general concerns, the economic effect of the Refuge on the community, for example, to very specific concerns, such as ruts in a gravel road leading to a particular boat ramp. The issues and concerns were classified under major headings. The following paragraphs summarize the issues that are addressed in the Environmental Impact Statement and Comprehensive Conservation Plan.

Bob Etzel

1.14.1 Issue 1: Recreation

Recreation was the most frequently mentioned issue by the public. The public was concerned with all facets of recreation, such as concern for loss of recreation; desire to maintain existing recreational facilities; support/maintain/enhance all forms of recreation; and to expand, improve, re-open and/or add new facilities or activities to the Refuge. Comments were made about the poor or inadequate conditions of some of the facilities, including marinas, boat ramps, restrooms, and campgrounds. Comments made to expand, improve, re-open and/or add new facilities or activities to the Refuge covered a wide range of topics. Some people would like to see the Refuge expand and improve by adding restaurants, marinas, hotels, restrooms, bike trails, hiking trails, disposal containers, roads, shooting range, dog training areas, horse trails, or gas stations. Many others would like to see the Refuge re-open swimming areas, picnic areas, and sailing facilities. Others would like to see additional nature walks, environmental education programs, and water quality monitoring.

1.14.2 Issue 2: Wildlife Conservation

Another issue identified by the public was wildlife conservation. The public recognizes the need to conserve and protect wildlife populations as well as their habitat. People feel that game and non-game species should be protected, threatened and endangered species should be protected, habitats should be preserved, and restoration efforts should be properly employed. The public feels that this is a very important aspect to maintaining the Refuge environment which reflects on how the public uses the Refuge.

1.14.3 Issue 3: Refuge Purposes

A third issue, support for the intended purposes for Refuge management/concern for compatibility of Refuge purposes, was identified as critical to the Refuge. People who wrote or spoke to this concern tended to feel that for some years Refuge management has not properly emphasized or supported the four original purposes for which the Refuge was established. Indeed, some expressed concern that these very purposes may now be considered incompatible with the overall mission of the National Wildlife Refuge System, due to recent legislation and changing policies of the Service.

1.14.4 Issue: Recreational Boating

A fourth issue, support for boating and its proper regulation, was also addressed. There was broad, strong support for the continuation and encouragement of boating at the Refuge. At the same time, the commenting public recognized actual and potential conflicts among boaters and between boaters and other recreational users of the lakes. Comments on regulation of boating include installing speed limits, removing "no wake" signs, and restricting motorized vessels. Many people expressed opposition to jet-skis, or at least expressed the need for more restrictive regulations for their use.

1.14.5 Issue 5: Role in Regional Economy

One issue identified as important in the focus group meetings but not in the letters was the benefits the Refuge provides to the local economy. Focus group participants recognized that the Refuge not only provides tourism dollars, but also agricultural and industrial dollars to the local economy.

1.14.6 Issue 6: Communication between Refuge and Community

Another issue identified as important in the focus group meetings, but not in the letters, was the need for better communication between the Refuge and the community. Some focus group attendees felt that the Refuge could do a better job of informing the local community of current issues facing the Refuge.

1.15 Issues Eliminated from Detailed Study

The public identified some additional issues and concerns during scoping. The Service has determined that the following issues do not merit detailed study in this document.

ATV Use on the Refuge

Some people were opposed to the use of ATVs on the Refuge.

Rationale: The Refuge is not proposing to expand the public's use of ATVs. The Refuge currently issues a very limited number of special use permits to people with disabilities authorizing them to use specific roads for specific activities.

Oil and Gas Production, Mining, Road Building, and Quarries

Some people were opposed to these activities.

Rationale: The Refuge is not proposing to engage in any of these activities, except for possibly building a minor amount of new road (Heron Flats overlook). In fact, the amount of roads likely will decrease as some industrial facilities become obsolete. The federal government owns and controls all but a very small fraction of the mineral rights on Refuge lands. Furthermore, the economics of extracting any minerals appear to be extremely prohibitive for the foreseeable future.

Need for a CCP

Some people were opposed to the preparation of a CCP.

Rationale: Service policy, which is based on federal law, requires every national wildlife refuge to have a CCP.

Privatization of Refuge Management

Some people supported a privately run Refuge.

Rationale: Public Law 80-361, the legislation that established the Refuge, states: "...all lands herein transferred shall be administered by the Secretary of the Interior through the Fish and Wildlife Service.." As part of the National Wildlife Refuge System, the Service is mandated to administer the Refuge.

Concession Operations

Some people oppose any concessions on the Refuge.

Rationale: Concession contracts are functional tools the Refuge has used for many years to provide certain services to the public that it otherwise could not offer because of budget and personnel constraints.

Changing the Name of the Refuge

Some people would like to see the Refuge name changed from "Refuge" to "Federal Wildlife Management Area."

Rationale: As part of the National Wildlife Refuge System, the name "Crab Orchard National Wildlife Refuge" is appropriate.

Chapter 2: Alternatives, Objectives, and Strategies

2.1 Introduction

This chapter describes the alternatives developed in response to the issues and concerns discussed in Chapter 1. The preferred alternative, or proposed action, is also identified. Objectives and management strategies are used to describe what the Service would do over the next 15 years to implement each of these alternatives. A summary table of the alternatives is at the end of the chapter (Table 4 on page 75).

2.2 Formulation of Alternatives

The planning team and additional staff from the Refuge, Regional Office, and Illinois DNR met at a workshop from April 23 to 27, 2001, to develop alternative management concepts. Four concepts were developed and labeled: "Existing Management; Recreational Land Exchange; Open Land Management; and Forest Land Management." The management concepts were described in a project update that was distributed at the Refuge and mailed to 1,400 people on the planning mailing list in September 2001. People were asked to comment on the concepts by November. We received approximately 39 messages through e-mail, 62 individual letters and 79 form letters, with approximately half of those letters including individual comments. We also received a petition with 485 names. Some people wrote in support of an alternative. Each alternative had some supporters. Some people commented on a particular aspect of an alternative. Some people suggested variations of the concept alternatives. A summary of the comments received is presented in Appendix H. Based on the comments received and land cover data analysis, the alternatives were amended and made more specific and an additional alternative was added by the planning team and Refuge staff. The alternatives were also given titles that better describe their content.

Crab Orchard NWR

2.3 Selecting the Preferred Alternative

In selecting a preferred alternative, we considered environmental, economic, and social factors and our ability to implement the actions necessary to accomplish the alternatives. We based our decision on how well the goals of the Refuge were met by each alternative and the environmental consequences of each alternative (See Chapter 4). We selected Alternative E as our preferred alternative. Alternative E will fulfill our statutory mission and responsibilities, and we have adequate authority to implement it.

Ruddy Duck, U.S. Fish & Wildlife Service

During our initial analysis, we considered Alternative B as our "working" preferred alternative. However, Alternative B was abandoned as our preferred alternative when we confronted the difficulties of implementing the land exchange, which would be an important part of Alternative B. If we exchange land, Federal regulations require that the land involved in the exchange be of approximately the same value. Our preliminary appraisal estimates indicated that the Federal property in the proposed exchange exceeds the value of the Southern Illinois University property by as much as $20 million. We evaluated the possibility of putting restrictive covenants on the exchanged property to reduce its value and reducing the amount of property that might be exchanged, but we were unable to reach equal values for the two properties. The exchange proposed in Alternative B could only be accomplished with Congressional action, which we did not want to pursue. We thought that the exchange would be politically sensitive and that its resolution in the legislative process would be lengthy and out of our control. Rather than pursue a course with an uncertain timetable and outcome, we chose an alternative that is within our current authority to implement.

2.4 Summary of Alternatives

2.4.1 Alternative A: Current Management/No Action

2.4.1.1. Background

The Council of Environmental Quality's regulations (40 CFR §1502.14(d)) for implementing the National Environmental Policy Act require that all environmental impact statements include the alternative of taking no action. In addition, some public comments favored the Refuge continuing on its present course. This alternative is being analyzed in response to the views of some of the public and to satisfy the Council's regulations.

2.4.1.2. Summary

Wildlife: Under this alternative the current management activities at the Refuge would continue. The Refuge would continue to provide sufficient habitat for the needs of wintering geese. Current moist-soil management would continue. The Refuge would continue efforts to protect water quality by focusing within the Refuge boundaries. These efforts would include using best management practices on agricultural lands (including haying and grazing) and stabilizing lakeshores. The Refuge would continue to avoid impacts to nesting bald eagles and Indiana bat habitat, continue current wilderness management, grassland management, reforestation, and proceed with conversion of all non-native pine plantations to native hardwood forests.

Recreation: All current recreation uses and patterns on the Refuge would continue. There would be continued decline in support for swimming, power boating and water-skiing. There would be a gradual increase in the quality of other recreational facilities. However, at current levels of improvement, it would take many years to bring the quality of the campgrounds to standards comparable to others in the area. Camping would be limited to a 2-week stay. Hunting, fishing, wildlife observation and photography, environmental education and interpretation would continue at the current level with gradual improvement. Management of public use in the wilderness would continue at its current level.

Industry: Current industrial policies would remain in place and the Refuge would provide facilities for the existing tenants at fair market value rental rates.

Agriculture: The amount of agricultural land would remain fairly constant. However some loss may occur through installing buffer strips needed for soil and water protection. Current acreage of hay fields and pastures would remain about the same. All mowing of pastures, hay fields, and clover fields would take place after August 1.

2.4.2 Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis With Land Exchange

2.4.2.1. Background

Through the years the Refuge has been criticized for its lack of support of the recreational purpose of the Refuge. Recreation on the Refuge drew the greatest number of comments during the scoping of issues. When the Refuge was established, the Director of the Service assured Congress that the Service would be able to manage for the four purposes of the Refuge. In 50 years of management, the Service has not been able consistently to provide facilities and management for quality non-wildlife-dependent recreational experiences. Providing for swimming, picnicking, and power boating does not fit well with the capabilities and resources of the Service. Under this alternative the non-wildlife-dependent recreation that would remain the responsibility of the Refuge would be guided by the philosophy of "consolidate and improve."

Over the last decade habitat fragmentation has been identified as a significant result of changing land use. Habitat fragmentation is known to have negative effects on biological diversity. The number of species that can live within a fragment is related to the size of the fragment. This effect has been shown in both forest and grasslands (Turner et al. 1998). Habitat fragmentation has been identified as a primary threat to area-sensitive songbirds in the Midwest (Robinson 1996). Many of the species affected by habitat fragmentation are of concern to the conservation community.

Under this alternative, management emphasis would be on reducing habitat fragmentation and reconciling conflicts between the Refuge's recreation purpose and the Refuge System mission by focusing on wildlife-dependent recreation on the Refuge while still providing a full spectrum of recreational activities in the area.

2.4.2.2. Summary

Wildlife: Under this alternative some of the current management activities at the Refuge would be modified to provide greater benefits to wildlife. The Refuge would continue to provide sufficient habitat for the needs of wintering geese. Acreage of moist-soil management units would increase. The Refuge would continue efforts to protect water quality on the Refuge, as well as start cooperative efforts with landowners within the watershed. The Refuge would continue to protect nesting bald eagles and Indiana bat habitat. The Refuge would proceed with conversion of all non-native pine plantations to native hardwood forests. The Refuge would manage two large forest blocks to benefit area-sensitive forest birds. The Refuge would maintain some early successional habitat. Pasture and hayfield management would change to provide more emphasis on habitat quality for grassland birds. Removal of linear forest habitat and hedgerows adjacent to agricultural fields would benefit Canada Geese and grassland birds.

Recreation: The main point of this alternative is to offer increased recreational opportunities by exchanging land in the developed northwestern portion of the Refuge for undeveloped land at another location. The Service would try to reconcile conflicts between the Refuge's recreation purpose and the Refuge System mission through a land exchange with Southern Illinois University or other interested parties. The recipient of the exchange would have ownership and management responsibility for the area and could offer non-wildlife-dependent recreational opportunities such as camping, boating, or swimming at their discretion. Under this alternative the Refuge would slightly increase use restrictions on Crab Orchard Lake. Group camps would be managed to include the Refuge's environmental education program. The Refuge would focus on improving hunting, fishing, wildlife observation and photography, environmental education and interpretation (the Refuge System's priority wildlife-dependent recreational opportunities). The Refuge and exchanged lands would offer a spectrum of recreational opportunities ranging from developed, non-wildlife-dependent, recreation in the northwestern corner of Crab Orchard Lake to wildlife-dependent opportunities at Little Grassy and Devils Kitchen lakes. Gas motors would be prohibited on the most southern portion of Devils Kitchen Lake. The campground at Little Grassy Lake would be upgraded. The campground at Devils Kitchen Lake would be closed. Camping would be limited to a 2-week stay. The Refuge would take a more active approach to wilderness management. Horseback use would be confined to designated trails.

Industry: Under this alternative, the Refuge would update the industrial use policy with the intent of not promoting expansion and consolidating the areas occupied by industrial tenants. The Service would maintain roads, water and sewer services and tenants would be expected to maintain and

upgrade leased facilities as needed. The Service would seek not to compete with neighboring industrial parks. If an industrial tenant were to leave the Refuge and their facilities were suitable for occupancy, the Refuge would make them available for new tenants.

Agriculture: The amount of row crops would decrease slightly. Current acreage of hay fields and pastures would remain about the same. All mowing of pastures, hay fields, and clover fields would take place after August 1 to protect nesting birds. The Refuge would convert fescue pastures to other cool-season and native warm-season grasses over a period of 15 years and modify grazing regimes to benefit grassland birds.

2.4.3 Alternative C: Open Land Management, Consolidate and Improve Recreation

2.4.3.1. Background

Both grassland and forest species are negatively affected by habitat fragmentation. Under this alternative the Refuge would take advantage of the lands that are already open and increase the size of existing large blocks of open land for grassland dependent species, especially birds. Under this alternative the Refuge would satisfy the Refuge's recreation purpose as much as possible within Service budget priorities with increased emphasis on wildlife-dependent recreation.

2.4.3.2. Summary

Wildlife: Under this alternative cropland and grassland would increase slightly. Pasture and hayfield management would change to provide more emphasis on habitat quality for grassland birds. Acres devoted to moist soil management would increase. The Refuge would continue to provide sufficient habitat for the needs of wintering geese. The Refuge would continue efforts to protect water quality by focusing within the Refuge boundaries. The Refuge would continue to protect nesting Bald Eagles and Indiana bat habitat. The Refuge would manage one large forest block to benefit area-sensitive forest birds. The Refuge would convert non-native pine plantations located south of Grassy Road and outside the wilderness area to native hardwood forests.

Recreation: To enhance non-wildlife-dependent recreational activities, the Refuge would consolidate marinas and picnic areas, upgrade existing boat ramps and designate times and places for the various types of boating activities. Camping capacity would be reduced, the quality of camping facilities would be upgraded and a 2-week maximum stay policy would be implemented. A spectrum of recreational opportunities ranging from more developed recreation at Crab Orchard Lake to less developed opportunities at Devils Kitchen Lake would be provided. Camping at Devils Kitchen would be discontinued. Crab Orchard and Little Grassy Campgrounds would be upgraded to standards comparable to others in the area. The Refuge would study the possibility of adding primitive campsites to Devils Kitchen Lake, where gas motors would be permitted. Opportunities for hunting, fishing, wildlife observation and photography, environmental education, and interpretation would increase. Horseback use would be confined to designated trails.

Industry: Under this alternative, the Refuge would update the industrial use policy with the intent of not promoting expansion and consolidating the areas occupied by industrial tenants. The Service would maintain roads, water and sewer services and tenants would be expected to maintain and upgrade leased facilities as needed. The Service would seek not to compete with neighboring industrial parks. If an industrial tenant left the Refuge, the Refuge would not seek a new tenant for the vacant facility.

Agriculture: The amount of row crops would increase slightly. Current acreage of hay fields and pastures would remain about the same. All mowing of pastures, hay fields, and clover fields would take place after August 1 to protect nesting birds. The Refuge would convert fescue pastures to other cool-season and native, warm-season grasses over a period of 15 years and modify grazing regimes to benefit grassland birds.

2.4.4 Alternative D: Forest Land Management, Consolidate and Improve Recreation

2.4.4.1. Background

Both grassland and forest species are negatively affected by habitat fragmentation. Under this alternative the Refuge would take advantage of the natural tendency and historical prevalence of forests in the area and increase the size of large blocks of forests for forest interior species, especially birds. Under this alternative the Refuge would satisfy the

Refuge's recreation purpose as much as possible within Service budget priorities with increased emphasis on wildlife-dependent recreation.

2.4.4.2. Summary

Wildlife: Under this alternative some of the current management activities at the Refuge would be modified to provide greater benefits to wildlife. The Refuge would continue to provide sufficient habitat for the needs of wintering geese. Acreage of moist-soil management units would remain the same. The Refuge would continue efforts to protect water quality on the Refuge. The Refuge would continue to protect nesting bald eagles and Indiana bat habitat. The Refuge would proceed with conversion of all non-native pine plantations to native hardwood forests. The Refuge would manage two large forest blocks to benefit area-sensitive forest birds. The Refuge would maintain some early successional habitat. Pasture and hayfield management would change to provide more emphasis on habitat quality for grassland birds, along with an emphasis on cattle production on pastures.

Recreation: To enhance non-wildlife-dependent recreational activities, the Refuge would consolidate marinas and picnic areas, upgrade existing boat ramps and designate times and places for various types of boating activities. Camping capacity would be reduced, the quality of camping facilities would be upgraded and a 2-week maximum stay policy would be implemented. A spectrum of recreational opportunities ranging from more developed recreation at Crab Orchard Lake to less developed opportunities at Devils Kitchen Lake would be provided. The campground at Little Grassy Lake would be upgraded. Use of gas motors on Devils Kitchen Lake would be prohibited. The quality of hunting, fishing, wildlife observation and photography, environmental education, and interpretation opportunities would improve without significant increases in facilities. Group camps would be managed to include the Refuge's environmental education program. Horseback use would be prohibited.

Industry: Under this alternative, the Refuge would update the industrial use policy with the intent of not promoting expansion and consolidating the areas occupied by industrial tenants. The Service would seek not to compete with neighboring industrial parks. If an industrial tenant left the Refuge, the Refuge would not seek a new tenant for the vacant facility.

Agriculture: The amount of row crops and hay fields would decrease slightly. Current acreage of pastures would remain about the same. All mowing of pastures, hay fields, and clover fields would take place after August 1 to protect nesting birds. The Refuge would increase forage diversity and use rotational grazing in pastures to increase cattle production.

2.4.5 Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)

2.4.5.1. Background

Over the last decade habitat fragmentation has been identified as a result of changing land use. Habitat fragmentation is known to have significant negative effects on biological diversity. The number of species that can live within a fragment is related to the size of the fragment. This effect has been shown in both forest and grasslands (Turner et al. 1998). Habitat fragmentation has been identified as a primary threat to area sensitive songbirds in the Midwest (Robinson 1996). Many of the species affected by habitat fragmentation are of concern to the conservation community.

The Refuge recognizes that improvements in the recreation program are needed. Under this alternative the Refuge would satisfy the Refuge's recreation purpose as much as possible within Service budget priorities with increased emphasis on wildlife-dependent recreation.

2.4.5.2. Summary

Wildlife: Under this alternative some of the current management activities at the Refuge would be modified to provide greater benefits to wildlife. The Refuge would continue to provide sufficient habitat for the needs of wintering geese. Acreage of moist-soil management units would increase. The Refuge would continue efforts to protect water quality on the Refuge, as well as start cooperative efforts with landowners within the watershed. The Refuge would continue to protect nesting Bald Eagles and protect, restore and/or enhance potential Indiana bat habitat. The Refuge would proceed with conversion of all non-native pine plantations to native hardwood forests. The Refuge would manage two large forest blocks to benefit area-sensitive forest birds. The Refuge would maintain some early successional habitat. Pasture and hayfield management would

change to provide more emphasis on habitat quality for grassland birds. Removal of linear forest habitat and hedgerows adjacent to agricultural fields would benefit Canada Geese and grassland birds.

Recreation: To enhance non-wildlife-dependent recreational activities, the Refuge would consolidate marinas and picnic areas, upgrade existing boat ramps and designate times and places for the various types of boating activities. Under this alternative the Refuge would slightly increase use restrictions on Crab Orchard Lake. Group camps would be managed to include the Refuge's environmental education program. Camping capacity would be reduced, the quality of camping facilities would be upgraded and a 2-week maximum stay policy would be implemented. A spectrum of recreational opportunities ranging from more developed recreation at Crab Orchard Lake to less developed opportunities at Devils Kitchen Lake would be provided. The campgrounds at Crab Orchard Lake and Little Grassy Lake would be upgraded. Camping at Devils Kitchen Lake would be reduced to primitive sites only, and gas motors would be prohibited on the most southeastern portion of the lake. Opportunities for hunting, fishing, wildlife observation and photography, environmental education, and interpretation would increase. The Refuge would take a more active approach to wilderness management. Horseback use would be confined to designated trails.

Industry: Under this alternative, the Refuge would update the industrial use policy with the intent of not promoting expansion and consolidating the areas occupied by industrial tenants. The Service would maintain roads, water and sewer services and tenants would be expected to maintain and upgrade leased facilities as needed. The Service would seek not to compete with neighboring industrial parks. If an industrial tenant were to leave the Refuge and their facilities were suitable for occupancy, the Refuge would make them available for new tenants.

Agriculture: The amount of row crops would decrease slightly. Current acreage of hay fields and pastures would remain about the same. All mowing of pastures, hay fields, and clover fields would take place after August 1 to protect nesting birds. The Refuge would convert fescue pastures to other cool-season and native warm-season grasses over a period of 15 years and modify grazing regimes to benefit grassland birds.

Glenn Smart

2.5 Alternatives Considered but Not Analyzed in Detail

Reestablish pre-settlement habitat conditions: eliminate lakes, remove sediment, restore vegetation to pre-settlement conditions, eliminate non-native invasive species.

This alternative was not analyzed in detail because reestablishing pre-settlement conditions is not practical. The elimination of the lakes and removal of sediment contained in lake bottoms would not only be cost prohibitive but would be seen by most Refuge users as inappropriate. The lakes provide for a majority of Refuge visits, both wildlife-related and non-wildlife related. The elimination of non-native species is a worthy goal but not practical. The Refuge has been heavily infested by many non-native species, such as autumn-olive, Japanese honeysuckle, fescue and others. If they could be eliminated, it would take many years and require a cost-prohibitive investment in removal and treatment of these species. In addition, the Refuge purposes preclude complete reestablishment of pre-settlement conditions.

Eliminate all non-wildlife-dependent recreational activities

This alternative was not analyzed in detail because of the long history of non-wildlife-dependent recreation on the land prior to and after the establishment of the Refuge. To attempt to eliminate this type of recreation through this planning

process would not be practical. The political turmoil that would be created by such an alternative would stop the planning process.

Eliminate all picnicking

This alternative was not analyzed in detail because of the long established tradition of maintaining picnicking sites on the Refuge. Additionally, these sites are associated with other recreational activities such as bank fishing and/or wildlife observation.

Have the industrial purpose removed from the Refuge purposes

This alternative was not analyzed in detail because suitable industrial infrastructure still exists on the Refuge to support the munitions industry. The removal of industry as a purpose would be seen as a threat to the local economy and jobs.

Expand group camps

This alternative was not analyzed in detail because the Service is trying to reduce the number of sites and facilities on national wildlife refuges that are operated for limited use by individuals and organizations.

Immediately close Crab Orchard Boat &Yacht Club

The Crab Orchard Boat & Yacht Club has a long history on the Refuge. It has constructed and maintained the facilities that are on the site occupied by the Club. This alternative was not analyzed in detail because the immediate closure of the facility would not allow members to amortize their recent investments in a reasonable amount of time.

2.6 Detailed Description of Alternatives and Relationship to Goals, Objectives and Strategies

In addition to setting goals as part of the CCP process, objectives and strategies that will help specify and achieve the goals were developed. Goals are broad statements of the desired future condition. Objectives are specific statements of what will be accomplished to help achieve a goal. Strategies specify the activities that would be pursued to realize an objective.

Some of the alternatives emphasize one goal over another, thus objectives and strategies differ among some alternatives. This section describes the objectives and strategies for each of the alternatives (Alternatives A, B, C, D and E) under the goals of the Refuge. Note that Alternative A represents the anticipated conditions if the current management and trends continued.

Two land cover maps are included for each alternative. One map depicts the expected land cover in 2100, the other in 2015. The 2100 map depicts the long-range landscape plan for an alternative. Because succession and restoration are slow processes, we have included the map for 2015 to depict what we think is reasonable to expect in the next 15 years – the time horizon for the CCP – under each alternative.

2.6.1 Features Common to All Alternatives

Canada Geese Goal

Provide enough food for wintering Canada Geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

Background: When established, the Refuge was recognized as being important to providing habitat for wintering Canada Geese. The Refuge was also established with an agricultural purpose. The agricultural purpose and supporting wintering Canada Geese are interrelated.

Objective 1

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days annually.

Strategies:

1. Maintain at least 4,000 acres in Refuge row crop program, actively manage moist-soil units, and continue fall mowing around selected ponds.
2. Continue managing the Refuge agriculture program with methods that benefit Canada Geese, such as: leave 25 percent of the corn crop unharvested, plant winter wheat in soybean fields each fall, use low tillage planting techniques, keep fields in clover 2 years out of the 5-year rotation.
3. Continue seasonal closure of east end of Crab Orchard Lake.

Forest, Early Successional and Grassland Birds Goal

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

Background: The Refuge has about 25,000 acres of forest habitat. Most of this acreage is in old-field or second-growth hardwood forest cover on upland and bottomland sites. Oaks are keystone species that are essential to a healthy, diverse forest ecosystem in this region. Typically with a lack of disturbance shade-tolerant trees increase in dominance while oaks steadily decrease, and understory diversity is greatly diminished. On many sites timber harvesting, prescribed burning, and other methods of disturbance must occur for oaks to flourish. Past forest management activities have included prescribed burning and the thinning of hardwood stands to maintain tree health, promote mast production and control species composition. Our proposed management actions would apply these same treatments in order to provide habitat for the full spectrum of native plants and animals with an emphasis on the habitat needs of the resource conservation priority species listed in Table 34 on page 131. No commercial timber harvesting would take place in the Crab Orchard Wilderness or any research natural area.

Objective

Manage forest land to favor oak-hickory forest types on suitable sites with all age classes from seedling stage to old-growth represented. Manage native, shade-tolerant tree species (such as sugar maple) to prevent wide-spread succession to climax forest cover types.

Strategies

1. Write and implement a *Habitat Management Plan* following policy in the Fish and Wildlife Service Manual (620 FW 1).
2. Apply appropriate silvicultural treatments to manage forest health, species composition, and age structure. Treatments may include non-commercial forest stand improvement treatments (girdling, cutting, and/or applying herbicide to individual stems), commercial timber cutting (thinnings, improvement cuttings, and regeneration cuttings) and prescribed burning. Forest stand improvement treatments may occur in any forest type (up to 25,000 acres). Commercial timber cutting may occur in any forest type outside the Crab Orchard Wilderness and research natural areas (up to 19,700 acres). Commercial harvest operations are not likely to take place on more than 400 acres annually on average, half of which would be considered regeneration cuttings. Our preferred regeneration technique is the shelterwood method. More specifically, the shelterwood method with reserves would be used in hardwood (and pine) stands where some hardwoods would be left standing following the final removal cutting. Prescribed fire may be applied in upland forest (up to 23,000 acres of hardwood and pine types), but not in bottomland forest.
3. Reforest available open sites located outside of the two large forest blocks (described in the Forest, Early Successional and Grassland Birds Goal section under Alternative B on page 41) by planting native hardwoods, with preference given to oaks and hickories, to reduce forest fragmentation. Examples of such sites would be small agricultural fields (or portions thereof) no longer being farmed, abandoned

Natural Area, Crab Orchard NWR

industrial areas, abandoned rights-of-way (roads, powerlines, and pipelines), and remediated contaminant areas.

4. Control exotic, invasive plants through integrated pest management practices.

Threatened and Endangered Species Goal

Maintain or enhance populations of federal and, where compatible, state threatened and endangered species that occur at or near Crab Orchard National Wildlife Refuge.

Background: The Bald Eagle is the only federally designated threatened species known to occur on the Refuge. The Indiana bat, which is federally classified as endangered, is known to occur in proximity to the Refuge. Thirty-one state-listed threatened and endangered species inhabit, or have inhabited, the Refuge (see Appendix E). Chapter 3 describes the threatened and endangered species on the Refuge. 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 preparation of the EIS.

Objective 1

Assure that federally listed species, state-listed species and federally proposed species and their habitats are protected.

Strategies:

1. No disturbance of bald eagles will take place during critical periods within protective zones as described in the Northern States Bald Eagle Recovery Plan (USFWS, 1983). Areas are designated closed through signing and brochures.
2. Forest management activities, such as thinning and prescribed burning, would require close coordination with U.S. Fish and Wildlife Service, Ecological Services personnel. These activities may require standard surveys to determine whether Indiana bats are present in a given forest unit or the activities may be scheduled outside of the season when Indiana bats are likely to use Refuge forests.

Resident Fish and Wildlife Goal

Maintain or enhance resident fish and wildlife populations consistent with management activities for federal trust resources in cooperation with the Illinois DNR.

Background: There is a long history of public fishing, public hunting, and management of resident fish and wildlife species on the Refuge.

Objective 1

Manage Refuge fisheries with emphasis on mixed-species, warm-water sport fishing.

Strategy

1. Continue cooperative management of Refuge fisheries with Illinois DNR. Continue managing fish populations and habitat through activities such as: setting length and creel limits, seasonal closures of spawning bed areas, habitat enhancements, annual surveys, and fish stocking.

Objective 2

Manage Refuge resident wildlife populations at levels that allow opportunities for sport hunting of game species.

Strategies

1. Continue managing the Refuge agriculture program with methods that benefit resident game species, such as: leave 25 percent of the corn crop unharvested, plant winter wheat in soybean fields each fall, use low tillage planting techniques, keep fields in clover 2 years out of the 5-year rotation, delay mowing until after August 1, and use no insecticides.
2. Incorporate beneficial practices such as those suggested in the Northern Bobwhite Conservation Initiative: convert cool-season to warm-season grasses and burn and thin pine plantations.
3. Continue controlled hunting for turkey and deer in the restricted use portion of the Refuge.

Outreach Goal

Visitors, cooperators, tenants, and local residents will understand Refuge goals, issues and activities. Service personnel will understand the expectations and concerns of the general public by being receptive to their feedback.

Background: During the scoping process, residents of local communities reported they felt uninformed by the Refuge about activities occurring on

the Refuge and about the reasons for certain activities. To resolve this concern, the Refuge will communicate more effectively with local communities and listen more attentively to community concerns.

In keeping with the history of public use on the Refuge, many non-wildlife oriented special events have been permitted on the Refuge. These special events have included organized running, bicycling, and swimming events, use of Refuge for "National Hunting and Fishing Days" activities, and American Red Cross Blood Drives.

The Refuge will continue to support special events that foster good community relations and are sponsored by nonprofit organizations. To be permitted, these events cannot damage Refuge habitats or facilities, nor can they adversely impact fish and wildlife populations. In addition these events cannot interfere with Refuge visitors and wildlife-dependent activities such as hunting, fishing, and environmental education. Permitted activities will be limited to one-time and annual events.

Objective 1

The positive attitude toward Refuge management will increase among visitors, cooperators, tenants, and local residents throughout the life of the plan.

Strategies

1. Issue press releases, hold Refuge open houses and hold regularly scheduled forums.
2. Within 2 years of the Plan's approval, create and maintain a "listening log" of written and verbal public input submitted to the Refuge. Review this log quarterly and address voiced community concerns.
3. Provide annual reports on the "State of the Refuge." Distribute these reports upon request at the Visitor Center and by mail and post the current year's report on the Refuge website.
4. Continue to permit selected annual and special events that are sponsored by nonprofit organizations, provided they are compatible and do not damage Refuge resources or interfere with wildlife-dependent recreation.

Protection Goal

Protect the integrity of Refuge biological and cultural resources and the health and safety of visitors, industrial workers, farmers, and Service staff.

Background: Past industrial practices at the Refuge contaminated some lands and waters. As a result, in 1987 the Refuge was added to the U.S. Environmental Protection Agency's National Priorities List of contaminated sites. Studies have located many sites of contamination within the former Illinois Ordnance Plant (IOP) resulting from military activities that occurred during World War II or subsequent activities of private industrial tenants. Lands no longer used by industry are converted to habitat for fish and wildlife. Some of these lands have been contaminated. These contaminants may need to be removed so that they do not adversely impact plants, fish, wildlife, or public health and welfare. Refuge visitors should be able to use these habitats for hunting, fishing, wildlife observation and other potential future uses without being exposed to unacceptable levels of contaminants. The Service is seeking remedy for past acts of contamination through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as "Superfund." The Service believes past acts of contamination should be remedied with the best and most cost effective technologies available. The Service also believes that the Refuge should not be burdened with residual contamination that may impair the ability of the Service to manage the Refuge for appropriate uses in the future.

The Refuge's law enforcement officers serve to protect the natural and cultural resources, as well as the health and safety of visitors, staff, and tenants. The Refuge depends on cooperative relationships with the Illinois DNR and several local sheriff departments.

The Refuge faces a significant challenge of controlling exotic and invasive plants to protect biological diversity, provide high quality habitats for fish and wildlife, and facilitate agriculture, recreation, and industry.

The Refuge contains many documented cultural resources, and other undiscovered sites probably exist.

The Refuge manages 24 conservation easements within a 21-county area in southern Illinois. Inadequate staffing levels have impeded proper management of the widely dispersed easements. Some of

the easements have not been surveyed or marked on the ground. The easements should be inspected regularly, but some have not been inspected in over 10 years. Without appropriate monitoring the easements and their resources can not be protected from encroachment.

Objective 1

Refuge lands and waters are safe for fish, wildlife, plants, and people.

Strategy

1. Work with USEPA, Illinois EPA, Departments of Interior and Justice, and responsible parties to remediate contaminated sites. Where contamination is left in place, or where there is potential for undiscovered contamination that may pose a risk from exposure, institutional controls may be formulated. An institutional control plan would be written by the CERCLA staff and made available to Refuge management for implementation.

Objective 2

Visitors will feel safe on the Refuge and illegal harvest of fish and wildlife will be reduced.

Strategy

1. Maintain full-time law enforcement staff.

Objective 3

Manage or eliminate invasive species on the Refuge.

Strategy

1. Write and implement an Integrated Pest Management (IPM) Plan following guidance developed by the Service's "Promises Invasive Species Team." The IPM plan will address target species control methods, mapping and monitoring.

Objective 4

Protect the cultural, historic, and pre-historic resources of federally-owned lands within the Refuge.

Strategies

1. Implement the Cultural Resource Management Plan for Cultural Resources within the Crab Orchard National Wildlife Refuge (Godfrey and Stubbs 2001).
2. Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. Notify the Regional Historic Preservation Officer early in project planning or upon receipt of a request for permitted activities.
3. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program.
4. Complete accessioning, cataloging, inventorying, and preserving the museum collection at the Refuge in accordance with "Survey of Collections at Crab Orchard NWR" by Mayda S. Jensen.

Objective 5

Meet Service policy guidelines ("Administration and Enforcement Procedures for Conservation Easement") for 12 conservation easements by 2007, for all easements by 2010.

1. Complete legal surveys on 50 percent (12 tracts) of all conservation easements by 2007 through contracted services. Complete contracted surves on the remaining tracts by 2010.
2. Conduct annual inspections of all conservation easements.
3. Develop land use plans for 50 percent (12 tracts) of the conservation easements and restore grassland and wetland habitats on 25 percent of these tracts by 2009.

4. Hire a permanent 6-month law enforcement officer to conduct annual inspections, develop land use plans, and restore wetland and grassland habitat projects.

Wilderness Goal

Protect the ecological integrity, preserve the wilderness character, restore natural conditions to the extent practicable, and provide opportunities for solitude and primitive recreation within the Crab Orchard Wilderness.

Background: As long as they do not alter natural processes, the Wilderness Act of 1964 permits certain activities within designated wilderness areas. The Crab Orchard Wilderness is a popular area for hunting, hiking, nature study, horseback riding, and mushroom picking. Prohibited activities, such as camping and off-road vehicle use, occasionally occur. Horseback use and trails have developed inconsistent with the existing Wilderness Management Plan. The Wilderness Management Plan, which was approved in 1985, is dated and needs to be revised.

Suitability

In accordance with Refuge planning policy, this EIS includes a wilderness review to identify Service-owned lands and waters within the planning unit that may qualify for inclusion in the National Wilderness Preservation System. The Service has identified two tracts of land within the planning unit that meet the criteria for Wilderness Study Areas: an 80-acre tract completely surrounded by the existing Crab Orchard Wilderness and a 40-acre tract surrounded on three sides by the Crab Orchard Wilderness. Southern Illinois University owned both tracts when the Crab Orchard Wilderness was designated in 1976. The Refuge subsequently acquired the tracts through a land exchange in 1979. The two tracts are roadless, contiguous to designated wilderness, appear natural, and offer opportunities for solitude and primitive recreation. Both tracts are currently managed as a part of the Crab Orchard Wilderness.

An additional 558-acre tract contiguous with the southern boundary of Crab Orchard NWR was acquired in the same land exchange. Rocky Comfort Road runs north-south through this tract. The 424 acres west of the road are the site of a former Southern Illinois University environmental education camp. The 134 acres east of the road are old fields that are undergoing natural ecological succession. Neither portion of the 558-acre tract currently meets the criteria for naturalness.

There are no additional areas within the remainder of the Crab Orchard NWR planning unit that meet the minimum criteria for a Wilderness Study Area. The results of the wilderness inventory are documented in Figure 5.

The two parcels within the Crab Orchard Wilderness that were acquired after the Wilderness was designated have wilderness characteristics and should be recommended for wilderness designation. This will add consistency to the protection and management of the Wilderness. The Wilderness will be managed in accordance with Service policy for Wilderness management (6 Refuge Manual 8). All activities in designated Wilderness will be carried out in conformance with the mandates of the Wilderness Act and the establishing legislation for the Crab Orchard Wilderness, Public Law 95-557. The use of motorized vehicles and mechanical transport is prohibited, except in emergency situations.

Objective 1

Recommend the designation of two parcels (120 acres) as Wilderness within 2 years of approval of the CCP.

Strategy

1. Prepare and submit a Wilderness Study Report. Service wilderness policy is currently under revision. The direction of the new policy will be followed when it is adopted.

Objective 2

Revise and implement the Crab Orchard Wilderness Management Plan within 5 years of approval of the CCP.

Strategy

1. Prepare and implement a Wilderness Management Plan. Service wilderness policy is currently under revision. The direction of the new policy will be followed when it is adopted.

Objective 3

Restore native hardwood forest on 325 acres of pine and pine-hardwood forest in the Crab Orchard Wilderness within 15 years of approval of the CCP.

Strategies

1. Thin the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness to promote establishment and growth of native hardwoods. Thinning

Figure 5: Results of Crab Orchard NWR Wilderness Inventory

would be conducted in several phases over a 10- to 15-year period to mimic the natural process of succession where pines are gradually replaced by hardwoods. Individual pines would be killed by cutting, girdling or injecting herbicide. No trees would be removed from the site. Treatments would be conducted so that the results would appear natural as much as possible. However, trees along heavily used trails may need to be felled to avoid personal injury to visitors, in which case this zone may appear unnatural for several years. Eventual removal of all the non-native pines would restore the natural vegetative cover of the area and enhance wilderness characteristics.

2. Prescribed burn the pine and pine-hardwood stands during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration. Control lines would be established by hand tools where necessary, using natural firebreaks as much as possible.

Objective 4

Control or eradicate invasive species (especially autumn-olive, multiflora rose, Amur honeysuckle, white poplar, and Oriental bittersweet) over the 15-year life of the CCP.

Strategy

1. Prepare and implement an Integrated Pest Management Plan following guidance developed by the Service's "Promises Invasive Species Team."

Objective 5

Explore ways to increase cooperation with the U.S. Forest Service on management of the Crab Orchard Wilderness and the adjoining Panther Den Wilderness within 2 years of approval of the CCP (Figure 5).

Strategy

1. Contact the Forest Supervisor of the Shawnee National Forest and discuss ways our agencies could work together in managing the adjoining wildernesses.

Objective 6

Provide opportunities for primitive recreation, such as hiking, hunting, nature study and wild food collection, over the 15-year life of the CCP.

Strategies

1. Continue current primitive recreational opportunities.
2. Prepare and distribute a wilderness brochure and conduct interpretive programs to inform the public about primitive recreational opportunities available.

Objective 7

Within 5 years of approval of the CCP, determine an appropriate level of opportunities to offer equestrians based on an evaluation of the current level and extent of horseback riding use and its effects on the Wilderness.

Strategy

1. Evaluate the current, unauthorized River to River route. Cooperate with partners to plan, construct, and maintain an authorized River to River trail route through the Refuge.

Volunteers and Support Groups Goal

Volunteers and Refuge support groups will be stewardship partners and strong advocates for the Refuge.

Background: Volunteers, support groups, and other partnerships strengthen Refuge activities and contribute to making the Refuge an integral part of the community.

Objective 1

Improve Refuge support for volunteer and Friends of Crab Orchard NWR activities to a point where at least 95 percent of volunteers and Friends members feel like valued contributors to the success of Refuge programs and endeavors.

Strategies

1. Continue to manage volunteer and support programs in accordance with Service guidelines detailed in "A Guidebook for Working with Volunteers." Maintain an active liaison with support groups and partners.
2. Provide in-depth initial training to Refuge volunteers that will enable them to effectively and efficiently complete projects and responsibilities. Encourage involvement in diverse volunteer activities that match volunteer interests.
3. Continue demonstrating Refuge appreciation for volunteer contributions and Friends support annually through a Volunteer

Appreciation Banquet and other appropriate means. Present awards for service hours in accordance with Service guidelines.

2.6.1.1. Operational Policies

Area Designations

Background: Twice since the establishment of the Refuge, the Service has published its land use policy in the Federal Register. These documents used the concept of dividing the Refuge into three areas and describing the types of use that would be considered within a particular area. This policy was last published in the Federal Register on September 6, 1961. It called for using Area I for "various forms of recreation, including public hunting and fishing in accordance with State laws, picnicking, boating, swimming, and similar activities;" Area II for "industrial purposes;" and Area III "for use and administration as a public recreation area on which group recreation, group camps and private cabin or cottage site developments on lands zoned for those purposes."

Since the publication of the policy described above, Congress has passed several laws governing the management of the National Wildlife Refuge System. The most recent, the National Wildlife Refuge System Improvement Act of 1997 (Act) sets forth guiding principles for management of all national wildlife refuges, such as wildlife-dependent recreation having priority over non-wildlife-dependent recreation. It challenges the managers of Crab Orchard National Wildlife Refuge to balance Refuge purposes, which are "...conservation of wildlife and for the development of agriculture, recreation, industrial and related purposes...," with the Refuge System mission of "administering a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitats..." The Act states that: "... if a conflict exists between the purposes of a refuge and the mission of the System, the conflict shall be resolved in a manner that first protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission of the System."

Proposed Policy: With this comprehensive conservation plan, the Service is attempting to balance its management responsibilities across all portions of the Refuge. Under all alternatives described in Chapter 2 of this plan, the concept of classifying uses of the Refuge into Areas I, II and III would be dropped. Only the industrial area of the Refuge, formerly known as either Area II or the Closed Area, would retain the designation of "restricted use area" because of safety and security concerns.

The safety and security concerns are associated with property protection, contaminants and the storage of explosive materials. Under all alternatives described in Chapter 2 of this plan, the warehouse area on the east end of Ogden Road (Area 7) would be closed to the general public, thereby precluding access to Blue Heron Pond for recreational fishing.

Wildlife management is a major focus for all lands encompassed by the boundaries of Crab Orchard NWR.

Camping Length of Stay

Background: People camped near Crab Orchard Lake before the Refuge was established. In the early days of the Refuge, camping was allowed throughout the open areas of the Refuge. However, the dispersed camping caused unacceptable litter and resource damage. In order to minimize the problems, four concession-operated campgrounds were constructed and camping was permitted only in the campgrounds. Crab Orchard Lake Campground began operation in 1964. Since then, the Refuge campgrounds have been operated by both concessionaires and the Service at different times.

Refuge regulations have not limited the length of stay for campers. By not limiting the length of stay, campers have been able to occupy a site for an entire season. The result is that sometimes families on a short vacation or a weekend visit have limited opportunity to camp in the most desirable sites near the water. Some people who have occupied sites for the entire season have brought in equipment and material that have created an atmosphere more typical of a permanent trailer park than a campground. The lack of a length of stay regulation is unusual in public campgrounds. In order to provide a more equitable opportunity to stay in desirable camping sites, we would establish a maximum length of stay at all Refuge campgrounds.

Proposed Policy: We would limit the length of stay at Refuge campgrounds to 14 nights comparable with other Federal and State campgrounds in the area. For the first 2 years, approximately one-half of the campsites would remain available for long-term camping and the other half for stays up to 14 days maximum. The second 2-year period would permit up to one-third of campsites to be available for 28 days and the remaining two-thirds would be limited to 14-day maximum stays. Finally, beginning in the

fifth year, a 14-day maximum stay would apply to all campsites. At the end of a camping stay, we would require persons to remove all camping equipment from the campground for a minimum of 48 hours. Personal property such as trailers or recreational vehicles may not be stored in the campground during this 48-hour period. In addition, a reservation system would be phased in for Refuge campgrounds.

Group Camps

Background: Refuge policy that immediately followed establishment of the Refuge had provisions that permitted group recreation, group camps and private cabin or cottage site development on lands zoned for that purpose. The areas chosen for group camps were along the shoreline of the proposed Little Grassy Lake. Interest from organizations on how to establish a group camp in this area was shown as early as December 1947.

The Service prioritized the availability of this opportunity for planned group camping with the policy of first serving strictly youth camping groups, second youth/adult church camp educational programs and last fraternal organizations. In 1950, the Refuge began reviewing applications for group camping from a number of organizations. The Service issued several group camping leases to organizations such as: The Boy Scouts of America, the Girl Scouts, the Educational Council of 100 Inc., Pioneer Communications Club, Independent Order of Odd Fellows, The United Methodist Church, The Presbyterian Church and others. Many of these organizations began using the area in 1952. Today there are four group camps still operating on the Refuge: Pine Ridge Camp (Boy Scouts), Camp Cedar Point (Girl Scouts), Camp Carew (Presbyterian Church), and the United Methodist Church Camp.

Proposed Policy: Group camps would continue with the requirement that they provide environmental education as specified in current agreements. The infrastructure associated with the existing camps would not expand beyond current square footage occupied by the camps. The camps would be assessed a fee for use of federal lands. Because the use authorized under the agreements includes environmental education with no profit gained by the camps, the fees will be minimal administrative and use fees. If an organization decides to no longer operate their camp, the Refuge would determine if the site should be closed or leased to another organization based on Refuge's environmental education goals, the purpose and mission of the organization wishing to occupy the camp, the condition of the facilities and existing National Wildlife Refuge System policies.

Recreational Fees

Background: Entrance fees were implemented in 1988 under the authorization of the Emergency Wetland Resource Act of 1986. The entrance fee program admitted anyone holding a permit and accompanying passengers in their vehicle to the Refuge. In 1997, under authorization of the Omnibus Consolidated Rescissions and Appropriations Act of 1996, the entrance fee program was modified to a recreation use fee program. The user fee program requires all vehicles and boats using the Refuge to have a valid fee decal. In evaluating the use fee program as part of the comprehensive conservation planning process, we recognized that the current program does not fairly implement the intent of the Federal Demonstration Fee Program.

Proposed Policy: We would implement a recreational fee program that is comparable to other fee programs within the Service. These changes would be consistent with the new Federal Lands Recreation Enhancement Act and increase convenience for the visiting public. The refuge would have an entrance fee as well as an expanded amenity recreation fee. Federal Duck Stamps, America the Beautiful Passes, and Crab Orchard Refuge annual, weekly and daily passes would permit entry to the Refuge. An expanded amenity recreation fee would be charged in addition to the entrance fee for using boat launching facilities and participating in quota hunts. Table 1 summarizes proposed recreational fees.

Fishing Tournaments

Background: Five fishing tournaments are held each year on the Refuge's three lakes under special use permits. Devils Kitchen Lake and Little Grassy Lake each host one tournament. Crab Orchard Lake hosts three tournaments. The tournaments are well established and require minimal assistance from Refuge staff, although Refuge and Illinois Department of Natural Resources officers do conduct spot checks for violations during the tournaments. Anglers and biologists have expressed concern over reduced fish populations because of post-release mortality and the lack of vegetation for spawning bass.

Proposed Policy: The five current fishing tournaments would continue on the Refuge's three lakes. However, if any of these five organizations decide to discontinue a tournament, the event would be elimi-

Table 1: Proposed Recreational Entrance Fees and Federal Passes That Will Permit Entry

Fee Option	Cost	Eligibility	Allows Entry to...	Validation Period
Daily Fee	$2/vehicle	Anyone	Crab Orchard NWR	1 day
Weekly Fee	$5/vehicle	Anyone	Crab Orchard NWR	7 consecutive days
Commercial bus	$20	For buses up to 20 passengers	Crab Orchard NWR	1 day
Refuge Annua[1]l	$15/vehicle	Anyone	Crab Orchard NWR	1 year (July 1 - June 30)
Duck Stamp	$15	Anyone	Any national wildlife refuge	1 year (July 1 - June 30)
Golden Eagle	$65	Anyone	Any federal fee area	1 year from month of purchase
Golden Age	$10	Persons 62 years or older	Any federal fee area	Lifetime
Golden Access	Free	Anyone who is permanently disabled	Any federal fee area	Lifetime
Hologram[2]	$15	Anyone holding a National Park Pass	Any federal fee area	1 year from month of purchase
Daily boat launch fee	$2/boat	Anyone	Crab Orchard NWR	1 day
Daily boat launch fee	$2/boat	Anyone	Crab Orchard NWR	1 day
Weekly boat launch fee	$5/boat	Anyone	Crab Orchard NWR	7 consecutive days
Annual boat launch[3]	$10/boat	Anyone	Crab Orchard NWR	1 year (July 1 to June 30)

1. *Additional passes for vehicles and boats may be purchased for $5.*
2. *The National Park Pass ($50) can be upgraded through the purchase of a $15 Golden Eagle hologram. The Golden Eagle hologram can be affixed to the Park pass to allow for entrance into all federal fee areas. The National Park pass will not be available at the Refuge, but the hologram can be made available.*
3. *Additional passes for vehicles and boats may be purchased for $5.*

nated and not replaced in the future. We will continue to work with tournament organizers to reduce post-release mortality.

Fish-offs

Background: The three lakes receive many visits from fishing clubs hosting events called "fish-offs." A fish-off is defined as an organized club fishing event having 20 boats or fewer. Recreational anglers and biologists have expressed concern over reduced fish populations and catch rates as a result of fishing pressure on Refuge lakes. In the past, the total number of fish-offs has not been limited, and as many as 95 Refuge-authorized fish-offs have been held in a single year, in addition to unauthorized events.

Proposed Policy: Organizers of fishing events must obtain a fish-off use permit. The permit allows the organizer to have one fish-off per lake, per year. The total number of fish-offs allowed on the Refuge will be determined annually by the Refuge Manager. There is a $35 charge for the permit and the organizer must follow terms and conditions of the permit.

Recreational and Technical Rock Climbing:

Background: Crab Orchard NWR is not typically considered a climber's destination, but some demanding and varied rock climbs can be found in the southern portions of the Refuge. Over the years Refuge visitors have inquired about climbing, but climbing has never been officially permitted. Rock climbing has occurred in the Devils Kitchen and Little Grassy areas. The Refuge has in the past discouraged rock climbing activities such as jumping and diving from the rocks of Devils Kitchen Lake by not permitting swimming in the lake and by closing the area below the Crab Orchard Dam spillway to public access. Climbing opportunities can be found at nearby Giant City State Park.

Proposed policy: Recreational and technical rock climbing would not be permitted on the Refuge. This includes free-style rock climbing, rappelling and technical rock climbing.

Scuba Diving

Background: Limited opportunities for scuba diving do exist on Crab Orchard NWR, however this activity has never explicitly been permitted. Some visitors have participated in this activity under the assumption that it was allowed. Due to the relatively shallow and turbid condition of Crab Orchard Lake and the fact that swimming is prohibited on Devils Kitchen Lake, Little Grassy Lake is the only location where a visitor could reasonably expect to participate in this activity.

Proposed Policy: Due to the fact that swimming is already allowed in Little Grassy Lake, the lake is already heavily used by youth camps, and it is a popular fishing destination, we propose to prohibit scuba diving on the Refuge to reduce conflicts between these user groups.

Trapping

Background: Opportunities for trapping do exist on Crab Orchard NWR. In the past, trapping has been loosely regulated through special use permits in areas designated by the refuge biologist. A maximum number of 50 recreational trapping permits had been determined, but due to changes in culture and markets, that number does not reflect actual demand.

Proposed policy: Limited trapping will be allowed in designated areas of the Refuge through special use permits. Carefully controlled trapping is considered a management tool, and contributes to the habitat and wildlife management goals of the Refuge. In some cases it is the only means by which nuisance wildlife can be removed. The activity will be limited in scope to areas of the Refuge that are identified by the Refuge biologist, and carefully regulated through the use of special use permits.

Dog Training:

Background: Dog field trials were a part of the Crab Orchard Creek Project before the establishment of Crab Orchard National Wildlife Refuge. Training of dogs has occurred sporadically on the Refuge, and is regulated through special use permits. In addition, dogs are allowed on the Refuge, provided they are leashed. Hunting is a priority public use and supports the recreation purpose for which the Refuge was established, and well trained hunting dogs contribute to this activity by locating and retrieving game that may otherwise be lost.

Proposed policy: The training of dogs that are to be used for hunting will be allowed in designated areas of the Refuge through special use permits. This use does not include field trials or commercial/professional dog training, which remains prohibited. This use also does not include training of dogs from sunset to sunrise, also known as "running" furbearers with dogs, which will also be prohibited.

2.6.1.2. Fire

The following section contains detail about the prescribed fire and wildland fire suppression procedures used on the Refuge. We have included detail here to fully document the Refuge's Fire Management Plan in compliance with the National Environmental Policy Act.

Prescribed Fire

Prescribed fire is used regularly on the Refuge as a habitat management tool.

Periodic burning of grasslands reduces encroaching woody vegetation such as autumn-olive and encourages the growth of desirable species such as native, warm-season grasses. Periodic burning of pine and hardwood forest reduces encroaching, low-value, and shade-tolerant species and reduces hazardous fuel buildup. Fire also encourages regeneration of desirable species, enhances biodiversity, and improves wildlife habitat. Additionally, prescribed burning in the wilderness will reduce encroachment of undesirable species and encourage biodiversity.

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, weather conditions, 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.

The normal prescribed fire season begins October 1 and ends March 31. Additionally, an open burn permit is obtained from the Illinois EPA prior to each burn season, and all EPA air quality standards and guidelines are adhered to. 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 the Shawnee National Forest or Lake Egypt Fire Protection District, 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 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 parameters, 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.

Wildland Urban Interface

Wildland Urban Interface (WUI) is defined as the area where houses meet or intermingle with undeveloped wildland vegetation. This makes the WUI a focal area for human-environment conflicts such as wildland fires, habitat fragmentation, invasive species, and biodiversity decline. FIREWISE is a community safety program developed to educate the public to the wildland urban interface and corrective measures needed. Additional examples include working toward a comprehensive social awareness and support system to inform the public concerning the benefits of management ignition in fire adapted ecosystems.

The WUI creates the need to reduce wildland and urban intermix fire threats. The fire management program will mitigate any interface risks by a combination of mechanical fuels treatments near any buildings and prescribed fire to reduce and eliminate hazard fuel loadings while creating wide buffers around developed areas and adjacent to private property.

Mechanical Fuel Treatments

Mechanical fuel reduction is the use of mechanical equipment (i.e. weed whackers, chainsaws, dozers, rubber tired skidders, chippers, mowers, etc.) to cut and remove, or prepare for burning, woody fuels. Mechanical treatments are intended to help in achieving resource management goals and objectives, most often a combination of ecosystem restoration and reduction of high hazard fuel loadings. Mechanical fuel treatments must be described in a fuels project plan. The plan will contain a prescription defining goals, objectives, and treatment methods employed to achieve the objectives.

Mechanical fuel treatment is often used in concert with prescribed fire treatment. High hazard fuel conditions can be reduced while meeting structural objectives in areas immediately adjacent to buildings or on boundary areas through a mix of mechanical treatment and prescribed fire. Mechanical treatment can be used as the primary method of reaching structural goals while prescribed fire actually removes and eliminates the hazardous fuels. The timing of the mechanical treatment to ensure that soil compaction and disturbance does not occur during wet season or times of high precipitation is important. Conducting mechanical treatments during frozen ground conditions or late in the growing season tend to yield the best results.

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. 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 if adequate resources are not available locally.

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 towards safeguarding life while protecting Refuge resources and property from harm. Mutual aid resources responding from cooperating agencies must meet the qualification standards of their agency.

All wildland 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, anchor points, escape routes, and safety zones.

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 as low as practicable to 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.

2.6.2 Alternative A: Current Management/No Action

2.6.2.1. Wildlife Conservation Goals

Canada Geese Goal

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

Background: When established, the Refuge was recognized as being important to providing habitat for wintering Canada Geese. The Refuge was also established with an agricultural purpose. The agricultural purpose and supporting wintering Canada Geese are interrelated. The importance of wintering refuge habitat to the Mississippi Valley population of Canada Geese has been recognized in population management plans. The Refuge has about 4,500 acres of cropland, 1,000 acres of pasture, 700 acres of hay fields, and 450 acres of moist-soil units commonly used by geese (see Figure 6 on page 36). Other goose management activities include seasonal closure to boating on the east end of Crab Orchard Lake and fall mowing around selected ponds.

Objective 1

Provide enough food for wintering Canada Geese to support 6.4 million goose-use-days.

Strategy

1. Maintain 4,500 acres of cropland in agricultural production (Figure 6). Manage 1,000 acres of pasture and 700 acres of hay fields. Manage 450 acres of moist-soil units. Continue fall mowing around selected ponds. Maintain seasonal closure to boating on the east end of Crab Orchard Lake.

Forest, Early Successional and Grassland Birds Goal

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

Background: The Refuge has about 25,000 acres of forest habitat. Studies have shown that forest fragmentation reduces nesting success of migratory birds because of increased nest predation and parasitism. The Refuge has carried out reforestation activities in recent years to reduce fragmentation of forested habitats and retire former agricultural fields and pastures.

The Refuge has about 3,300 acres of pine plantations. Most of the pine plantations were established between 1938 and 1941 by the USDA Soil Conservation Service for the purpose of controlling soil erosion. Pines, which are not native to the Refuge, generally provide lower quality wildlife habitat than native hardwoods. The existing plans call for thinning and prescribed burning pine plantations to encourage the growth of desirable, mast-producing hardwoods.

The Refuge has about 2,500 acres of early successional habitat. Some migratory birds primarily use early successional habitats, such as shrubland and fallow herbaceous fields. Without active management, these habitat types will succeed to forest. These habitat types are identified in Figure 6 on page 36.

Refuge grasslands include pastures (1,000 acres), hay fields (700 acres), and native grasslands (240 acres). Pastures and hay fields provide the majority of the grassland habitat for migratory birds. However, the pastures are relatively poor quality habitat for many migratory birds because they are dominated by fescue, a non-native grass. Refuge hay fields are commonly mowed in spring and summer when migratory birds are nesting, which reduces nesting success. The presence of woody vegetation along fence rows and roadsides tends to reduce the value of grasslands for some birds.

The Refuge has 4,500 acres in the row crop program. The crop rotation is generally corn/soybeans/corn/clover/clover. Grassland birds, such as the dickcissel and eastern meadowlark, use clover fields for nesting habitat. Cooperative farmers commonly mow second year clover to make hay during the nesting season of migratory birds, which reduces nesting success.

The forest, shrubland and grassland resource conservation priority bird species that would benefit under this alternative are listed in Table 34 on page 132. These priority bird species are a regional subset of the priority species found in Partners in Flight plans.

Objective 1

Complete about 240 acres of reforestation as outlined under the existing Refuge reforestation plan to benefit forest wildlife species.

Strategy

1. Conduct reforestation activities that may include site preparation (mechanical clearing and/or applying herbicides to unwanted

Figure 6: Land Cover of Crab Orchard NWR, Alternative A, Current Management (No Action) Projected Conditions 2015

Figure 7: Land Cover of Crab Orchard NWR, Alternative A, Current Management (No Action), Projected Conditions, 2100

vegetation), planting hardwood tree seedlings, and follow-up mechanical or chemical treatments.

Objective 2

Accelerate succession of all (about 3,300 acres) pine plantations to native hardwood forest.

Strategy

1. Thin pine plantations to promote establishment and growth of native hardwoods. Most thinning treatments will be conducted under contract by commercial timber harvesting firms. Conduct prescribed burning during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration.

Objective 3

Maintain 240 acres of native warm-season grassland to benefit grassland birds, such as northern bobwhite, eastern meadowlark, and Henslow's sparrow. (Figure 6)

Strategy

1. Prescribed burn all native warm-season grasslands on a 2- to 3-year cycle to favor grassland vegetation and control undesirable plants. Apply mechanical or herbicide treatments to control vegetation, when needed.

Objective 4

Maintain 1,000 acres of pasture, 700 acres of hay fields, and about 1,600 acres of clover fields with increased emphasis on habitat quality for grassland birds.

Strategy

1. All mowing of pastures, hay fields, and clover fields will take place after August 1.

Ducks, Shorebirds, and Other Waterbirds Goal

Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

Background: The Refuge has several types of habitat that support ducks, shorebirds, and other waterbirds: 9,100 acres of open water in artificial lakes and ponds, 1,900 acres of bottomland forest, and 500 acres of swamps, marshes, and wet meadows. The Refuge manages about 450 acres of these wetlands to encourage the growth of moist-soil plants and aquatic invertebrates to provide food for waterfowl, shorebirds, and other waterbirds.

Objective 1

Provide 350 to 450 acres of moist soil habitat during fall, winter and spring for migrating shorebirds, waterfowl, and other waterbirds.

Strategy

1. Maintain dikes and water control structures. Manipulate water levels and vegetation to encourage production of food.

Water Quality Goal

Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.

Background: Water quality in streams and lakes on the Refuge is impacted by sedimentation, agricultural chemicals, and contaminants from past industrial uses.

Objective 1

Keep Refuge soil erosion and chemical inputs at levels that do not impair water quality or fish and wildlife.

Strategies

1. Work with farmers to establish buffer strips and keep livestock away from streams and ponds. Continue using current soil and water protection measures in the Refuge farm program: use no insecticides, use only Service-approved herbicides, use minimum tillage practices, and use winter cover crops.
2. Continue cleanup of contaminated sites. Ensure Refuge industrial operations conform to prescribed environmental standards.

2.6.2.2. Recreation/Public Use Goals

Hunting, Fishing, Wildlife Observation and Photography, Interpretation and Environmental Education Goal

Hunters, anglers, viewers and photographers of wildlife, general visitors, and students enjoy high-quality experiences through a variety of opportunities that promote an understanding and appreciation of the Refuge's natural and cultural resources and their management.

Background: The Refuge System Improvement Act of 1997 identified six wildlife-dependent, priority public uses that should be facilitated on National Wildlife Refuges if compatible with the purposes of

the refuge. These priority uses, specifically hunting, fishing, wildlife observation and photography, interpretation, and environmental education, are compatible and can be facilitated at Crab Orchard. Under this alternative, facilities and programs would be provided at the levels and trends present in 2001.

Objective 1

Provide hunting opportunities at the levels offered in 2001.

Strategies

1. In the public hunting area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.
2. In the restricted use area of the Refuge, maintain current hunting opportunities by permit during shotgun deer and spring shotgun turkey seasons. Maintain shotgun deer season hunting opportunities for youth and persons with disabilities.
3. Continue providing waterfowl hunting opportunities in the controlled waterfowl hunting area through an agreement with a partner organization.

Objective 2

Provide fishing opportunities at the levels offered in 2001.

Strategies

1. In the public fishing areas, continue the policy of providing fishing opportunities based on state and federal regulations.
2. Continue to provide bank and boat fishing opportunities in accordance with state and federal regulations. Maintain existing Refuge boat ramps, fishing piers, and parking facilities.

Objective 3

Provide wildlife observation and photography opportunities at the levels offered in 2001.

Strategies

1. Continue popular, established programs and tours like the October Discovery Auto Tours, January Eagle Tours, and Spring Wildflower Walks that enhance visitor experience, bring visitors in closer proximity to

Wilson's Snipe, Crab Orchard NWR

resources, and provide optimum seasonal opportunities for observation and photography.

2. Maintain existing photo blinds, observation blinds, and identified observation areas.

Objective 4

Provide interpretive opportunities and materials at the levels offered in 2001.

Strategies

1. Continue to maintain and replace damaged and outdated interpretive and information panels on Refuge kiosks, wayside exhibits, trails, ramps, and other facilities. Ensure all panels comply with Service standards.
2. In cooperation with Refuge volunteers and other partners, conduct a variety of quality interpretive programs annually. Continue popular and established interpretive programs and special events, such as the Families Understanding Nature program and National Wildlife Refuge Week.
3. Continue to plan interpretive auto tour route, using existing roads, that will facilitate opportunities for wildlife and cultural resource observation and provide visitors with an overview of the Refuge, its resources, and its management.

Objective 5

Provide environmental education programs and materials at the levels offered in 2001.

Strategies

1. Within 2 years of the plan's approval, develop the environmental education portion of the Visitor Services Plan outlining a

comprehensive, curriculum-based approach structured to be compatible with state learning standards.

2. Continue the development and maintenance of a multi-faceted environmental education resource library, available for use by educators and in Refuge educational programs, comprised of books, videos, posters, audio tapes, written materials, and environmental education kits.
3. Continue currently-offered environmental education programs done by request, including on-site and off-site programs, special educational events, group camp programs, and special interest group programs.
4. Conduct an annual review of the Refuge environmental education program. Invite feedback from area educators. Revise as necessary.

Other Land- and Water-based Recreation Goal

Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge.

Background: The Refuge was established with and has a history of providing recreation that is not wildlife-dependent. Activities that fulfill the recreation purpose of the Refuge but are not wildlife-dependent include motorboating and sailing, water-skiing, swimming, camping and picnicking. The Refuge has been challenged to maintain the quantity and quality of the facilities in support of these activities throughout its existence. Under this alternative, facilities would be provided at the levels present in 2001 and the quality would be improved as time and resources permitted. In the past, two areas were set aside for the Crab Orchard Boat & Yacht Club and The Haven. The Boat & Yacht Club is a private organization requiring a membership for the use of campgrounds and a marina operated by the Club. The Haven is a facility that is operated and used by local veterans for rest and recreation.

Objective 1

Maintain and gradually improve the quality of boat launches, marinas, beaches, picnic areas, and campgrounds at levels offered in 2001.

Strategy

1. Use recreation fee funds and compete for Maintenance Management System funds to improve facilities. Follow guidelines for evaluating concession operations.

Customer Service Goal

Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.

Background: Policy and guidance of the Service directs each refuge to meet basic standards in hosting visitors. The guidance covers signs, kiosks, leaflets, facility and road maintenance, customer service, and opportunities for visitor feedback.

Objective 1

Meet Service standards for signs, information sources, facilities, and opportunities for visitor feedback at the levels offered in 2001.

Strategy

1. Maintain and gradually improve kiosks, rest rooms, boundary signing, and opportunities for visitor feedback as time and resources permit.

Objective 2

Provide visitors with a safe and enjoyable visit and a feeling of security.

Strategies

1. Conduct annual safety inspections of all Refuge facilities and reaffirm compliance with Service standards.
2. Maintain recognizable, consistent signs that clearly identify public hunting areas.
3. Respond to notification of safety problems and unsafe situations promptly and in accordance with Service standards.

2.6.2.3. Agricultural Goal

Agricultural Goal

Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.

Background: Agriculture, one of the specified purposes of the Refuge, has been a part of the landscape since early settlement. After many years of soil depletion and erosion, beginning in the 1930s efforts have been made to implement better farming practices. On the Refuge, agriculture has been used to benefit wildlife, chiefly wintering Canada geese.

Objective 1

Continue farming operations on about 4,500 acres of row crops and 1,000 acres of pastures and 700 acres of hay fields.

Strategy

1. Maintain infrastructure (roads, fences) in support of agricultural operations. Address erosion with buffer strips. Enlist technical oversight from the Natural Resource Conservation Service and the University of Illinois Extension.

2.6.2.4. Industrial Goal

Industrial Goal

Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards.

Background: The management of industry on the Refuge was reviewed in the early 1980s and an Industrial Policy was established. Most of the goals established under that policy have been accomplished. Under this alternative, management would continue under the existing policy.

Objective 1

Meet the guidelines of the Industrial Policy established in December 1981.

Strategies

1. Maintain roads, as well as water and sewer lines, in industrial areas as appropriations become available. Building and grounds maintenance are the responsibility of the lessee in accordance with lease requirements.
2. Remove buildings that are no longer suitable for occupancy for reasons of contamination, safety or lack of structural integrity and restore to natural habitats.

2.6.2.5. Boundary Modification

The authorized Refuge boundary would remain unchanged.

2.6.3 Alternative B: Reduced Habitat Fragmentation/Wildlife-dependent Recreation Emphasis With Land Exchange

2.6.3.1. Land Exchange

Early in this planning process, the Service indicated an interest in exchanging land developed for non-wildlife-dependent recreation, such as camping and marina operations, for undeveloped land adjoining the Refuge. Southern Illinois University (SIU) and the Service have agreed upon a framework for a land exchange that included the following:

The Service would exchange approximately 500 acres located in the northwest corner of the Refuge for land located south and west of the current boundary that is now owned by SIU (see Figure 8 on page 42 and Figure 13 on page 57).

Parcels in this 500 acres include the Crab Orchard Boat & Yacht Club, The Haven, Crab Orchard Campground, Lookout Point, Take Pride Point (formerly Hogan's Point) and the marina areas known as Playport and Images.

The land currently owned by the Service would be exchanged with SIU with the expectation of complementing the University's academic mission. Each of the above mentioned parcels would be managed according to a mutually agreeable plan that essentially permits the continuation of existing non-wildlife-dependent recreational uses. (A letter from SIU to the Service outlining the proposed uses can be found in Appendix I on page 451.)

The Service would retain a flowage easement on lands exchanged with SIU. Additionally, the Service would maintain a reversionary interest such that if the lands were no longer used as outlined in Appendix I, the land or individual parcels would revert back to Service ownership.

The Service would manage the lands received from SIU as forest habitat. The area would be open to the public for wildlife-dependent recreation. Some of this second-growth forest, with proper management and time, may reach a quality sufficient for its inclusion in the Crab Orchard Wilderness. The approximate acreage for the current land cover types of the SIU property are: pine forest, 8 acres; hardwood forest, 1,569 acres; and old fields, 122 acres. In addition to the approximately 125 acres of

Figure 8: Lands Proposed for Exchange Between Crab Orchard NWR and Southern Illinois University

Table 2: Area of Food-producing Canada Goose Habitat by Alternative

Habitat	Existing Condition (acres)	Alt. A (acres)	Alt. B and E (acres)	Alt. C (acres)	Alt. D (acres)
Corn	1,816	1,800	1,760	1,920	1,720
Wheat	908	900	880	960	860
Clover	1,816	1,800	1,760	1,920	1,720
Hay	800	700	600	700	500
Pasture	1,000	1,000	1,000	1,000	1,000
Moist Soil	450	450	500	500	450
Ponds and Lakes	9,000	9,000	9,000	9,000	9,000
Misc. Mowed Areas	200	200	200	200	200
Total Acres	15,900	15,850	15,700	16,200	15,450
Percent of Existing Acres	100	99	98	101	97

developed land, the land currently owned by the Service that would be part of the exchange has a land cover that includes: pine forest, 150 acres; hardwood forest, 150 acres; agricultural, 40 acres; and grassland/shrubland, 40 acres.

2.6.3.2. Wildlife Conservation Goals

Canada Geese Goal

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

Background: When established, the Refuge was recognized as being important to providing habitat for wintering Canada Geese. The Refuge was also established with an agricultural purpose. The agricultural purpose and supporting wintering Canada Geese are interrelated. The importance of wintering refuge habitat to the Mississippi Valley population of Canada geese has been recognized in population management plans.

The Refuge's approach to meeting the goal of 6.4 million goose-use-days is to provide relatively large amounts of a diverse array of food-producing habitats (Table 2). This approach provides relatively high assurance that even if a major habitat fails to provide, sufficient foods will be available in other habitats. The amount of these habitats would vary only 1-2 percent under any CCP alternative (Table 2). The amount of goose food produced by these habitats would vary up to 14 percent (Table 3). This leaves the Refuge with 4,300-4,540 acres of row crops, which agrees with the Illinois DNR recommendation of "Maintain 4,000-5,000 acres of agriculture in crop fields, as winter food for Canada geese and other wildlife" (IDNR 2001).

Objective 1

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days.

Strategy

1. Maintain 4,400 acres of cropland in agricultural production (Figure 9 on page 46). Manage 500 acres of moist-soil units. Continue fall mowing around selected ponds. Maintain seasonal closure to boating on east end of Crab Orchard Lake. Ensure technical oversight of the agricultural program. Remove woody fence rows and roadside vegetation.

Forest, Early Successional and Grassland Birds Goal

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

Background: See the background provided in Alternative A.

Objective 1

Manage two portions of the Refuge as large forest blocks to benefit area-sensitive forest birds. The first area (about 13,000 acres) extends from the southern end of Grassy Bay east to Caney Creek, and south including the wilderness area. The second area (about 1,700 acres) extends from the federal prison north and includes the Crab Orchard Creek bottomlands. This will include about 490 acres of reforestation of open habitat to consolidate large blocks of forest habitat.

Table 3: Millions of Potential[1] Goose-use-days[2] of Food by Habitat and Alternative

Habitat	Existing Condition (GUDs)	Alt. A (GUDs)	Alt. B and E (GUDs)	Alt. C (GUDs)	Alt. D (GUDs)
Corn	7.1	7.0	6.9	7.5	6.7
Wheat	2.0	2.0	1.9	2.1	1.9
Clover	3.7	3.7	3.6	3.9	3.5
Hay	2.9	2.5	2.2	2.9	1.8
Pasture	3.3	3.3	0.8	0.8	3.3
Moist Soil	0.5	0.5	0.5	0.5	0.5
Ponds and Lakes[3]					
Misc. Mowed Areas[3]					
Total GUDs	19.5	19.0	15.9	17.7	17.7
Percent of Existing GUDs	100	97	82	91	91

1. *Results do not reflect food losses due to low production, consumption by other animals, etc.*
2. *"Goose-use-day" is defined as enough food to feed one goose for one day.*
3. *Production is not calculated or included in total GUDs.*

Strategy

1. Reforest about 290 acres of crop fields, 130 acres of fallow fields, and 90 acres of perennial grasslands. This may include site preparation, planting a cover crop, planting tree seedlings, and weed control treatments.

Objective 2

Accelerate succession of all (about 3,300 acres) pine plantations to native hardwood forest.

Strategy

1. Thin pine plantations to promote establishment and growth of native hardwoods. In some cases, remove pine overstory to release young hardwoods. Most silvicultural treatments will be conducted under contract by commercial timber harvesting firms. Conduct prescribed burning during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration.

Objective 3

Maintain about 300 acres in early successional habitat.

Strategy

1. Use prescribed fire or mechanical treatment (mowing, discing) to disturb about 200 acres every 3 to 5 years. Add about 100 acres of 30-foot-wide borders of native warm-season grasses in row crop fields in the open portion of the Refuge.

Objective 4

Maintain 260 acres of native warm-season grassland.

Strategy

1. Prescribed burn all native warm-season grasslands on a 2- to 3-year cycle to favor grassland vegetation and control undesirable plants. Apply mechanical or herbicide treatments to control vegetation, when needed.

Objective 5

Maintain 1,000 acres of pasture, 700 acres of hay fields, and about 1,600 acres of clover fields with increased emphasis on habitat quality for grassland birds.

Strategy

1. Remove 124 acres of linear forest habitat and 8 miles of hedge rows. Install fences to create paddocks within pastures to enable greater control of grazing intensity. Convert fescue pastures to other cool-season and native warm-season grasses by preparing the site and reseeding. The typical Refuge pasture would become three or four paddocks with a paddock of cool-season grass and two or three paddocks of native

warm-season grasses. Cattle would enter the cool-season grass paddock in the spring switch to the warm season grasses in the summer, and move back to the cool season grass in the fall. The native warm season grass will provide the grassland birds with nesting, migration, and winter habitat. Vegetation structure will be managed by the amount of grazing applied to each paddock. Most of the pasture grass would not require fall mowing and would be taller than 6 inches during the winter. All mowing of hay fields, pastures, and clover fields will take place after August 1.

Rationale for converting pasture fescue: Tall fescue (*Festuca arundinacea*) is a cool-season, perennial grass native to Europe that is invasive in many natural communities in the U.S. Tall fescue has been planted for forage and soil conservation and now covers more than 35 million acres in the U.S. (Ball et al. 1993). It has become the most abundant or dominant plant in many areas, including the Refuge's grasslands. Most (75-80 percent) tall fescue in the U.S. is infected with a fungus (*Neotyphodium coenophialum*) that produces compounds that are toxic to insects (Breen 1994), small mammals (Coley et al. 1995, Conover 1998), and birds (Conover and Messmer 1996, Madej and Clay 1991). Tall fescue often results in loss of plant diversity (Clay and Holah 1999). Livestock losses related to tall fescue in the U.S. have been estimated between $500 million and $1 billion annually (Ball et al. 1993).

Conversion of tall fescue pastures to native warm-season grasses and cool-season grasses with higher wildlife values will provide several benefits: 1) reduce the abundance of an invasive, non-native species, 2) increase plant diversity, 3) increase plant productivity, 4) improve forage for cattle production, and 5) improve pastures for wildlife production.

Ducks, Shorebirds, and Other Waterbirds Goal

Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

Background: See Alternative A.

Objective 1

Provide 450 to 500 acres of moist-soil habitat during fall, winter and spring for migrating shorebirds, waterfowl, and other waterbirds.

Strategy

1. Construct about 100 acres of new moist-soil habitat. Maintain dikes and water control structures. Manipulate water levels and vegetation to encourage production of waterfowl foods.

Water Quality Goal

Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.

Background: Natural processes along with various human activities occurring in the watershed affect water quality on the Refuge. Since the Refuge controls only a portion of the watershed, increased efforts to protect water quality both on the Refuge and beyond its boundaries are essential. Urbanization of lands adjacent to the Refuge is likely to have even greater impacts on water quality in the future.

Objective 1

Improve the quality of water within the watershed of the Refuge.

Strategies

1. Cooperate with Illinois Environmental Protection Agency to monitor water quality. Identify landowners and land uses in the watershed. Provide education and technical assistance to landowners with particularly sensitive riparian areas. Work with municipalities and developers to enhance on-site storm water retention.
2. Work with farmers to establish buffer strips and keep livestock away from streams and ponds. Continue using current soil and water protection measures in the Refuge farm program: use no insecticides, use only Service-approved herbicides, use minimum tillage practices, and use winter cover crops.
3. Continue cleanup of contaminated sites. Ensure Refuge industrial operations conform to prescribed environmental standards.

Figure 9: Land Covers of Crab Orchard NWR, Alternatives B and E, Projected Conditions 2015

Figure 10: Land Covers of Crab Orchard NWR, Alternatives B and E, Projected Conditions 2100

2.6.3.3. Recreation/Public Use Goals

Hunting, Fishing, Wildlife Observation and Photography, Interpretation and Environmental Education Goal

Hunters, anglers, viewers and photographers of wildlife, general visitors, and students enjoy high-quality experiences through a variety of opportunities that promote an understanding and appreciation of the Refuge's natural and cultural resources and their management.

Background: The Refuge System Improvement Act of 1997 identified six wildlife-dependent, priority public uses that should be facilitated on National Wildlife Refuges if compatible with the purposes of the refuge. These priority uses, which include hunting, fishing, wildlife observation and photography, interpretation, and environmental education, are compatible and can be facilitated at Crab Orchard NWR. While all of these uses are provided at the Refuge to some extent, support for some of these uses has been inconsistent and the quality of experience has been variable. Efforts to enhance visitor enjoyment by promoting understanding and appreciation of Refuge resources, management strategies, and purposes have had limited success. The Refuge can provide high-quality experiences for these priority wildlife-dependent users through emphasis on and improvement of supporting facilities, programs, and materials over the next 15 years. A high-quality experience includes uncrowded conditions, no conflicts with other users, a reasonable opportunity, and overall satisfaction. Understanding and appreciation of Refuge resources, management strategies, and purposes also contribute to quality of experience and influence visitor enjoyment.

Objective 1

Increase the quality of hunting opportunities to a level where at least 90 percent of hunters experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. Instill a sense of awareness among hunters of the Refuge as a component of the National Wildlife Refuge System and of hunting as a wildlife management tool.

Strategies

1. In the public hunting area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.
2. In the restricted use area of the Refuge, maintain current hunting opportunities by permit during shotgun deer and spring shotgun turkey seasons. Maintain shotgun deer season hunting opportunities for youth and persons with disabilities and, within 3 years of the plan's approval, provide these groups with opportunities for spring shotgun turkey season hunting when populations warrant.
3. Within 6 years of the plan's approval, establish additional hunting programs to encourage participation in the Refuge hunting program by non-traditional segments of the public such as youth, persons with disabilities, and women.
4. Administer goose hunts in the controlled area through an agreement with a partner organization.
5. Continue to promote conservation practices and increase hunter adherence to federal and state regulations through effective informational brochures and signs. Increase the visibility of Refuge law enforcement.
6. Over the life of the plan, enhance public understanding of Refuge hunting opportunities, the role of hunting in wildlife management, and the Refuge as a component of the National Wildlife Refuge System by increasing the quality of maps, signs, and brochures.

Objective 2

Increase the quality of fishing opportunities to a level where at least 90 percent of anglers experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. Enhance angler understanding of the issues, strategies, and policies involved in Refuge fisheries management and conservation. Instill anglers with a sense of awareness of the Refuge as a component of the National Wildlife Refuge System.

Strategies

1. In the public fishing areas, continue the policy of providing fishing opportunities based on state and federal regulations.
2. Within 5 years of the plan's approval and in cooperation with other partners, promote current and develop additional fishing opportunities and programs to encourage participation by non-traditional segments of the public such as youth, persons with disabilities, and women.
3. Continue to provide bank and boat fishing opportunities in accordance with state and federal regulations. Maintain existing Refuge boat ramps, fishing piers, and parking facilities. Study the feasibility for and construct accessible fishing facilities at Little Grassy Lake and Devils Kitchen Lake within 4 years of the plan's approval.
4. Over the life of the plan, promote Refuge fishing opportunities and encourage conservation practices such as catch-and-release fishing through the development and maintenance of high-quality maps, signs, brochures and the Refuge web page.
5. Ensure that the fishing public clearly understands the fish consumption advisories for Crab Orchard Lake through signs and brochures within 2 years of the plan's approval.
6. Over the life of the plan, provide insight to anglers regarding Refuge strategies, issues, and policies for fisheries management and conservation by redesigning and developing more effective informational signs and brochures. Increase angler awareness of the Refuge as a component of the National Wildlife Refuge System by improving the quality and content of maps, signs, and brochures.

Objective 3

Ensure that viewing and photography opportunities meet the needs of 95 percent of participants. Establish and maintain viewing and photography opportunities for all major Refuge habitat types and optimum seasons.

Strategies

1. Within 2 years of the plan's approval, develop an annual observation/photography fact sheet for the Refuge that will include a calendar of established tours, programs, and events; information on identified and recommended viewing and photography areas; guidelines to enhance viewing enjoyment; and a Refuge map delineating trails, blinds, platforms, and identified viewing areas.
2. Continue popular, established programs and tours like the October Discovery Auto Tours, January Eagle Tours, and Spring Wildflower Walks that enhance visitor experience, bring visitors in closer proximity to resources, and provide optimum seasonal opportunities for observation and photography and continually evaluate these programs for effectiveness.
3. Within 2 years of the plan's approval, improve the existing photography/observation blinds and platforms by adding camouflage as needed to enhance viewing opportunities. Evaluate location of existing blinds and platforms and move as needed. Position interpretive and identification panels in or near blinds and platforms to promote understanding and appreciation of Refuge resources. Enhance panels to promote awareness of the Refuge as a component of the National Wildlife Refuge System.
4. Within 5 years of the plan's approval, evaluate need for and add additional blinds/platforms, including interpretive and identification panels, where and if needed to ensure observation and photography opportunities in all major Refuge habitat types. Maintain all identified viewing and photography sites.

Visitor using a spotting scope, Crab Orchard NWR

5. Over the life of the plan and in cooperation with other partners, encourage utilization of the Refuge for birding and other wildlife observation through development of informational materials, programs, trails, tours, and special events. Promote the Refuge as a site for quality wildlife observation and photography through participation in selected community and regional birding, nature, and photography festivals and events.
6. Within 8 years of the plan's approval, identify and create a Refuge birding trail that may include enhancement and coordination of existing trails, viewing areas and signs, and creation of a birding trail brochure and map.
7. Over the life of the plan, expand the Refuge web site to promote wildlife observation and photography. Include updates on Refuge and area sightings of rare birds and other wildlife; profiles of selected seasonally-occurring and resident species; suggested optimal viewing times and locations; and current Refuge programs, facilities, tours, and other opportunities for observation and photography.

Objective 4

Increase the effectiveness of the Refuge interpretive program such that 85 percent of participants gain a better understanding of three primary concepts: (1) the value and unique purposes of the Refuge, (2) the Refuge as a component of a national network of refuges, and (3) the significance and mission of the National Wildlife Refuge System. Heighten awareness of conservation and stewardship concepts. Encourage participants to adopt conservation practices and take positive actions that support Refuge goals and the Refuge System mission.

Strategies

1. Within 3 years of the plan's approval, develop the interpretive portion of the Visitor Services Plan outlining a comprehensive, multifaceted approach emphasizing selected themes and key Refuge resources. Themes will be selected based on importance to Refuge and System goals and relevance to surrounding communities. All interpretive materials, tours, facilities and programs will focus on one or more of these Refuge themes, along with the three basic concepts of the Refuge and Refuge System. Refuge interpretive themes may be in a storyline form that includes three or more themes. Themes may include: Exploring the Diversity of Wildlife, Understanding the Past, Protecting the Balance, and Communicating Visitor Opportunities.
2. Within 4 years of the plan's approval, renovate and replace damaged and outdated interpretive and information panels on Refuge kiosks, wayside exhibits, trails, ramps, and other facilities. Ensure that all panels and structures comply with Service standards.
3. In cooperation with Refuge volunteers and other partners, conduct a variety of high-quality interpretive programs annually. Continue popular and established interpretive programs and special events, such as the Families Understanding Nature program and National Wildlife Refuge Week. Ensure interpretive programming remains current and dynamic by continually evaluating and creating new programs, incorporating new ideas, updating information, and revitalizing ongoing programs. Focus each interpretive program on one or more Refuge themes.
4. Over the life of the plan, upgrade the following Refuge trails to enhance interpretive opportunities: Rocky Bluff Trail for neotropical migrants; Woodlands Trail for wildlife observation, fishing and accessibility; and Harmony Trail for wildlife observation.
5. Over the life of the plan and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, revise Refuge interpretive brochures, handouts, and other written materials as needed to improve consistency and to meet Service standards.
6. Within 1 year of the plan's approval, create a custom audiovisual program that provides visitors with orientation information about the Refuge. Ensure this program and a variety of other wildlife-related audiovisual programs are made available for view at the Visitor Center and for use in interpretive programs.

7. Within 3 years of the plan's approval, establish and maintain an interpretive auto tour route, using existing roads, that will facilitate opportunities for wildlife and cultural resource observation and provide visitors with an overview of the Refuge, its resources, and its management. Include identified stations with interpretive panels.

Objective 5

Increase the effectiveness of the Refuge environmental education program so that 90 percent of participants gain a better understanding and appreciation of the resources, purposes, and value of the Refuge and the Refuge System. Heighten awareness of conservation and stewardship concepts and encourage participants to take positive actions on the Refuge and in their community that support Refuge goals and the Refuge System mission.

Strategies

1. Promote the use of the Refuge as an outdoor classroom and incorporate national environmental education guidelines and state learning standards into programs and materials.
2. Manage the environmental education program as described in Service policy.
3. Within 2 years of the plan's approval, develop the environmental education portion of the Visitor Services Plan, outlining a comprehensive, curriculum-based approach structured to be compatible with state learning standards and national environmental education guidelines. Emphasize key Refuge resources, the Refuge, the National Wildlife Refuge System, and selected Refuge themes. These themes will be based on importance to Refuge and System goals and relevance to surrounding communities. All environmental education materials, facilities, and programs will focus on one or more of these Refuge themes, along with the basic concepts of the Refuge and the Refuge System. Refuge themes may be in a storyline form that incudes three or more themes. Themes may include: exploring the diversity of wildlife, understanding the past, protecting the balance, and communicating visitor opportunities.
4. Within 3 years of the plan's approval and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, create an array of environmental education kits, each focusing on one or more aspects of Refuge themes. Educational kits will include interactive materials and a detailed instructional and activity guide designed with a clear, consistent format and coordinated with state learning standards. Develop and maintain a multi-faceted environmental education resource library, available for use by educators and in Refuge educational programs, comprised of books, videos, posters, audio tapes, written materials, and environmental education kits.
5. Within 4 years of the plan's approval and in cooperation with other partners, establish an environmental education complex that incorporates an outdoor amphitheater with educational displays, a set of associated trails, the Refuge Visitor Center, and an educator's trail specifically designed to facilitate environmental education activities and function as an outdoor classroom.
6. Within 4 years of the plan's approval and in cooperation with other partners, create an Educator's Guide to Crab Orchard National Wildlife Refuge that provides an orientation, guidelines, grade-level and state learning standards information, maps, and site-specific activities that focus on one or more Refuge themes. Incorporate input from area educators to ensure that the Refuge guide meets area teachers' needs.
7. In cooperation with other partners, conduct or host bi-annual teacher workshops that encourage area educators to incorporate environmental education into their curriculum and to utilize Refuge materials, staff, and resources, both in the classroom and during field trips. Within 5 years of the plan's approval, develop a Refuge-specific teacher workshop to demonstrate methods for combining use of the Educator's Guide, environmental education kits, and the educator's trail. Explore continuing education credit options for all teacher workshops.
8. Over the life of the plan, establish a positive, cooperative relationship with educators and schools in surrounding communities. Promote use of the Refuge,

environmental education resources, and staff through e-mail newsletters to educators, the Refuge web page, informational fliers and materials, targeted special events, and involvement in area parent-teacher and other organizations.

9. Continue currently-offered environmental education programs done by request, including on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Over the life of the plan, expand the environmental education program to include additional on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Develop pre- and post-visit activities in addition to on-site activities.
10. Over the life of the plan, establish partnerships with selected local schools, agencies, and nonprofit organizations to more effectively develop and expand environmental education programs. Involve volunteers in educational programs and explore the potential for environmental education interns through Southern Illinois University and John A. Logan College. Explore the potential for creating a grant program to help area schools with field trip expenses.
11. Conduct a bi-annual review of the Refuge environmental education program. Invite feedback from area educators. Revise as necessary.

Other Land- and Water-based Recreation Goal

Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge when the Refuge was established.

Background: The Refuge has not been able to provide and maintain facilities and services in support of non-wildlife-dependent recreation at the level expected by many visitors, as expressed in comments as part of this planning effort.

In order to better provide non-wildlife-dependent recreation, under this alternative the portion of the Refuge that supports the majority of non-wildlife dependent recreation would be transferred to Southern Illinois University in a land exchange. The assumption is that SIU can provide more and better quality facilities and services than the Refuge to support boating, water skiing, swimming, picnicking and camping. The Refuge would concentrate its resources on improving the quality of the six priority wildlife-dependent uses.

Objective 1

Maintain the quality of non wildlife-dependent recreation facilities and activities at the levels offered in 2001 until facilities are transferred in a land exchange. Improve the quality of facilities not a part of the exchange to industry standards within 5 years of completion of exchange.

Strategies

1. Maintain picnicking at Greenbriar, Wolf Creek, Harmony Trail, and Visitor Center recreation areas. Within 2 years of the land exchange convert the Cambria Neck recreational area to foot traffic only.
2. Explore the potential for a bicycle route within the restricted use area of the Refuge. The route would run mainly along old railroad beds.
3. Continue current policies on swimming at Devils Kitchen, Little Grassy, and Crab Orchard Lakes. Swimming is prohibited at Devils Kitchen Lake, east of Wolf Creek Causeway at Crab Orchard Lake, all marina areas, and within 100 feet of all boat ramps, spillways, causeways, and dams.
4. Within 5 years of the plan's approval, upgrade boat ramps and associated parking at Devils Kitchen, Little Grassy and Crab Orchard Lakes.
5. Continue current policies on lake zoning on Crab Orchard Lake (includes 150-foot no-wake zone along shoreline) with an additional no-wake zone east of Highway 148 and in some coves (see Figure 11). Implement the zoning of motorized boating at Devils Kitchen Lake. Gas motors would be prohibited south of the southernmost boat ramp on Devils Kitchen Lake and ponds within the public use area of the Refuge .
6. Horseback use on the Refuge would be confined to public roads and a designated River to River Trail (see Figure 12) and erosion due to trail use would be actively controlled through maintenance and/or seasonal closures.

Figure 11: Crab Orchard Lake Watercraft Zoning Proposed Under Alternatives B, C, D and E

Figure 12: Proposed Horseback Riding Trails on Crab Orchard NWR Under Alternatives B, C and E

7. Camping at Devils Kitchen would be discontinued. Little Grassy Campground would be upgraded to standards comparable to others in the area.
8. The Crab Orchard Boat & Yacht Club and The Haven would be included in the land exchange with SIU.

Customer Service Goal

Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.

Background: Policy and guidance of the Service directs each refuge to meet basic standards in hosting visitors. The guidance covers signs, kiosks, leaflets, facility and road maintenance, customer service, and opportunities for visitor feedback. Awareness of Crab Orchard National Wildlife Refuge as a national wildlife refuge can also influence visitor experience and enjoyment.

Objective 1

Improve Refuge signs, kiosks, and facilities so 90 percent of visitors feel welcome and secure, enjoy their visit, and recognize the area as a national wildlife refuge.

Strategies

1. Within 5 years of the plan's approval, develop and install distinct and consistent identification markers that allow visitors to recognize and distinguish between each type of Refuge facility, including trails, observation platforms, photography blinds, bank fishing areas, public hunting areas,

and other similar locations. Design all such markers in accordance with Service standards.

2. Within 3 years of the plan's approval, revise information on existing kiosks, trailhead and other identification markers, boundary signs, structures and other such signs as necessary to meet Service standards.
3. Within 5 years of the plan's approval, create and install additional kiosks where needed at Refuge access points to ensure all visitors are greeted and informed that they are entering a national wildlife refuge. Ensure that all structures comply with Service standards.
4. Verify annually that visitors are welcomed and treated courteously by staff and volunteers. Confirm customer service standards during employee and volunteer orientations. Provide visitors with opportunities for feedback through suggestion cards, verbal reports, written mail, and e-mail through the Refuge web page. Address customer service issues promptly and professionally according to Service standards.
5. Within 2 years of the plan's approval, develop a Refuge brochure with detailed information on accessible facilities, trails, programs, and recreational opportunities at the Refuge.
6. Conduct semi-annual safety inspections of all Refuge facilities and reaffirm compliance with Service standards.
7. Maintain recognizable, consistent signs that clearly identify public hunting areas. Increase awareness among non-hunting visitors of hunting areas and seasons through effective signs and brochures.
8. Respond to notification of safety problems and unsafe situations promptly and in accordance with Service standards. Increase visibility of Refuge law enforcement, particularly during periods of heavy visitation.

2.6.3.4. Agricultural Goal

Agricultural Goal

Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.

Objective 1

Continue farming operations on about 4,400 acres of row crops with greater emphasis on conservation practices.

Strategy

1. Maintain infrastructure (roads, fences) in support of agricultural operations. Drop small, less profitable fields (less than 5 acres) from row cropping and convert to other cover (about 15 fields totaling 52 acres).Identify and drop farmed wetlands from the farm program. Permit cooperator to harvest corn remaining in the field in the spring. Emphasize Johnsongrass control. Prohibit mowing of clover in the crop rotation until after August 1. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.

Objective 2

Continue farming operations on about 700 acres of hay fields with greater emphasis on conservation practices.

Strategy

1. Prohibit mowing of hay until after August 1. Maintain an updated rate charge for hay.

Objective 3

Enhance nesting habitat for grassland birds while maintaining or increasing the value for grazing on about 1,000 acres of pastures.

Strategy

1. Convert fescue pastures to other cool-season grasses and native warm season grasses with higher wildlife value. Divide existing pastures into three or four paddocks with a paddock of cool season grass and two or three paddocks of native warm season grasses. Rotate grazing cattle among the paddocks during the season. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.

2.6.3.5. Industrial Goal

Industrial Goal

Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards, that are utilized by compatible tenants.

Background: Industry began in the area during World War II. When the Refuge was established it was given an industrial purpose, because industry was seen as a way of improving the economy of the area. The war time industry and some subsequent industrial tenants have contaminated the soils and waters of the Refuge. Providing the water and sewer infrastructure in support of industry has been difficult for the Refuge to accomplish. Most of the manufacturing and storage buildings are reaching the limits of their expected lifetime. The buildings require a lot of maintenance and refurbishing to meet today's standards. Recently, several industrial parks have been developed in the area that offer amenities not available on the Refuge. Of the industries on the Refuge, the munitions industry is in a unique position of requiring widely spaced facilities for safety. By providing a safe area for munitions manufacture, the Refuge is able to contribute to and support the national defense. Under this alternative, the Refuge would continue to provide an area for defense munitions manufacture. The Service would seek not to compete with neighboring industrial parks. The Refuge would maintain roads and provide water and sewer services sufficient for current industrial tenants. Tenants would be expected to bring their facilities up to prescribed safety, health, environmental and maintenance standards under any new leases. If tenants do not renew leases, the Refuge would seek new tenants for facilities that continue to be suitable for occupancy. Under this alternative the intent would be to consolidate the areas occupied by industry.

Objective 1

Consolidate the areas occupied by industry.

Strategies

1. Update Industrial Policy. Maintain the current infrastructure to support existing facilities.
2. Remove buildings that are no longer suitable for occupancy for reasons of contamination, safety or lack of structural integrity and restore to natural habitats.

2.6.3.6. Boundary Modification

The authorized Refuge boundary would expand to include land proposed for exchange with Southern Illinois University and additional lands contiguous with the current Refuge boundary.

Background: The Washington Office of the Service approved the study of potential additional Refuge lands in 1990. The Refuge did not pursue the study of additional lands until the CCP process. The CCP planning effort was the logical time to re-examine all management and land protection issues related to the Refuge. So, during the CCP effort we again looked at the possible need to adjust the boundary of the Refuge. Land acquisition and subsequent habitat management would enhance the purposes of the Refuge and offer additional protection to existing lands as development accelerates along Refuge boundaries.

Land Exchange

Early in this planning process, the Service indicated an interest in exchanging land developed for non-wildlife-dependent recreation, such as camping and marina operations, for undeveloped land adjoining the Refuge. Southern Illinois University (SIU) and the Service agreed upon a framework for a land exchange that included the following:

- The Service would exchange approximately 500 acres located in the northwest corner of the Refuge for approximately 1,700 acres of land owned by SIU located south and west of the current Refuge boundary (see Figure 13 and Figure 8 on page 42).
- Parcels in the 500 acres of Refuge land include the Crab Orchard Boat & Yacht Club, The Haven, Crab Orchard Campground, Look Out Point, Take Pride Point (formerly Hogan's Point) and the marina areas also known as Playport and Images. The land cover types include approximately 125 acres of developed land, 150 acres of pine forest, 150 acres of hardwood forest, 40 acres of agricultural fields, and 40 acres of grassland/shrubland.
- The land currently owned by the Service would be exchanged with SIU with the expectation of complementing the University's academic mission. Each of the above mentioned parcels would be managed according to a mutually agreeable plan that essentially permits the continuation of existing non-wildlife-dependent recreational uses and developing additional

Figure 13: Crab Orchard NWR Inholdings, Boundary Modification, and Adjacent Protected Lands

facilities. (A letter from SIU to the Service outlining the proposed uses can be found in Appendix I.)

The Service would retain a flowage easement on lands exchanged with SIU. Additionally, the Service would maintain a reversionary interest such that if the lands were no longer used as outlined in the letter in Appendix I, the land or individual parcels would revert back to Service ownership.

The Service would manage the lands received from SIU as forest habitat. The area would be open to the public for wildlife-dependent recreation. This second growth forest, with proper management and time, may reach a quality sufficient for its designation as Wilderness. The approximate acreage for the current land cover types of the SIU property are: 8 acres of pine forest, 1,569 acres of hardwood forest, and 122 acres of old fields.

Contiguous Lands

A proposed modification of the Refuge boundary could result in the addition of approximately 4,242 acres to the Refuge. The boundary modification would allow the acquisition of inholdings from willing sellers and moving segments of the boundary to coincide with roads that would better define the limits of the Refuge. The boundary modification would increase the efficiency of management, reduce incompatible land uses, and enhance public use opportunities.

Currently, if a landowner wishes to sell or exchange land that is outside the authorized boundary of the Refuge, the Service must complete an analysis for the individual parcel and complete environmental documents related to the transaction. This tract-by-tract analysis is inefficient and does not provide for an overall, cumulative analysis of the land transactions. The separate analysis also may delay a land transaction to the detriment of the seller.

The inholdings, boundary modification, and adjacent protected lands are depicted in Figure 13. A more detailed analysis of the boundary modification is presented in a Land Protection Plan (Appendix L).

The priority for acquisition of parcels would be determined by Refuge purposes; goals and objectives of the CCP; the potential to contribute to an unfragmented landscape component of forest or grassland; and pending development. Habitat within the proposed modified boundary includes approximately 2,000 acres of farmland, some of which has reverted back to grasses, brush and hardwoods. The other land is composed of a combination of pasture, old field and mixed stands of oak, hickory, sycamore and tulip-poplar.

Service policy is to buy land only from willing sellers. The policy is that no rights of landowners or citizens would be transferred without the willing participation of the individuals owning land or rights to the land, including appropriate just-compensation for those rights. The Service is required to make purchase offers based on fair market value that matches the price of comparable land in the area.

It is also Service policy to seek the least amount of land ownership necessary to meet resource protection goals. Fee title acquisition is only one option available to the landowner and the Service. Conservation easements, cooperative agreements and other options may meet conservation objectives for some parcels.

The Service would evaluate any lands that it may acquire for potential contamination. We do not anticipate finding any contamination, which would hinder the Service's ability to achieve the Refuge purposes, in the area of proposed expansion. The extent of possible contamination is expected to be limited to levels associated with residences and small farming operations.

Any acquired lands would become part of the Refuge. The annual costs for administration, operations and maintenance would be lower than acquiring non-adjacent lands. Operation costs would ultimately depend upon the amount of land purchased in fee and easement and habitat restoration requirements.

2.6.4 Alternative C: Open Land Management/Consolidate and Improve Recreation

2.6.4.1. Wildlife Conservation Goals

Canada Geese Goal

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

Goal, background and objectives are the same as those listed under Alternative A.

Strategy

1. Maintain 4,800 acres of cropland in agricultural production. (Figure 14 on page 60). Manage 500 acres of moist-soil units. Continue fall mowing around selected ponds. Maintain seasonal closure to boating on east end of Crab Orchard Lake.

Forest, Early Successional and Grassland Birds Goal

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

Objective 1

Manage the southern portion of the Refuge as a large forest block to benefit area-sensitive forest birds. This area (about 9,500 acres) extends south from Grassy Road and includes the Crab Orchard Wilderness.

Strategy

1. Reforest 1 fallow field (52 acres) south of Grassy Road. This may include site preparation, planting a cover crop, planting tree seedlings, and weed control treatments.

Objective 2

Accelerate succession of pine plantations south of Grassy Road and outside the Wilderness (about 650 acres) to native hardwood forest.

2. Thin pine plantations to promote establishment and growth of native hardwoods. Most silvicultural treatments will be conducted under contract by commercial timber harvesting firms. Conduct prescribed burning during the dormant season (November through March) on a 3 to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration.

Objective 3

Same as Alternative B (page 44).

Strategy

Same as Alternative B (page 43).

Objective 4

Same as Alternative B (page 44).

Strategy

Same as Alternative B (page 44).

Objective 5

Same as Alternative B (page 44).

Strategy

Same as Alternative B (page 44).

Ducks, Shorebirds, and Other Waterbirds Goal

Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

Objectives and strategies same as Alternative B (page 45).

Water Quality Goal

Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.

Objectives and strategies same as Alternative A (page 45).

2.6.4.2. Recreation/Public Use Goals

Hunting, Fishing, Wildlife Observation and Photography, Interpretation and Environmental Education Goal

Hunters, anglers, viewers and photographers of wildlife, general visitors, and students enjoy high-quality experiences through a variety of opportunities that promote an understanding and appreciation of the Refuge's natural and cultural resources and their management.

Background: The Refuge System Improvement Act of 1997 identified six wildlife-dependent, priority public uses that should be facilitated on national wildlife refuges if compatible with the purposes of the Refuge. These priority uses, which include hunting, fishing, wildlife observation and photography, interpretation, and environmental education, are compatible and can be facilitated at the Refuge. While all of these uses are provided at the Refuge to an extent, support for some of these uses has been inconsistent and the quality of the experience has been variable. The Refuge can provide high-quality experiences for these priority wildlife-dependent uses through improvement of supporting facilities, programs, and materials over the next 15 years. A high-quality experience includes uncrowded conditions, no conflicts with other users, a reasonable opportunity, and overall satisfaction. Understanding and appreciation of Refuge resources, management strategies, and purposes also contribute to quality of experience and influence visitor enjoyment.

Figure 14: Land Cover of Crab Orchard NWR, Alternative C, Projected Conditions 2015

Figure 15: Land Cover of Crab Orchard NWR, Alternative C, Projected Conditions 2100

Objective 1

Increase the quality of hunting opportunities to a level where 75 percent of hunters experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. Instill a sense of awareness among hunters of the Refuge as a component of the National Wildlife Refuge System and of hunting as a wildlife management tool.

Rationale: Without the land exchange, the management of non-wildlife-dependent recreation would reduce the visitor services staff's ability to provide the quality of services for wildlife-dependent recreation anticipated in Alternative B.

Strategies

1. In the public hunting area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.
2. In the restricted use area of the Refuge, maintain hunting opportunities, by permit, during shotgun deer and spring shotgun turkey seasons. Areas with high concentrations of waterfowl may occasionally be closed during the restricted use area shotgun hunts. Maintain shotgun deer season hunting opportunities for youth and persons with disabilities and, within 3 years of the plan's approval, provide these groups with opportunities for spring shotgun turkey season hunting when populations warrant.
3. Administer goose hunts in the controlled area through an agreement with a partner organization.
4. Over the life of the plan, promote ethical hunting behavior and increase hunter adherence to federal and state regulations through effective informational brochures and signs. Increase the visibility of Refuge law enforcement.
5. Over the life of the plan, enhance public understanding of Refuge hunting opportunities, ethical behaviors, the role of hunting in wildlife management, and the Refuge as a component of the National Wildlife Refuge System by increasing the quality of maps, signs, and brochures.

Objective 2

Increase the quality of fishing opportunities to a level where 75 percent of anglers experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. At least 75 percent of anglers understand the issues, strategies, and policies involved in Refuge fisheries management and conservation.

Strategies

1. In the public fishing areas, continue the policy of providing fishing opportunities based on state and federal regulations.
2. Continue to allow tournaments and fish-offs on the Refuge. Continue current policies on limited closures of Refuge waters east of Wolf Creek Road.
3. Continue to provide bank and boat fishing opportunities in accordance with state and federal regulations. Maintain Refuge boat ramps, fishing piers, and parking facilities. Study the feasibility for and construct accessible fishing facilities at Little Grassy and Devils Kitchen lakes within 4 years of the plan's approval.
4. Over the life of the plan, promote Refuge fishing opportunities and encourage conservation practices, such as catch-and-release fishing, through the development and maintenance of high-quality maps, signs, brochures and the Refuge web page.
5. Ensure that the fishing public clearly understands the fish consumption advisories for Crab Orchard Lake through signs and brochures.
6. Over the life of the plan, provide insight to anglers regarding Refuge strategies, issues, and policies for fisheries management and conservation by redesigning and developing more effective informational signs and brochures. Increase angler awareness of the Refuge as a component of the National Wildlife Refuge System by improving the quality and content of maps, signs, and brochures.

Objective 3

Objective and strategies for wildlife observation and photography same as Alternative B (page 49).

Chamnestown Trail Entry, Crab Orchard NWR. Glenn Smart

Objective 4

Increase the effectiveness of the Refuge interpretive program so that 70 percent of visitors gain a better understanding of three primary concepts: (1) the value and unique purposes of the Refuge, (2) the Refuge as a component of the national network of refuges, and (3) the significance and mission of the National Wildlife Refuge System. Heighten awareness of conservation and stewardship concepts. Encourage visitors to adopt ethical behaviors and to take positive actions that support Refuge goals and the Refuge System mission.

Strategies

1. Within 3 years of the plan's approval, develop the interpretation portion of the Visitor Services Plan outlining a comprehensive, multifaceted approach emphasizing selected themes and key Refuge resources. Themes will be selected based on importance to Refuge and System goals and relevance to surrounding communities. All interpretive materials, tours, and programs will focus on one or more of these Refuge themes, along with the three basic concepts of the Refuge and Refuge System. Refuge interpretive themes may be in a storyline form that includes three or more themes. Themes may include: Exploring the Diversity of Wildlife, Understanding the Past, Protecting the Balance, and Communicating Visitor Opportunities.
2. Within 4 years of the plan's approval, renovate and replace damaged and outdated interpretive and information panels on Refuge kiosks, wayside exhibits, trails, ramps, structures and other facilities. Ensure all panels comply with Service standards.
3. In cooperation with Refuge volunteers and other partners, conduct a variety of high quality interpretive programs annually. Continue popular and established interpretive programs and special events, such as the Families Understanding Nature program and National Wildlife Refuge Week. Ensure interpretive programming remains current and dynamic by continually creating new programs, incorporating new ideas, updating information, and revitalizing ongoing programs. Focus each interpretive program on one or more Refuge themes.
4. Over the life of the plan and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, revise Refuge interpretive brochures, handouts, and other written materials as needed to improve consistency and to meet Service standards.
5. Within 1 year of the plan's approval, create a custom audiovisual program that provides visitors with orientation information about the Refuge. Ensure this program and a variety of other wildlife-related audiovisual programs are made available for viewing at the Visitor Center and for use in interpretive programs.
6. Within 3 years of the plan's approval, establish and maintain an interpretive auto tour route, using existing roads, that will facilitate opportunities for wildlife and cultural resource observation and provide visitors with an overview of the Refuge, its resources, and its management. Include identified stations with interpretive panels and corresponding, radio-broadcasted interpretive messages.

Objective 5

Increase the effectiveness of the Refuge environmental education program so that 75 percent of participants gain a better understanding and appreciation of the resources, purposes, and value of the Refuge and the Refuge System. Heighten awareness of conservation and stewardship concepts and encourage participants to

take positive actions on the Refuge and in their community that support Refuge goals and the Refuge System mission.

Strategies

1. Within 2 years of the plan's approval, develop the environmental education portion of the Visitor Services Plan, outlining a comprehensive, curriculum-based approach structured to be compatible with state learning standards and national environmental education guidelines. Emphasize key Refuge resources, the Refuge, the National Wildlife Refuge System, and selected Refuge themes. These themes will be based on importance to Refuge and System goals and relevance to surrounding communities. All environmental education materials, facilities, and programs will focus on one or more of these Refuge themes, along with the basic concepts of the Refuge and the Refuge System. Refuge themes may be in a storyline form that incudes three or more themes. Themes may include: Exploring the Diversity of Wildlife, Understanding the Past, Protecting the Balance, and Communicating Visitor Opportunities.
2. Within 3 years of the plan's approval and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, create an array of environmental education kits, each focusing on one or more aspects of Refuge themes. Educational kits will include interactive materials and a detailed instructional and activity guide designed with a clear, consistent format and coordinated with state learning standards. Develop and maintain a multi-faceted environmental education resource library, available for use by educators and in Refuge educational programs, comprised of books, videos, posters, audio tapes, written materials, and environmental education kits.
3. Within 4 years of the plan's approval and in cooperation with other partners, establish an environmental education complex that incorporates an outdoor amphitheater with educational displays, a set of associated trails, the Refuge Visitor Center, and an educator's trail specifically designed to facilitate environmental education activities and function as an outdoor classroom.
4. Within 4 years of the plan's approval and in cooperation with other partners, create an Educator's Guide to Crab Orchard National Wildlife Refuge that provides an orientation, guidelines, grade-level and state learning standards information, maps, and site-specific activities that focus on one or more Refuge themes. Incorporate input from area educators to ensure the Refuge guide meets area teachers' needs.
5. In cooperation with other partners, conduct or host annual teacher workshops that encourage area educators to incorporate environmental education into their curriculum and to utilize Refuge materials, staff, and resources, both in the classroom and during field trips.
6. Continue currently-offered environmental education programs done by request, including on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Over the life of the plan, expand the environmental education program to include additional on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Develop pre- and post-visit activities in addition to on-site activities.
7. Over the life of the plan, establish partnerships with selected local schools, agencies, and nonprofit organizations to more effectively develop and expand environmental education programs. Involve volunteers in educational programs and explore the potential for environmental education interns through Southern Illinois University and John A. Logan College. Explore the potential for creating a grant program to help area schools with field trip expenses.
8. Conduct an annual review of the Refuge environmental education program. Invite feedback from area educators. Revise as necessary.

Other Land- and Water-based Recreation Goal

Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge when the Refuge was established.

Background: There is a recognized need to improve the facilities at the Refuge. Under current trends of resource allocation, the current facilities

can not be maintained at acceptable standards. Under this alternative, the intent would be to reduce the facilities so that the quality could be improved.

A conflict has existed between anglers and high speed watercraft. A 150-foot no-wake zone along the shoreline of Crab Orchard Lake would reduce this conflict. This alternative also establishes additional no-wake zones in several necks on the lake, as well as east of Highway 148.

The Haven and the Crab Orchard Boat & Yacht Club are available only to a limited segment of the general population. The facilities and activities at these clubs amount to private use of public land. Our long-term goal is to make these areas available to a broader portion of the public.

The Haven is a 10-acre site located on the north side of Crab Orchard Lake, near the Highway 13 and Cambria Neck Road intersection. This site has been leased to the Egyptian Past Commanders Club of the American Legion since 1948 for the benefit and enjoyment of disabled veterans primarily from the Marion Veterans Hospital and the Anna State Hospital. The Haven includes a one-story lodge building, and several outside picnic sites, that are used for day visits by veterans for recreation and socializing. During the length of the planning period established for this Refuge CCP (next 15 years), the Refuge Staff will work collaboratively with the Egyptian Past Commanders Club to evaluate the effectiveness of this facility in achieving the purpose of Haven's establishment, and to make recommendations for its future use.

We will extend the lease of the Crab Orchard Boat & Yacht Club for 2 years after the approval of the Refuge CCP. After the lease expires, we will convert the operation of the club facilities to a concession contract. This would end what amounts to private use of public land and make the facilities available to a wider portion of the public.

Objective 1

Improve the quality of boat launches, marinas, beaches, picnic areas, and campground to industry standards within the life of the CCP.

Strategies

1. Maintain picnicking at the Refuge recreational areas of Greenbriar, Wolf Creek, and Harmony Trail, and relocate picnic facilities from Cambria Neck and Playport Marina to a day use area at the current Images Marina site. Explore the option of concession-operated picnic shelters at Little Grassy and Crab Orchard campgrounds.

Photography is one of the priority wildlife-dependent public uses on national wildlife refuges.

2. Explore the potential for a bicycle route within the restricted use area of the Refuge. The route would run mainly along old railroad beds.
3. Continue current policies on swimming at Devils Kitchen, Little Grassy and Crab Orchard lakes. Prohibit scuba diving.
4. Within 10 years of the plan's approval, upgrade boat ramps and associated parking at Devils Kitchen, Little Grassy and Crab Orchard lakes.
5. Continue current zoning on Crab Orchard Lake with additional no wake zones (see Figure 11 on page 53). Gas motors would be prohibited in the most southeastern arm of Devils Kitchen Lake, from the mouth of Grassy Creek south to the Refuge boundary, and in ponds within the public use area.
6. Horseback use on the Refuge would be confined to a designated River to River Trail (see Figure 12 on page 54) and erosion due to trail use would be actively controlled through maintenance and/or seasonal closures.
7. Camping at Devils Kitchen would be reduced to primitive sites only. Crab Orchard and Little Grassy campgrounds would be upgraded to standards comparable to others in the area.
8. Within 2 years of the plan's approval, consolidate Playport and Images marinas on Crab Orchard Lake. Images marina slips will be moved to Playport marina. Within 5

years of the plan's approval, remove the building at Images Marina and develop the area into a large access area to the lake with a comfort station.

9. After 2 years of the completion of the CCP, the Crab Orchard Boat & Yacht Club will be converted to a concession.

Customer Service Goal

Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.

Background: Policy and guidance of the Service directs each refuge to meet basic standards in hosting visitors. The guidance covers signs, kiosks, leaflets, facility and road maintenance, customer service, and opportunities for visitor feedback. Awareness of Crab Orchard NWR as a national wildlife refuge can also influence visitor experience and enjoyment.

Objective 1

Improve Refuge signs, kiosks, and facilities so that 90 percent of visitors feel welcome and secure, enjoy their visit, and recognize the area as a national wildlife refuge.

Strategies

1. Within 3 years of the plan's approval, revise information on existing kiosks, trailhead and other identification markers, boundary signs, and other such signs as necessary to meet Service standards.
2. Within 5 years of the plan's approval, create and install additional kiosks where needed at Refuge access points to ensure that all visitors are greeted and informed that they are entering a national wildlife refuge. Ensure that all structures comply with Service standards.
3. Verify annually that visitors are welcomed and treated courteously by staff and volunteers. Confirm customer service standards during employee and volunteer orientations. Provide visitors with opportunities for feedback through suggestion cards, verbal reports, written mail, and e-mail through the Refuge web page. Address customer service issues promptly and professionally according to Service standards.
4. Within 2 years of the plan's approval, develop a Refuge brochure with detailed information on accessible facilities, trails, programs, and recreational opportunities at the Refuge.
5. Conduct semi-annual safety inspections of all Refuge facilities and reaffirm compliance with Service standards.
6. Maintain recognizable, consistent signs that clearly identify public hunting areas. Increase awareness among non-hunting visitors of hunting areas and seasons through effective signs and brochures.
7. Respond to notification of safety problems and unsafe situations promptly and in accordance with Service standards. Increase visibility of Refuge law enforcement, particularly during periods of heavy visitation.

2.6.4.3. Agricultural Goal

Agricultural Goal

Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.

Objective 1

Continue farming operations on about 4,500 acres of row crops, and reclaim and farm about 300 acres of former fields, with greater emphasis on conservation practices.

Strategies

Same as Alternative B (page 55).

Objectives and strategies for pastures are the same as Alternative B (page 55).

Objectives and strategies for hay fields are the same as Alternative A (page 55).

2.6.4.4. Industrial Goal

Industrial Goal

Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards.

Objective 1

Consolidate the areas occupied by industry.

Strategies

1. Non-munitions-related tenants would not be replaced as they leave the Refuge.

2. Remove buildings that are no longer suitable for occupancy for reasons of contamination, safety or lack of structural integrity and restore to natural habitats.

2.6.4.5. Boundary Modification

The authorized Refuge boundary would expand to include additional lands contiguous with the current Refuge boundary.

The proposed boundary modification is depicted in Figure 13 on page 57. The background discussion of this proposed modification is presented under Alternative B.

2.6.5 Alternative D: Forest Land Management/Consolidate and Improve Recreation

2.6.5.1. Wildlife Conservation Goals

Canada Geese Goal

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

Goal, background, and objectives same as Alternative A (page 35).

Sumac, Crab Orchard NWR. Glenn Smart

Strategy

1. Maintain 4,300 acres of cropland in agricultural production (Figure 16). Manage 450 acres of moist-soil units. Continue fall mowing around selected ponds. Maintain seasonal closure to boating on the east end of Crab Orchard Lake.

Forest, Early Successional and Grassland Birds Goal

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

Objectives and strategies for reforestation, management of pine plantations, and management of early successional habitat are the same as Alternative B (page 43).

Objective 1

Objectives and strategies for native warm-season grassland are the same as Alternative B (page 43).

Objective 2

Maintain 1,000 acres of pasture, 500 acres of hay fields, and about 1,500 acres of clover fields with increased emphasis on habitat quality for grassland birds, along with an emphasis on cattle production on pastures.

Strategy

1. Remove 15 acres of linear forest habitat and 2 miles of hedge rows. Increase forage diversity in fescue pastures by adding legumes, other cool-season or warm-season grasses by reseeding or interseeding. Subdivide larger pastures for rotational grazing to increase cattle production. All mowing of hay fields, pastures, and clover fields will take place after August 1.

Ducks, Shorebirds, and Other Waterbirds Goal

Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

Objectives and strategies are the same as Alternative A (page 38).

Water Quality Goal

Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.

Objectives and strategies are the same as Alternative A (page 38).

2.6.5.2. Recreation/Public Use Goals

Hunting, Fishing, Wildlife Observation and Photography, Interpretation and Environmental Education Goal

Hunters, anglers, viewers and photographers of wildlife, general visitors, and students enjoy high-quality experiences through a variety of opportunities that promote an understanding and appreciation of the Refuge's natural and cultural resources and their management.

Objectives and strategies for hunting, fishing, wildlife observation and photography, interpretation, and environmental education are the same as Alternative C (page 59).

Other Land- and Water-based Recreation Goal

Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge when the Refuge was established.

Objectives and strategies for other land- and water-based recreation are the same as Alternative C except that horseback use would be prohibited on the Refuge and gas motors would be prohibited on Devils Kitchen Lake.

Customer Service Goal

Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.

Objectives and strategies for customer service are the same as Alternative C (page 66).

2.6.5.3. Agricultural Goal

Agricultural Goal

Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.

Background: Under this alternative the emphasis would be on producer benefits. Decisions that involve a compromise between agricultural goals and wildlife goals would be weighted toward the agricultural goals.

Objective 1

Continue farming operations on about 4,300 acres of row crops with greater emphasis on conservation practices, along with reasonable allowances to cooperators.

Strategy

1. Maintain infrastructure (roads, fences) in support of agricultural operations. Address erosion with buffer strips. Drop small, less profitable fields (less than 5 acres) from row cropping and convert to other cover (about 15 fields totaling 52 acres). Identify and drop farmed wetlands from the farm program. Permit cooperator to harvest corn remaining in the field in the spring. Emphasize Johnsongrass control, for example: allow cooperators to adjust rotation by planting soybeans in two successive years in one field annually. Prohibit mowing of clover in the crop rotation until after August 1. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.

Objective 2

Continue farming operations on about 500 acres of hay fields with greater emphasis on conservation practices.

Strategy

1. Prohibit mowing of hay until after August 1. Maintain an updated rate charge for hay.

Objective 3

Continue farming operations on about 1,000 acres of pasture with greater emphasis on conservation practices, along with reasonable allowances to cooperators.

Strategy

1. Remove 15 acres of linear forest habitat and 2 miles of hedge rows. Increase forage diversity in fescue pastures by adding legumes, other cool-season or warm-season grasses by reseeding or inter-seeding. Subdivide larger pastures for rotational grazing to increase cattle production. All mowing would take place after August 1. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.

2.6.5.4. Industrial Goal

Industrial Goal

Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards.

Objective and strategies are the same as Alternative C (page 66).

2.6.5.5. Boundary Modification

Same as Alternative C (page 66).

Figure 16: Land Cover of Crab Orchard NWR, Alternative D, Projected Conditions 2015

Figure 17: Land Cover of Crab Orchard NWR, Alternative D, Projected Conditions 2100

2.6.6 Alternative E: Reduced Habitat Fragmentation/Consolidate and Improve Recreation (Preferred Alternative)

2.6.6.1. Wildlife Conservation Goals

Canada Geese Goal

Provide enough food for wintering Canada geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

Background and objective same as Alternative A (page 35).

Strategy

1. Maintain 4,300 acres of cropland in agricultural production (see Figure 9 on page 46). Manage 450 acres of moist-soil units. Continue fall mowing around selected ponds. Maintain seasonal closure to boating on the east end of Crab Orchard Lake.

Forest, Early Successional and Grassland Birds Goal

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

Objectives and strategies for reforestation, management of pine plantations, management of early successional habitat, and management for native warm-season grasslands are the same as Alternative B (page 43).

Ducks, Shorebirds, and Other Waterbirds Goal

Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

Objective and strategies are the same as Alternative B (page 45).

Water Quality Goal

Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.

Objective and strategies are the same as Alternative B (page 45).

2.6.6.2. Recreation/Public Use Goals

Hunting, Fishing, Wildlife Observation and Photography, Interpretation and Environmental Education Goal

Hunters, anglers, viewers and photographers of wildlife, general visitors, and students enjoy high-quality experiences through a variety of opportunities that promote an understanding and appreciation of the Refuge's natural and cultural resources and their management.

Objectives and strategies for hunting, fishing, wildlife-observation and photography, interpretation, and environmental education are the same as Alternative C (page 59).

Other Land- and Water-based Recreation Goal

Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge when the Refuge was established.

Objectives and strategies for other land- and water-based recreation are the same as Alternative C (page 64) except that gas motors would be prohibited in the most southeastern arm of Devils Kitchen Lake, from the mouth of Grassy Creek south to the Refuge boundary, and in ponds within the public use area. (See Figure 18.) The portion of the lake south of Line Road 6 boat ramp would be designated a no-wake zone.

Customer Service Goal

Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.

Objectives and strategies for customer service are the same as Alternative C (page 66).

2.6.6.3. Agricultural Goal

Agricultural Goal

Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.

Objectives and strategies for agriculture are the same as Alternative B (page 55).

2.6.6.4. Industrial Goal

Industrial Goal

Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards.

Objective and strategies for industry are the same as Alternative B (page 55).

Figure 18: Devils Kitchen Lake Zoning, Crab Orchard NWR

Eastern box turtle, Crab Orchard NWR

2.6.6.5. Boundary Modification

The authorized Refuge boundary would expand to include additional lands contiguous with the current Refuge boundary.

The proposed boundary modification is depicted in Figure 13 on page 57. The background discussion of this proposed modification is presented under Alternative B (page 56).

2.7 Comparison of Alternatives

2.7.1 Comparison of Funding and Personnel Needs by Alternative

2.7.1.1. Alternative A: Current Management (No Action)

Under this alternative, funding and personnel would remain the same.

2.7.1.2. Alternative B: Reduced Habitat Fragmentation/ Wildlife-dependent Recreation Emphasis With Land Exchange

Habitat management increases under this alternative. Reforestation, aggressive control of invasive species, an increase in the number of acres managed as moist soil units, and improvements to the open land units would require additional staff and operating funds. A person with expertise in agriculture and invasive species would be added to the biological program staff. Also, a person with expertise in Geographic Information Systems would be needed to assist the biological staff with mapping and record keeping for invasive species control and other habitat work. Maintenance staff efforts would shift from the campground and marina operations that would be traded to SIU to assist with the increased habitat work.

Emphasis on recreation would focus on wildlife-dependent activities such as hunting, fishing, and environmental education. To improve the quality of services, the Refuge would add a position in the visitor information center to assist with administrative duties, freeing up the park rangers to provide environmental education and interpretive opportunities. Law enforcement efforts would shift from campgrounds and marinas that would be traded to SIU to resource protection on other parts the Refuge. Funds for new signs, kiosks, courtesy boat docks, improvements to the Little Grassy Campground, trails, and environmental education would be required.

The addition of the new strategies to meet the goals and objectives of this alternative would require a 15 percent increase in the Refuge's current operations and maintenance budget.

2.7.1.3. Alternative C: Open Land Management/ Consolidate and Improve Recreation

Habitat management under this alternative focuses on open land. Many of the new habitat projects found in Alternative B would be undertaken in this alternative. The two new biological staff positions mentioned above would be added under this alternative. A seasonal tractor operator would need to be hired under this alternative to help accomplish the habitat work. This position is not necessary under Alternative B because the land exchange would allow the shifting of maintenance workers from the marina and campground work to habitat work.

Compared to Alternative A, this alternative has an increased focus on wildlife-dependent uses. The management of the campgrounds and marinas would reduce the visitor services staff's ability to provide the quality of services anticipated in Alternative B. The additional staff person to help with the administration of the visitor information center is included in this alternative.

The completion of the consolidation of the Playport and formerImages Marinas would occur under this alternative. Funds would be required to move the remainder of the docks from the Images area, removal of the concession building and construction of a boat ramp.

An increase in funding similar to Alternative B would be needed for this alternative.

2.7.1.4. Alternative D: Forest Land Management/ Consolidate and Improve Recreation

Habitat management under this alternative would focus on forests. Under this alternative the additions to the biological staff would be the Geographic Information System Specialist and a biological technician. The biological technician would assist with invasive species control and forestry work.

Compared to Alternative A, this alternative has a greater focus on wildlife-dependent uses. The management of the campgrounds and marinas would reduce the visitor services staff's ability to provide the quality of services anticipated in Alternative B. The additional staff person to help with the administration of the visitor information center is included in this alternative.

The completion of the consolidation of the former Images and Playport Marinas would occur under this alternative. Funds would be required to move the remainder of the docks from the Images area, removal of the concession building and construction of a boat ramp.

Funding of the Refuge's operations and maintenance budget would need to increase about 10 percent if this alternative is implemented.

2.7.1.5. Alternative E: Reduced Habitat Fragmentation/Consolidate and Improve Recreation (Preferred Alternative)

Habitat management increases under this alternative. Reforestation, aggressive control of invasive species, an increase in the number of acres managed as moist soil units, and improvements to the open land units would require additional staff and operating funds. A person with expertise in agriculture and invasive species would be added to the biological program staff. Also, a person with expertise in Geographic Information Systems would be needed to assist the biological staff with mapping and record keeping for invasive species control and other habitat work. A seasonal tractor operator would need to be hired under this alternative to help accomplish the habitat work. This position is not necessary under Alternative B because the land exchange would allow the shifting of maintenance workers from the marina and campground work to habitat work.

Compared to Alternative A, this alternative has an increased focus on wildlife-dependent uses. The management of the campgrounds and marinas would reduce the visitor services staff's ability to provide the quality of services anticipated in Alternative B. An additional staff person to help with the administration of the visitor information center is included in this alternative.

The completion of the consolidation of the Playport and former Images Marinas would occur under this alternative. Funds would be required to move the remainder of the docks from the Images area, removal of the concession building and construction of a boat ramp.

An increase in funding similar to Alternative B would be needed for this alternative.

Table 4: Summary of Management Alternatives

Issue	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
Wildlife Conservation					
Threatened/ Endangered Species	Management activities would protect Bald Eagle and Indiana bat.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.
Canada Goose	Provide food for 6.4 million goose-use-days annually.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.
Resident Fish and Wildlife	Manage mixed-species, warm-water sport fish population. Manage resident wildlife species at levels that allow hunting opportunities.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.
Forest Birds	Reforest 240 acres.	Reforest 490 acres.	Reforest 52 acres.	Same as Alt. B.	Same as Alt. B.
Prescribed Fire	Prescribed burning and thinning on about 3,300 acres pine plantations.	Prescribed burning and thinning on about 3,300 acres pine plantations.	Prescribed burning and thinning on about 650 acres pine plantations.	Same as Alt. B.	Same as Alt. B.
Early Successional Birds	All early successional habitat matures.	Maintain about 300 acres of early successional habitat.	Same as Alt. B.	Same as Alt. B.	Same as Alt. B.
Grassland Birds	Maintain 240 acres of native warm season prairie. Maintain 3,300 acres of agricultural grasslands. Delay mowing until after August 1.	Maintain 260 acres of native warm season prairie. Maintain 3,300 acres of agricultural grasslands. Delay mowing until after August 1. Remove 124 acres of linear forest habitat and 8 miles of hedge row. Convert fescue grasses in pastures to more desirable wildlife grasses.	Same as Alt. B.	Maintain 260 acres of native warm season prairie. Maintain 3,000 acres of agricultural grasslands. Delay mowing until after August 1. Remove 15 acres of linear forest habitat and 2 miles of hedge row.	Same as Alt. B.
Prescribed Fire	Prescribed burning on 240 acres of native prairie.	Prescribed burning on 260 acres of native prairie.	Same as Alt. B.	Same as Alt. B.	Same as Alt. B.
Ducks, Shorebirds and Other Waterfowl	Manage 450 acres of moist soil units.	Manage 500 acres of moist soil units by constructing about 100 acres of new units.	Same as Alt. B.	Same as Alt. A.	Same as Alt. B.

Table 4: Summary of Management Alternatives (Continued)

Issue	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
Water Quality	Continue use of soil and water protection measures.	Continue use of soil and water protection measures, plus establish more buffer strips and keep livestock away from streams. Work with landowners to improve quality of water within Refuge watersheds. Identify and drop farmed wetlands from the farm program.	Continue use of soil and water protection measures, plus establish more buffer strips and keep livestock away from streams. Identify and drop farmed wetlands from the farm program.	Same as Alt. C.	Same as Alt. B.
Recreation					
Hunting and Fishing	Hunting and fishing programs as offered in 2001.	Strive to provide quality experience for 90 percent of participants. Additional hunting programs to encourage non-traditional participants.	Strive to provide quality experience for 75 percent of participants. Additional hunting programs to encourage non-traditional participants.	Same as Alt. C.	Same as Alt. C.
Wildlife Observation and Photography	Provide programs as offered in 2001.	Strive to provide quality experience for 95 percent of participants. Increase number and quality of services and facilities.	Strive to provide quality experience for 85 percent of participants. Some increase in number and quality of services and facilities.	Strive to provide quality experience for 70 percent of participants. Slight increase in number and quality of services and facilities.	Same as Alt. C.
Interpretation and Environmental Education	Provide programs as offered in 2001.	Strive for better understanding of conservation and stewardship concepts among 85 percent of participants. Increase number and quality of services and facilities.	Strive for better understanding of conservation and stewardship concepts among 70 percent of participants. Some increase in number and quality of services and facilities.	Same as Alt. C.	Same as Alt. C.

Table 4: Summary of Management Alternatives (Continued)

Issue	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
Non-wildlife-dependent Land Based Recreation	Maintain four campgrounds and four group camps. Length of stay at campgrounds would be limited to 14 days. Existing picnic areas would be maintained.	Two campgrounds would become the responsibility of SIU. Refuge would improve and maintain campground at Little Grassy Lake. Devils Kitchen Campground and group picnic area would close. Length of stay at campgrounds would be limited to 14 days. Four group camps would be maintained. Picnic area at Cambria Neck would close.	Sites at three campgrounds would be consolidated and improved. Devils Kitchen Campground would be reduced to primitive campsites only. Length of stay at campgrounds would be limited to 14 days. Four group camps would be maintained. Remaining picnic areas would be improved and in some cases relocated to new picnic and day use areas.	Same as Alt. C.	Same as Alt. C.
	The Boat & Yacht Club and The Haven would continue operations.	The Boat & Yacht Club and The Haven would continue operations under agreement with Southern Illinois University.	The Boat & Yacht Club would be converted to a concession operation 2 years after completion of the CCP. The Haven would continue operations.	Same as Alt. C.	Same as Alt. C.
	Horseback use would remain an unauthorized use.	Horseback use would be permitted on designated trail.	Same as Alt. B.	Horseback use would be prohibited on Refuge.	Same as Alt. B.
Non-wildlife-dependent Water Based Recreation	Five marinas would be maintained.	Three marinas would become the responsibility of SIU. Refuge would maintain two marinas – Devils Kitchen and Little Grassy.	Four marinas would be maintained: Images Marina and Playport Marina would be consolidated at the Playport site.	Same as Alt. C.	Same as Alt. C.

Table 4: Summary of Management Alternatives (Continued)

Issue	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
	Maintain existing lake zoning for boating activities.	A no-wake zone east of Highway 148 and in some bays would be established in addition to existing regulations. Gas motor use at Devils Kitchen Lake would be prohibited south of southern most boat ramps.	Same as Alt. B with the exception that gas motor use at Devils Kitchen Lake would continue.	Same as Alt. B, except that gas motor use at Devils Kitchen Lake would be prohibited.	Same as Alt. B, except gas motors would be prohibited in the most southeastern arm of Devils Kitchen Lake, from the mouth of Grassy Lake south to the Refuge boundary. The portion of the lake south of Line Road 6 boat ramp will be designated a no-wake zone.
	Designated public beaches would remain.	Crab Orchard Lake beach becomes the responsibility of SIU.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.
Agriculture					
Row Crops	Farm 4,500 acres. No mowing until after August 1.	Farm 4,400 acres. Greater emphasis on buffer strips and not farming in wetlands. Allow cooperators to harvest remaining corn in the spring. No mowing until after August 1.	Farm 4,800 acres. Greater emphasis on buffer strips and not farming in wetlands. Allow cooperators to harvest remaining corn in the spring. No mowing until after August 1.	Farm 4,300 acres. Greater emphasis on buffer strips and not farming in wetlands. Eliminate fields smaller than 5 acres. Allow cooperators to harvest remaining corn in the spring, and other allowances to cooperators. No mowing until after August 1.	Same as Alt. B.
Hay Fields	Farm 700 acres. No mowing until after August 1.	Farm 600 acres. No mowing until after August 1.	Farm 700 acres. No mowing until after August 1.	Farm 500 acres. No mowing until after August 1.	Same as Alt. B.
Pastures.	Graze 1,000 acres. No mowing until after August 1.	Graze 1,000 acres. No mowing until after August 1. Convert fescue grasses in pastures to more desirable wildlife grasses.	Same as Alt. B.	Graze 1,000 acres. No mowing until after August 1. Enhance forage diversity and practice rotational grazing to increase cattle production.	Same as Alt. B.

Table 4: Summary of Management Alternatives (Continued)

Issue	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
Industry					
	Continue under 1981 guidelines. Departing tenants replaced if buildings remain suitable for occupancy. Emphasis on munitions manufacturing.	Update 1981 guidelines. Departing tenants replaced if buildings remain suitable for occupancy. Emphasis on munitions manufacturing.	Update 1981 guidelines. Non-munitions tenants would not be replaced as they leave the Refuge. Emphasis on munitions manufacturing.	Same as Alt. C.	Same as Alt. B.
Wilderness					
	Maintain 4,050-acre Crab Orchard Wilderness and recommend 120 acres of inholdings for Wilderness designation. The Wilderness Management Plan would be revised.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.
Protection					
	Natural and cultural resources and the health and safety of visitors would be protected. Integrated Pest Management Plan would be written and implemented. Clean-up of contaminated industrial sites would continue.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.

Chapter 3: Affected Environment

3.1 Introduction

Chapter 3 provides an overview of Crab Orchard National Wildlife Refuge and the resources it provides in terms of habitat, wildlife and people.

3.2 Physical Environment

3.2.1 Physiography

The physiography of the northern and southern portions of the Refuge is quite different. The terrain of the northern portion of the Refuge is characterized by low relief, broad valleys, and relatively well-developed drainage systems while the southern portion of the Refuge is uplands with narrow ridges dissected by deep, narrow valleys with steep slopes and numerous sandstone outcrops.

The northern portion of the Refuge is covered with a heterogeneous mixture of rock fragments ranging in size from clay to boulders deposited by glaciers on bedrock. Generally the slopes in the area are less than 3 percent. The southern portion of the Refuge is part of a continuous ridge extending from Battery Rock on the Ohio River to Horseshoe Bluff overlooking the Mississippi River. The hills are highly dissected uplands with little flat land and nearly all of the area has steep slopes, most in excess of 10 percent slope.

The Refuge's elevation ranges from less than 380 feet above mean sea level at Crab Orchard Creek in Jackson County to over 740 feet at the southeast corner of the Refuge in Union County.

The most prominent features of the Refuge landscape are three artificial impoundments: Crab Orchard Lake, Little Grassy Lake, and Devils Kitchen Lake. Together these lakes total about 8,720 surface acres.

Prairie restoration, Crab Orchard NWR

3.2.2 Geology

The bedrock underlying the Refuge is of Pennsylvanian age. In the northern part of the Refuge, the bedrock is covered by a thin layer of glacial till of Illinoian age. During the Wisconsin glacial age, the weathered Illinoian glacial till was covered by the Farmdale and the Peorian loess sheets. The present upland soils developed from these loess sheets. The Loveland loess sheet underlies the Peorian and Farmdale sheets in the unglaciated areas in the southern portion of the Refuge. The Mississippi River valley is the main source of the loess.

Although mining for bituminous coal has occurred over extensive areas to the north of the Refuge, no coal has been mined on Refuge lands. In 1940, an exploratory oil well was drilled in the central portion of the Refuge, but apparently it never produced any oil. The federal government owns the mineral estate on all lands originally transferred to the Department of the Interior in 1947, except for a one-half interest in oil and gas minerals on one 40-acre tract. The government does not own the subsurface rights on several parcels of land acquired since that time. These parcels amount to about 1,350 acres.

3.2.3 Soils

Information on soils is essential for their conservation, development, and productive use. The various soil types have characteristic properties that determine their potential and limitations for specific land uses. Knowledge of soils is important in managing the Refuge's agriculture and wildlife habitat programs, as well as recreational and industrial facilities and activities.

Since the existing soil surveys were published for Williamson County (Fehrenbacher and Odell, 1959) and Jackson County (Herman et al., 1977), many changes and dramatic improvements have been made in soil classification and mapping techniques. The Heartland Geographic Information System Project will create an updated, digitized soil survey of Williamson, Jackson, and Perry counties. The Refuge is co-sponsoring the new soil survey of Williamson County. The soil survey, which will meet current National Cooperative Soil Survey standards, will be completed in December 2005.

3.2.4 Climate

The climate of the area is typical of the mid-western region of the United States in which frequent weather changes occur from day-to-day and season-to-season. The weather is governed by cold air moving southward across the plains from Canada, warm, moisture-laden air moving up from the Gulf of Mexico, and dry air from the west and southwest.

Summers are generally hot and humid, with July normally the hottest month. Winters are normally mild with the coldest temperatures recorded in January. The average frost-free dates in spring and fall for the area are April 15 and October 22. The mean annual temperature of the area is about 57 degrees Fahrenheit with mean monthly temperatures ranging from about 35 degrees Fahrenheit in January to 79 degrees Fahrenheit in July. Lake evaporation in the area averages nearly 36 inches a year varying from about 0.7 inch in December to 5.6 in July.

The average annual rainfall for the area is approximately 44 inches. Precipitation is usually highest March through June. Annual snowfall averages from 10 to 15 inches.

3.2.5 Hydrology and Water Quality

The entire Refuge lies within the Crab Orchard Creek watershed. Crab Orchard Creek is a tributary of the Big Muddy River, which drains into the Mississippi River. Major tributaries of Crab Orchard Creek include Drury Creek, Grassy Creek, Little Grassy Creek and Wolf Creek; other tributaries include Prairie Creek, Pin Oak Creek, Pigeon Creek, Rocky Comfort Creek, and numerous smaller, unnamed streams (Figure 19). Surface water on the Refuge exists almost exclusively as man-made reservoirs and ponds. Three large reservoirs cover nearly 9,000 acres of the Refuge (Table 5 on page 82). There are about 60 smaller impoundments covering about 300 acres (range 0.5-100 acres, average = 6 acres). The only natural lake on the Refuge is a 42-acre oxbow of Crab Orchard Creek. The hydrology of this oxbow has been modified by drainage ditches and impoundment of Crab Orchard Lake.

Water quality, drainage modification, shoreline erosion and sedimentation remain ongoing concerns for water bodies on the Refuge. Refuge waters are impacted by agricultural runoff, wastewater treatment effluent, urban runoff, stream channelization, and industrial contaminants. Pollutants from agriculture include sediment, nutrients and pesticides.

3.2.5.1. Crab Orchard Lake

Crab Orchard Lake is the oldest (1940), largest, and most heavily used lake on the Refuge. Although created for water supply and recreation purposes, it is no longer used as a source for industrial or drinking water. Crab Orchard Lake is eutrophic (high nutrient levels, low oxygen levels) and rarely exhibits thermal stratification. Turbidity can be quite high, especially following rain storms, and the lake supports moderate plankton blooms during warm months. Water surface temperatures reach 88 degrees Fahrenheit in August. The land cover of the Crab Orchard Lake watershed consists of grasslands (34 percent), forests (31 percent), row crops (15 percent), open water (12 percent), urban development (7 percent), and wetlands (2 percent).

Figure 19: Streams and Watersheds of Crab Orchard NWR

Table 5: Crab Orchard NWR Lake Details

Name	Crab Orchard	Little Grassy	Devils Kitchen
Surface Area (acres)	6,910	1,000	810
Capacity (acre feet)	72,525	27,000	29,200
Average Depth (feet)	10.7	27.0	36.0
Shoreline Length (miles)	125	28.3	24.0
Watershed Area (square miles)	215	15	18.3
Creek Dammed	Crab Orchard Creek	Little Grassy Creek	Grassy Creek
Spillway Elevation	405.0	500.0	510.0
Maximum Depth (feet)	24.6	77.0	90.0

3.2.5.2. Little Grassy Lake

Little Grassy Lake was impounded in 1950 as a recreation resource and today is most commonly used for sport fishing. Little Grassy Lake is relatively clear, has low nutrient levels, and supports light plankton blooms during warm months. The land cover of the Little Grassy Lake watershed consists of forests (65 percent), grasslands (18 percent), row crops (10 percent), open water (6 percent) and wetlands (1 percent).

3.2.5.3. Devils Kitchen Lake

Devils Kitchen Lake was impounded in 1959 as a recreation resource and today is most commonly used for sport fishing. Devils Kitchen is one of the deepest and clearest lakes in Illinois, has low nutrient levels, and supports minimal plankton blooms

during warm months. Except for the dam area, the lake shoreline consists primarily of oak-hickory forest. The land cover of the Devils Kitchen Lake watershed consists of forests (62 percent), grasslands (25 percent), row crops (7 percent), open water (5 percent), and wetlands (1 percent).

3.2.6 Contaminants

3.2.6.1. Comprehensive Environmental Response Compensation and Liability Act (CERCLA)

Following World War II and the transfer of the War Department's Illinois Ordnance Plant to the Department of the Interior, explosives production continued to be the principal industry on the property. In addition, new industries moved into buildings formerly used by the wartime contractor. Over the years, approximately 200 tenants have operated a variety of manufacturing plants under lease from the Refuge. In addition to munitions, manufactured products included plated metal parts, ink, electrical components, machined parts, various painted products, and boats.

A number of locations on the Refuge were contaminated with hazardous substances as a result of handling and disposal methods that were once considered acceptable. These methods included placing waste materials in unlined landfills and discharging liquids into surface water bodies and impoundments. These practices contaminated soils, aquatic sediments, and water, which eventually led to the Refuge's designation by the U.S. Environmental Protection Agency (USEPA) in 1987 as a national priority for hazardous waste investigation and cleanup under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA).

In the 1970s, the State of Illinois identified polychlorinated biphenyl (PCB) and cadmium contamination at the Refuge. A fish consumption advisory has been in effect for Crab Orchard Lake since 1988. In 1989, a Refuge-wide investigation was completed on 33 sites. Several sites were remediated and other sites are in different phases of clean-up. A subsequent investigation was conducted in 2001. This investigation identified additional areas of significant contamination where efforts will fully characterize the nature and extent of contamination, evaluate potential cleanup alternatives, and select and implement protective cleanup measures.

The Department of the Interior, the Department of Army, the USEPA, and the Illinois Environmental Protection Agency (IEPA) are actively involved in the site remediation process. The agencies entered into a Federal Facilities Agreement (FFA) in 1991 that defined roles and responsibilities for the contaminants investigations and remediation.

Approximately $85 million has been spent so far for investigation and clean up of contaminated sites. In one cleanup project, approximately 117,000 cubic yards of hazardous PCB contaminated soils were safely treated. The soils, along with other PCB contaminated soils and incinerator ash, were placed in a repository on the site. Other cleanup projects addressed contamination problems associated with unexploded ordnance and lead-contaminated soils around water towers.

Investigation and cleanup are continuing at several sites in existing and former industrial areas within the restricted use portion of the Refuge. These activities are expected to continue into the foreseeable future.

3.2.7 Administrative Facilities

The Service is responsible for maintaining the Refuge headquarters building, visitor information center, maintenance building, a small office building, and three high hazard dams. The visitor information center is described in the discussion of public use in Section 3.6 on page 97.

The headquarters building consists primarily of office space for four offices – Refuge administrative staff, Ecological Services Marion Field Office, Ecological Services Crab Orchard Superfund Office, and U.S. Environmental Protection Agency. The building has 10,000 square feet and was completed in 1981.

The Refuge maintenance building consists of office areas, supply and equipment storage areas, and a large bay area for various equipment and

Crab Orchard NWR Headquarters, Bot Etzel

Figure 20: Land Cover of Crab Orchard NWR

vehicle maintenance and repair functions. This building has 10,000 square feet and was completed in 1981.

The office building houses the Carterville Fishery Resource Office and the Illinois Department of Natural Resources. This building, built in 1941, has 3,420 square feet.

The three major dams on the Refuge are the Crab Orchard Lake Dam, Devils Kitchen Lake Dam, and Little Grassy Lake Dam.

The Crab Orchard Lake Dam was constructed to provide a reservoir for an industrial and municipal water supply, recreation, and work relief. Construction was authorized in 1936 and completed in 1939, with extensive modifications completed in 1991. The dam is a zoned earth fill embankment dam with a service spillway.

Devils Kitchen Lake Dam was constructed to provide recreation, water storage, habitat and breeding grounds for migratory birds and other wildlife, and conservation. The dam was designed in 1940. Construction began in 1941, but was suspended in 1943 because of World War II. In 1955, the U.S. Army Corps of Engineers reviewed and modified the original designs. Construction was completed in 1959. The dam is concrete with a concrete spillway.

Little Grassy Lake Dam was constructed to provide recreation. Construction was authorized in 1936 and completed in 1942, with modifications in 1991, 1994 and 2003. The dam is a homogeneous earth fill embankment dam with a concrete spillway near the center of the embankment.

3.3 Habitat Overview

The purpose of this section is to broadly describe the existing habitats and the changes that have occurred in the last 200 years. The discussion helps us understand and evaluate the management alternatives discussed in this document. The historic framework helps us implement the Fish and Wildlife Service's policy on maintaining the biological integrity, diversity, and environmental health of the National Wildlife Refuge System. The historic perspective is useful to us as a starting point for assessing the condition of the landscape, the potential for restoration of habitats where appropriate, and the recognition of irreversible changes that may preclude or greatly limit restoration.

3.3.1 Background

The habitats of the Refuge area have changed dramatically in the last 200 years. The area that is now the Refuge was 90-95 percent forest prior to European settlement (Anderson and Anderson 1975) (Figure 20). European settlement of southern Illinois began in the early 1800s and by the mid 1800s Native Americans had been pushed out and villages and primitive roads established. Change in the area was greatest in the late 1800s and the first half of the 1900s. Nearly all of the area was either logged for timber or cleared and converted to other uses, particularly agriculture. By the 1930s, the soils in the area were depleted and severely eroded. Starting in 1938, the Resettlement Administration acquired 32,000 acres of the land along Crab Orchard Creek in an effort to prevent further deg-

radation. However, additional clearing and development ensued with the establishment of the Illinois Ordnance Plant during World War II.

The changes in Refuge habitats since 1807 can be summarized as follows: the original hardwood forest (92 percent of aboriginal area) was converted to largely open habitats (agricultural fields and open water) by the 1930s, where forests now exist the mature hardwood forest has been changed to a forest in an earlier seral stage and pine plantations. Savannah (7 percent of aboriginal area) and native prairie (1 percent of aboriginal area) have been completely converted to other habitats. The overall result has been the fragmentation of the hardwood forest and an increase in aquatic habitats with the construction of the lakes. The current land cover for the Refuge is displayed in Figure 21; changes in land cover are displayed in Table 6.

3.3.2 Forests

Before European settlement, the area that is now the Refuge was 92 percent forest. Essentially, all of the original forest was either converted to other habitats, harvested for timber, or otherwise disturbed. The amount of forest reached the lowest point in the first half of the 1900s. Since that time, forests have gradually become reestablished in abandoned farm fields and industrial areas, and some areas were actively replanted with trees. Presently, 56 percent of the Refuge is covered by forest. Examples of wildlife that use Refuge forests are deer, squirrels, raccoons, hawks, owls, and a variety of forest song bird species. A Refuge goal has been to manage for productive oak-hickory forest dominated by native species. Management activities have included tree planting, prescribed burning, thinning, and control of exotic and invasive plants.

3.3.3 Shrubland

Before European settlement, the area that is now the Refuge was about 7 percent savannah. Savannah was probably dominated by prairie grasses interspersed with trees, but some of it was dominated by shrubs. Presently, about 2 percent of the Refuge is covered by shrubland. Examples of wildlife that use shrubland are deer, rabbit, loggerhead shrike, Bell's vireo, and field sparrow. Most Refuge shrubland is the result of abandoning farm fields and industrial areas.

3.3.4 Grassland

Before European settlement, the area that is now the Refuge was 1 percent prairie. All of the prairie was converted to other habitats. Presently, about 4 percent of the Refuge is covered by grassland. Examples of wildlife that use grassland are deer, rabbit, northern bobwhite, grasshopper sparrow, loggerhead shrike, dickcissel, and eastern meadowlark. The majority of Refuge grassland is managed pasture (55 percent) and hay (35 percent) with the remainder (10 percent) represented by planted, native warm-season grasses. Management activities have included planting agricultural and native grasses, prescribed burning, grazing, mowing, control of exotic and invasive plants, and fertilizing.

3.3.5 Wetlands

Before European settlement, there was relatively little wetland habitat on the area that is now the Refuge. Presently, most wetland habitat on the Refuge consists of man-made ponds and lakes, which are discussed in the following paragraphs. Wetlands cover about 6 percent of the Refuge. Examples of wildlife that use wetlands are Canada goose, other waterfowl, herons, raccoons, turtles, frogs, and other amphibians and reptiles. The majority of these wetlands are bottomland hardwood forests (1,900 acres) and moist-soil units (450 acres). During normal years, water levels in moist-soil units are lowered during the summer to encourage the establishment of moist-soil vegetation. Water levels are then raised during the fall to make the seeds produced by moist-soil plants available to waterfowl. Management activities include maintenance of levees and water control structures, water level manipulation, mowing, disking, planting, and control of exotic and invasive plants.

3.3.6 Open Water

Before European settlement, the area that is now the Refuge had little, if any, open water habitat. Presently, about 20 percent of the Refuge is covered by open water, almost all of it in man-made reservoirs. Open water serves as habitat for warm-water sport fish, waterfowl and other waterbirds. Management activities include maintenance of dams, levees, and water control structures, and manipulation of water levels.

3.3.7 Cropland

Row croplands are farmed through cooperative farming agreements with eight farmers. The objectives of the cooperative farming program have been

Figure 21: Land Cover of Crab Orchard NWR, 2000

Table 6: Area and Percent Cover of Habitats on Crab Orchard NWR, 1807 and 2000

Habitat Type	Acres in 2000	Percent Cover in 2000	Acres in 1807	Percent Cover in 1807
Forest	**25,254**	**56**	**41,820**	**92**
Eastern Red-cedar Forest (old field)	71	<1		
Mixed Hardwood Upland Forest	18,923	42		
Mixed Hardwood Bottomland Forest	1,908	4		
Eastern Red-cedar Mixed Hardwood Forest (old field)	1,006	2		
Pine Plantation/Mixed Hardwood Forest	1,633	4		
Pine Plantation Forest	1,665	4		
Bald-cypress Plantation Swamp Forest	44	<1		
Early Successional Oak Forest (reforested)	5	<1		
Shrubland	**956**	**2**	**3,182**	**7**
Upland Mixed Shrubland (old field)	872	2		
Willow Wet Shrubland	3	<1		
Buttonbush Swamp Shrubland	81	<1		
Herbaceous	**9,026**	**20**	**455**	**1**
Restored Native Grassland	198	<1		
Fallow Herbaceous Field	1,542	3		
Forest Regeneration Herbaceous Land	168	<1		
Perennial Grass Crops	1,752	4		
Wet Herbaceous Meadow	389	1		
Common Reed Marsh	7	<1		
Cattail Marsh	25	<1		
Aquatic Herbaceous Marsh	365	1		
Agricultural Field	4,580	10		
Other Land Cover	**10,220**	**22**	**0**	**0**
Open Water	9,082	20		
Developed Land	1,138	2		
Totals	45,456	100	45,456	100

to provide food for wintering Canada geese and other waterfowl, protect and improve Refuge soils, and fulfill the agricultural purpose of the Refuge. Presently, about 10 percent of the Refuge is covered by cropland. Examples of wildlife that use cropland are deer, Canada goose, northern bobwhite, and wild turkey. Management activities include mowing, disking, planting, herbicide and fertilizer application, and harvesting.

3.3.8 Developed Land

Presently, about 2 percent of the Refuge is covered by developed land. These include: roads and adjacent rights-of-way, and industrial, administrative, and recreational facilities.

3.3.9 Invasive Species

Three categories of undesirable species (invasive, exotic, noxious) are found on the Refuge.

Invasive species are alien species whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Executive Order 13112 requires the Refuge to monitor, prevent, and control the presence of invasive species.

Exotic species are species that are not native to a particular ecosystem. Service policy directs the Refuge to try to maintain habitats free of exotic species.

Table 7: Principal Weed Species in Agricultural Fields, Crab Orchard NWR

Common Name	Scientific Name
crab grass	*Digitaria sp.*
fall panicum grass	*Panicum sp.*
foxtail grass	*Setaria sp.*
cocklebur	*Xanthium strumarium*
smartweed	*Polygonum sp.*
shattercane	*Sorghum bicolor*
ragweed	*Ambrosia sp.*
pigweed	*Amaranthus sp.*
lamb's quarters	*Chenopodium album*
trumpet-creeper	*Campsis radicans*
morning-glory	*Ipomoea sp.*
nutsedge	*Cyperus esculentus*

Noxious weeds are designated by the U.S. Department of Agriculture or the Illinois Department of Agriculture as species which, when established, are destructive, competitive or difficult to control. Principal weed species are shown in Table 7.

Invasive, exotic and noxious weed species are relatively abundant on the Refuge. These species are quite diverse and are found in most Refuge habitats, although some are typically found in agricultural fields or lakes and ponds. Johnsongrass, Canada thistle and giant ragweed are Illinois state-listed noxious weeds that occur on the Refuge. Currently, most Refuge control efforts focus on Johnsongrass, autumn olive, kudzu, garlic mustard and common reed. The principal invasive and exotic species on Crab Orchard NWR are shown in Table 8.

Exotic and invasive plant species pose one of the greatest threats to the maintenance and restoration of the diverse habitats found on the Refuge. They threaten biological diversity by causing population declines of native species and by altering key ecosystem processes like hydrology, nitrogen fixation, and fire regimes. Left unchecked, these plants have come to dominate many areas on the Refuge and reduced the value of the land as wildlife habitat. There is a bountiful seed source of many of these exotic/invasive species on the lands surrounding the Refuge, thus in order to be effective in our management plans, we must bring together a complex set of interests including private landowner, commercial, and public agencies.

Table 8: Principal Invasive and Exotic Species, Crab Orchard NWR

Common Name	Scientific Name
autumn olive	*Elaeagnus umbellata*
multiflora rose	*Rosa multiflora*
kudzu	*Pueraria montana*
purple loosestrife	*Lythrum salicaria*
common reed	*Phragmites australis*
Johnsongrass	*Sorghum halepense*
reed canary grass	*Phalaris arundinacea*
fescue grass	*Festuca pratensis*
tall fescue	*Festuca arundinacea*
garlic mustard	*Alliaria petiolata*
Japanese honeysuckle	*Lonicera japonica*
Amur honeysuckle	*Lonicera maackii*
Oriental bittersweet	*Celastrus orbiculatus*
Canada thistle	*Cirsium arvense*
bull thistle	*Cirsium vulgare lanceolatum*
black-locust	*Robinia pseudoacacia*
white poplar	*Populus alba*
mimosa	*Albizia julibrissin*
tree-of-heaven	*Ailanthus altissima*
wintercreeper	*Euonymus fortunei*
Chinese yam	*Dioscorea oppositifolia*
crown vetch	*Coronilla varia*
white sweet clover	*Melilotus alba*
yellow sweet clover	*Melilotus officinalis*
sericea lespedeza	*Lespedeza cuneata*
bush clover	*Lespedeza bicolor*
Japanese stiltgrass	*Microstegium vimineum*
dodder	*Cuscuta spp.*
shortleaf pine	*Pinus echinata*
loblolly pine	*Pinus taeda*
Virginia pine	*Pinus virginiana*
ponderosa pine	*Pinus ponderosa*
coontail	*Ceratophyllum demersum (aquatic)*
Eurasian watermilfoil	*Myriophyllum spicatum (aquatic)*
common teasel	*Dipsacus fullonum*
cut-leaved teasel	*Dipsacus laciniatus*

Prescribed burn on a national wildlife refuge, Bernie Angus

3.3.10 Natural and Current Role of Fire

Prior to European settlement, fire assuredly was an influence on the structure and function of the small patches of prairie and savannah in the area that is now the Refuge. Fire was less of a factor in open forests, and even less in closed forests. Now, the natural process of fire has been replaced by fire management that includes suppression and prescribed burning.

We have fire records for the Refuge from 1947 to the present, but information prior to 1986 is incomplete. Records indicate that the area has an average of 2.3 wildland fires annually, with a total of 127 wildland fires recorded from 1947 to 2001. Fires are most likely to occur in the spring from March 1 to May 15 and in the fall from October 15 to December 1.

We use prescribed fire to manipulate vegetation in a safe and cost-effective manner. Our principal purpose is to improve the wildlife habitat conditions in the southern pine plantations. Prescribed burning also reduces hazardous fuels, encourages oak and hickory and discourages sugar maple. Burning improves the condition of the understory. And, although burning is not specifically undertaken for these purposes, burning enhances the aesthetics of the forest by making the understory more open and improves access for both habitat management and recreation.

Southern pine plantations are burned to reduce fuels on the forest floor and to keep understory low to better provide for wildlife. By burning, we keep the understory vegetation in a young, vigorous condition, increasing seeds and fruit that are available to wildlife near the ground. As a result of fire, more light reaches the ground, which favors less shade-tolerant species. We conduct inventories to determine if there are enough young hardwoods in the understory of pine stands to permit succession to a native hardwood forest. If succession is likely, we will terminate prescribed burning.

Areas identified as "fallow herbaceous fields" (Figure 20, page 97) are old fields that have been invaded by low, woody vegetation and vines. If we want to maintain these lands in an early seral stage, fire helps maintain the openings and habitat diversity. Burning also enhances conditions for deer and upland game hunting and wildlife observation and photography.

Fire is essential for proper management of native, warm-season grasses and associated forbs. Prescribed fire stimulates growth of the grasses, increases seed germination and growth of forbs, creates open ground for wildlife, retards encroachment of woody vegetation, and reduces the fuel load. Tallgrass prairie has been established on several areas on the Refuge. Fire will play a significant role in maintaining this habitat type, which benefits prairie bird species.

3.4 Wildlife

Information on wildlife in the area before European settlement is limited. We do know that some mammals that were in the area are no longer found in Illinois (Hoffmeister 1989): bison (*Bison bison*), elk (*Cervus elaphus*), black bear (*Ursus americanus*), and mountain lion (*Felis concolor*). The Passenger Pigeon (*Ectopistes migratorius*) and Carolina Parakeet (*Conuropsis carolinensis*) inhabited the area but are now extinct. The Greater Prairie Chicken (*Tympanuchus cupido*) has a greatly reduced range (Bohlen 1989). We know little about how amphibians, reptiles, and invertebrates in the area may have changed through the years.

The Refuge provides habitat for many species that occur in Illinois (Table 9). See Appendix D for a complete list of wildlife species known to inhabit the Refuge.

3.4.1 Mammals

Forty-three species of mammals have been recorded in or near the Refuge (Appendix D). White-tailed deer, Virginia opossum, raccoon, rabbits, squirrels, beaver, and coyote are commonly observed species on the Refuge.

Table 9: Number of Wildlife Species Found in Illinois and at Crab Orchard NWR

Taxonomic Group	Number of Species Found in Illinois	Number of Species Found at Crab Orchard NWR	Percent of Illinois Species Found at Crab Orchard NWR
Amphibians	41	22	54
Reptiles	61	28	46
Mammals	62	43	69
Birds	327	269	82
Terrestrial Vertebrates	491	362	74

White-tailed deer numbers on the Refuge have shown a pattern similar to the rest of Illinois. By the early 1900s, deer had either been extirpated from the Refuge, or occurred in very low numbers. Refuge records mention a release of deer in 1942, but no numbers are provided. The number of deer on the Refuge is estimated at 10 in 1947, 30 in 1949 and 70 in 1950. By 1953, deer were no longer an oddity on the Refuge. The population increased and attained such high levels that deer damage to crops and forest began to become an issue in the early 1960s. The first Refuge deer hunt in the restricted use area occurred in 1966. The average annual harvest in the restricted use area since then has been about 600 per year.

3.4.2 Birds

Two-hundred sixty-nine species of birds have been recorded in or near the Refuge (Appendix D). Herons, Canada goose and other waterfowl, raptors, wild turkey, and songbirds are commonly observed species on the Refuge.

Canada Goose

Prior to European settlement, Canada geese probably rarely used the Refuge area. The Refuge was dominated by forest (more than 90 percent) and had little habitat to attract geese. Refuge records indicate that there were only about 2,200 Canada geese on the Refuge in 1947. Establishing a large, wintering population was a Refuge priority. Refuge staff kept pinioned or penned geese as a decoy flock to attract migrating geese and emphasized production of corn and other grains in the Refuge farm program to provide food for wintering geese. The response by Canada geese was relatively quick; in 1948 the peak count on the Refuge was 24,000 and peak counts generally increased through the middle 1990s (Figure 22). The average peak count (1947-2001) is 82,000.

Overall, Canada goose use of the Refuge, as measured in goose-use-days, has been more variable and shows less of a trend than peak counts (Figure 23). The average (1952-2002) has been 5.4 million goose-use-days. The Refuge goal is to provide food for 6.4 million goose-use-days each year.

Since the Refuge was created in 1947, attracting and providing food for migratory Canada Geese has been a primary focus of activities on the Refuge. Early efforts to attract geese included maintaining a captive flock of pinioned geese, increasing the production of desirable agricultural crops, and, sometimes, directly feeding geese by placing large quantities of grain in open areas of the Refuge. Current efforts to supply food for geese emphasize providing sufficient quantities of diverse food-producing habitats. Much of this food is provided by the Refuge agriculture program. Row crops provide corn, winter wheat, and clover. Hay fields and pastures provide grasses and legumes. Food is also provided in natural wetlands, managed moist soil wetlands, lakes and ponds, and miscellaneous sites such as mowed industrial areas and rights-of-way. Other goose management activities include seasonal closure to boating on the east end of Crab Orchard Lake and fall mowing around selected ponds.

In 1998, Service and Illinois DNR biologists completed a report that set a specific Refuge goal of providing food for 6.4 million goose-use days annually. This goal was derived using over 40 years of Refuge Canada Goose data (unpublished Crab Orchard NWR report, 1998). This report also calculated that the minimum amount of agricultural row crops required topotentially provide for 6.4 million GUDs is 1,500 acres, but this requires several critical assumptions. These assumptions are: 1) geese have unrestricted use of all fields, 2) average crop yields, 3) average winter temperatures, 4) average snow fall, and 5) crops are not consumed by other animals. In practice, we know these assumptions are not met

Figure 22: Peak Counts of Wintering Canada Geese on Crab Orchard NWR, 1947 to 2001

Figure 23: Canada Goose-use Days on Crab Orchard NWR, 1952 to 1999

and goose food availability is influenced by the following factors: 1) geese do not use some fields because they are too small to fly into or they are in the portion of the Refuge open to the public and disturbance levels are higher, 2) crop yields can vary substantially (winter wheat production was low in fall 2001 because of late and wet planting conditions, corn and clover production in 2002 was low because of drought conditions, etc.), 3) lower than average winter temperatures result in greater calorie demand by Canada Geese, 4) some crops are unavailable because of occasionally heavy snow cover, and 5) other animals (deer, raccoons, blackbirds, etc.) also consume crops. In order to compensate for factors that regularly decrease food availability (ex., consumption by other species and non-use of certain fields) and factors that occasionally decrease food availability (ex., low crop production due to drought, deep snow conditions) more than 1,500 acres of crops are required. For example, if each of these five factors reduced food availability by just 10 percent, over 2,500 acres of row crops would be required to provide 6.4 million goose-use-days. However, we know that in some instances these factors can cause larger reductions. For example, in 2002 corn production was reduced by 50 percent or more.

Wild Turkey

Wild turkeys were not known to occur on the Refuge until 122 were released by the Illinois Department of Conservation in 1958. Occasional turkey

Table 10: Nongame Species of Management Concern, Crab Orchard NWR

Common Name	Scientific Name
Common Loon	*Gavia immer*
Northern Harrier	*Circus cyaneus*
Red-shouldered Hawk	*Buteo lineatus*
Greater Yellowlegs	*Tringa flavipes*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Chuck-will's-widow	*Caprimulgus carolinensis*
Whip-poor-will	*Caprimulgus vociferus*
Red-headed Woodpecker	*Melanerpes erythrocepalus*
Northern Flicker	*Colaptes auratus*
Acadian Flycatcher	*Empidonax virescens*
Loggerhead Shrike	*Lanius ludovicianus*
Bell's Vireo	*Vireo belli*
Wood Thrush	*Hylocichla mustelina*
Blue-winged Warbler	*Vermivora pinus*
Prairie Warbler	*Dendroica discolor*
Prothonotary Warbler	*Protonotaria citrea*
Worm-eating Warbler	*Helmitheros vermivorus*
Louisiana Waterthrush	*Seiurus motacilla*
Kentucky Warbler	*Oporomis formosus*
Field Sparrow	*Spizella pusilla*
Grasshopper Sparrow	*Ammordramus savannarum*
Dickcissel	*Spiza americana*
Eastern Meadowlark	*Sturnella neglecta*
Orchard Oriole	*Icterus spurius*

sightings were made on the Refuge through 1965. In 1966, Refuge records estimate a population of seven wild turkeys and state that several observations were made during the year. Wild turkey numbers continued to increase enough that by 1989, the Illinois DNR trapped 14 hen turkeys for stocking off the Refuge. The Refuge held its first wild turkey hunting season in the restricted use area in the spring of 2001, when 39 wild turkeys were harvested by 52 hunters.

USFWS Nongame Bird Species of Management Concern

The Fish and Wildlife Conservation Act, 1980, requires that the Service identify "all migratory nongame birds that, without additional conservation action, are likely to become candidates for listing under the Endangered Species Act of 1973." Additionally, the Act further underscores the need to develop actions to assure the conservation of these species with the underlying philosophy that "an ounce of prevention is worth a pound of cure." Species of management concern in Region 3 have been identified in a Resource Conservation Priorities report (USFWS 2002). Nongame species of management concern known to regularly occur on the Refuge are shown in Table 10.

3.4.3 Amphibians and Reptiles

Twenty species of amphibians and 28 species of reptiles have been recorded on the Refuge (Appendix D). Cricket frog, Fowler's toad, bullfrog, painted turtle, eastern box turtle, racer, and diamondback water snake are commonly observed species on the Refuge.

3.4.4 Fish[1]

Prior to dam construction, fish habitat in the area consisted primarily of the larger, named streams. No fish community survey data from streams from before dam construction exists, and only one cursory survey has been completed since. Over the last 50-60 years, most fish habitat has been provided by the three large lakes and eight smaller impoundments. Fish management on the Refuge has emphasized mixed-species, warm-water sport fish. Since 1998, the fisheries on the Refuge have been managed cooperatively by IDNR and the Refuge. Table 11 lists fish species found in Crab Orchard Lake.

3.4.4.1. Crab Orchard Lake

The fish community of Crab Orchard Lake is dominated by carp and gizzard shad, which comprise 75 percent of the biomass. However, a popular recreational fishery exists for largemouth bass, bluegill, crappie, channel catfish and white bass. The Lake's aquatic habitat has been affected by shoreline erosion, sedimentation, excessive nutrient loading from discharges of municipal wastewater and nonpoint source pollution, and contamination by PCBs and other contaminants. Sediments contaminated by PCBs were dredged from a bay of the lake in 1996.

1. *Information for this section comes primarily from: 1) Refuge records; 2) IDNR records and 3) an unpublished report by the Carterville Fisheries Resource Office (Surprenant 1994).*

Table 11: Crab Orchard NWR Fish Species List

Common Name	Scientific Name	Common Name	Scientific Name
Bowfin		**Poeciliidae**	
Bowfin	*Amia calva* (N)	Mosquitofish	*Gambusia affinis*
Herrings		**Pikes**	
Gizzard shad	*Dorosoma cepedianum* (N)	Grass pickerel	*Esox americanus* (N)
Threadfin shad	*D. petenense* (I)*	Northern pike	*E. lucius* (I)
Minnows		**Silversides**	
Carp	*Cyprinus carpio* (I)	Brook silversides	*Labidesthes sicculus* (N)
Bluntnose minnow	*Pimephales notatus* (N)	**Sunfishes**	
Fathead minnow	*P. promelas*	Largemouth bass	*Micropterus salmoides* (N)
Golden shiner	*Notemigonus crysoleucas* (N)	Green sunfish	*Lepomis cyanellus* (N)
Suckers		Warmouth	*Chaenobryttus. gulosus* (N)
Bigmouth buffalo	*Ictiobus cyprinellus* (N)	Orangespotted sunfish	*L. humilus* (N)
Perches		Redear sunfish	*L. microlophus* (N)
Yellow perch	*Perca flavescens* (I)	Bluegill	*L. macrochirus* (N)
Log perch	*Percina caprodes* (N)	White crappie	*Pomoxis annularis* (N)
Slough darter	*Etheostoma gracile*	Black crappie	*P. nigromaculatus* (N)
Killifishes		Flier	*Centrarchus macropterus* (N)
Blackstripe topminnow		**Sea basses**	
Catfishes		White bass	*Morone chrysops* (N)
Black bullhead	*Ameiurus melas* (N)	Yellow bass	*M. mississippiensis* (N)
Yellow bullhead	*A. natalis* (N)	Striped bass	*M. saxatilis* (I)
Channel catfish	*I. punctatus* (N)	Hybrid striped bass	*M. chrysops X M. saxatilis* (I)
Flathead catfish	*Pylodictus olivaris* (N)	**Aphredoderidae**	
Tadpole madtom	*Noturus gyrinus* (N)	Pirate perch	*Aphredoderus sayanus*
Drums		* Periodically stocked (I) introduced species (N) native species	
Freshwater drum	*Aplodinotus grunniens* (N)		

The fish management goals for Crab Orchard Lake are to:

maintain and/or improve the existing bluegill and redear fisheries,
maintain and/or improve the existing largemouth bass fishery,
maintain the existing channel catfish fishery,
maintain the existing white bass and hybrid striped bass fishery,
maintain the existing white and black crappie fishery, and
monitor PCB concentrations in fish flesh.

Species abundance and body condition, which are monitored by annual surveys, determine population objectives for bluegill, redear, largemouth bass, black and white crappie, white and hybrid striped bass, and channel catfish.

Although initial stocking records are not available, if USDA Soil Conservation Service recommendations were followed, largemouth bass, bluegill, channel catfish, and bullheads were stocked. Other species now occurring were present in the watershed or have since been introduced. Following the pattern of large impoundments in the 1940s and 1950s, the largemouth bass fishery flourished initially then declined through the late 1940s as carp, gizzard shad, white crappie and yellow bass became dominant. Supplemental stocking of game species

began with 1.5 million largemouth bass 2-inch fingerlings in the 1950s. Since then, millions of fry and fingerlings of several species have been released into Crab Orchard Lake.

Commercial fishing was permitted on Crab Orchard Lake during the 1960s and 1970s and discontinued in 1979. There are no plans to resume commercial fishing on Crab Orchard Lake.

Contaminant levels in Crab Orchard Lake fish have been studied by the Illinois Environmental Protection Agency, Fish and Wildlife Service and Illinois Department of Natural Resources since 1975. PCBs in fish flesh have exceeded FDA safety levels, especially in fish east of Route 148 (Hite and King 1977, Ruelle 1983, Kohler and Heidinger 1990, Kohler and Heidinger 1994).

Based on analysis of PCB data, the first fish consumption advisory was issued in 1988. People were advised that certain fish had high contamination and should not be eaten. This advisory applied to channel catfish longer than 15 inches and to carp longer than 15 inches caught east of Route 148. People were advised that bluegill and largemouth bass caught east of Route 148 had moderate contamination and should not be eaten by children and nursing mothers. This advisory has since been modified and covers largemouth bass, channel catfish, and carp. Consumption advisory information is published annually by IDNR in the Illinois Fishing Information booklet.

3.4.4.2. Devils Kitchen Lake

Devils Kitchen Lake is most commonly used for sport fishing and is known for its quality-sized bluegill and redear, occasional trophy bass, and year-round rainbow trout. The fish management goals for Devils Kitchen Lake are to: 1) maintain and/or improve the existing bluegill and redear fisheries, 2) maintain and/or improve the existing largemouth bass fishery, and 3) maintain the existing rainbow trout fishery through annual stockings.

The forage base at Devils Kitchen Lake is augmented with annual stockings of threadfin shad, if available. Population objectives for bluegill, redear, and largemouth bass are based on species abundance and body condition, which are monitored by annual surveys. Low lake fertility results in minimal plankton blooms and limited food for fish leading to lower fish numbers and growth rates. In 2004, the Illinois Department of Public Health issued a fish consumption advisory for largemouth bass caught in Devils Kitchen Lake because of elevated levels of methyl mercury.

Table 12: Small Fishing Ponds on Crab Orchard NWR

Name	Surface Area (Acres)	Shoreline Length (miles)
A-41 Pond	37	2.0
Bluegill Pond	6	0.6
Blue Heron Pond	10	0.6
Honker's Corner Pond	6	0.5
Mann's Pond	9	0.7
Manager's Pond	2	0.3
North Prairie Pond	6	0.6
Visitor's Center Pond	40	2.3

3.4.4.3. Little Grassy Lake

Little Grassy Lake is most commonly used for sport fishing and is known for quality-sized bluegill, redear, and largemouth bass. The fish management goals for Little Grassy Lake are to: 1) maintain and/or improve the existing bluegill and redear fisheries, 2) maintain and/or improve the existing largemouth bass fishery, and 3) maintain the existing channel catfish fishery through annual stockings.

The forage base at Little Grassy Lake is augmented with annual stockings of threadfin shad, when available. Population objectives for bluegill, redear, and largemouth bass are based on species abundance and body condition, which are monitored by annual surveys. Like Devils Kitchen Lake, low fertility limits fish management. Light plankton blooms and limited food leads to lower fish numbers and growth rates.

3.4.4.4. Small Impoundments

Sport fisheries management also occurs on eight small impoundments (Table 12). The IDNR attempts to control algae blooms in some of the smaller impoundments. Two ponds were treated in 1999 and 2001 with an aquatic herbicide. These impoundments are managed for warm-water, mixed species sport fisheries.

3.4.5 Monitoring

Refuge staff, staff from the IDNR, and volunteers survey wildlife use. The surveys provide information for Refuge management and support state and national conservation efforts. The following paragraphs describe current monitoring programs.

Canada Goose Surveys: Aerial surveys of Canada Geese are conducted by the IDNR, generally from mid-October to mid-March. The data are used to estimate goose-use-days. Refuge biologists also conduct an informal survey of goose use of agricultural fields.

Weekly Waterfowl Survey: Refuge biologists survey waterfowl weekly from mid-August through mid-April, traveling over 70 miles and covering 50 points to view large areas of Crab Orchard Lake and several smaller impoundments and moist-soil units. Survey data are entered into a database, which can produce 16 types of reports. Gulls, shore, wading, and predacious birds are also counted throughout the route. Goose collar observations are also recorded and reported to the Office of Migratory Bird Management.

Bald Eagle Monitoring: Biologists monitor Bald Eagle nests for use and productivity. As part of a nation-wide effort, the Refuge has participated in the mid-winter Bald Eagle survey since 1961.

Heron Rookeries: Biologists periodically check the known heron rookeries for use and productivity.

Wild Turkeys: Biologists monitor wild turkeys to keep track of their population. The data are used in establishing harvest permits.

Bluebirds: Since 1992, a group of volunteers has maintained and monitored bluebird boxes. In 2000, nine volunteers monitored 220 boxes.

Christmas Bird Count: The Refuge participates in the Christmas Bird Count, a national survey organized by the National Audubon Society.

Spring Bird Count: The Refuge participates in the Spring Bird Count, another national survey organized by the National Audubon Society.

Mourning Dove Count: The Mourning Dove Count is conducted off the Refuge as part of a nation-wide survey coordinated by the Office of Migratory Bird Management. The survey has been conducted every year since 1964.

American Woodcock Singing Ground Survey: The North American Woodcock Singing Ground Survey is a cooperative effort conducted on and off the Refuge in conjunction with the Office of Migratory Bird Management.

White-tailed Deer: The Refuge uses a fall deer count to establish a deer population index. The population index is used, in turn, to determine the number of available hunting permits. A 20-mile survey route was developed by Southern Illinois University in 1966 and the Refuge has conducted the survey every year since then.

Indiana Bat Surveys: The Indiana bat is a federally listed endangered species. Biologists have conducted limited mist-netting to determine if and where the Indiana bat might be using the Refuge.

Amphibian Surveys: Biologists have used a variety of techniques (searching, song counts and drift fences) to determine what species of amphibians, and to a lesser extent reptiles, inhabit the Refuge. In a one-time effort, biologists surveyed for deformed frogs as part of a nation-wide cooperative effort. In an effort to evaluate certain CERCLA sites, surveys for the absence or presence of amphibians and deformed frogs are ongoing.

Gypsy Moth: The Refuge cooperates with the U.S. Forest Service by installing gypsy moth traps each summer as part of a nation-wide effort to monitor this pest's distribution and population.

Exotic and Invasive Plants: Biologists informally monitor exotic and invasive plants. Some of the species monitored are autumn-olive, Johnsongrass, common reed, purple loosestrife, Canada thistle, musk thistle, kudzu, and reed canary grass.

Forest Watch: Forest Watch is a volunteer cooperative effort organized by the Illinois DNR. Volunteers conduct biological monitoring in order to identify long-term changes in the health of forest ecosystems. Two permanent monitoring plots are located on the Refuge.

River Watch: River Watch, like Forest Watch, is a volunteer cooperative effort organized by the Illinois Department of Natural Resources. Each spring

Barn Owl, U.S. Fish & Wildlife Service

Figure 24: Bald Eagle Winter Survey Counts on Crab Orchard NWR, 1993-2002

Figure 25: Bald Eagle Fledgling Counts on Crab Orchard NWR, 1993-2000

citizen scientists evaluate two streams on the Refuge. The data and results are reported to the state for an evaluation of stream quality.

Fish Surveys: Refuge fish management is conducted by IDNR in conjunction with the Service's Carterville Fishery Resource Office. The IDNR uses electrofishing on the lakes and several of the smaller ponds each year to determine population diversity, structure and overall health. The IDNR also collects fish for contaminant analysis as dictated by the State fish consumption advisory group and studies delayed bass mortality associated with fishing tournaments as appropriate. Creel surveys were conducted in 1976, 1978 and 2000.

Lotus Surveys: The American lotus (Nelumbo lutea) that grows in Grassy Bay is in apparent decline and is being studied. The IDNR has done some seeding and planting in the bay. The Refuge is monitoring several new patches of lotus in Crab Orchard Lake east of Route 148.

Shoreline Surveys: Shoreline and island erosion has been shown to be a contributor of sediment to the lakes, especially Crab Orchard Lake. Over the years various surveys and control efforts have been tried. The last effort was in 2001.

3.5 Federal Threatened and Endangered Species

3.5.1 Mammals

The endangered Indiana bat (*Myotis sodalis*) is not known to occur on the Refuge, but it has been observed in areas nearby. In winter, Indiana bats hibernate in caves and mines. There are no known caves or mines on the Refuge, but Indiana bats are known to hibernate in caves in Jackson County adjacent to the Refuge. Summer maternity roosts and colonies are found in well-developed riparian woods and upland forests.

The first surveys for Indiana bats on the Refuge occurred in 1989. During two nights of netting, none were captured. However, Illinois DNR biologists thought that some of the Refuge habitat looked suitable. There have been several attempts to capture Indiana bats on the Refuge to determine if the species is present. A 1999 survey was unsuccessful in capturing any Indiana bats.

3.5.2 Birds

The Bald Eagle (*Haliaeetus leucocephalus*) occurs as a winter migrant and a summer breeder on the Refuge (Figure 24). The Bald Eagle is currently listed as a threatened species that has been proposed to be delisted. Bald Eagles are probably much more common in the area than they were before construction of Crab Orchard Lake in 1940. The Refuge estimated 10-14 wintering birds in 1961. The history of eagles nesting can be summarized as: 1974-construction of the first nest; 1979-the first nesting attempt; 1980-first nestling; 1981-first fledglings. Generally, each year 10 to 30 bald eagles winter on the Refuge; there are two or three active nests and two to six fledglings (Figure 25).

3.5.3 Plants

There are no known federally listed threatened or endangered plants on the Refuge.

3.6 Public Use Resources and Trends

Swimming, boating, picnicking, dog field trials, camping, hunting and fishing were a part of the Crab Orchard Creek Project before the establishment of Crab Orchard National Wildlife Refuge. When Congress transferred the lands to the Department of the Interior, they directed the Secretary to classify the lands for the most beneficial use. Subsequently, the Secretary designated Area I and Area III of the Refuge for recreational use, including hunting, fishing, picnicking, boating, swimming and similar activities. In Area III group recreation and camps were to take precedence over other public uses. Area II was classified as "closed refuge." (Figure 26)

When the Department of the Interior assumed management of the lands, Area I was under a single concession permit issued by the Soil Conservation Service. The concessionaire operated two government owned bathing beaches, a boat docking concession (Playport) and a skeet and trap facility. The Crab Orchard Boat & Yacht Club, an incorporated group of individuals, leased property and paid concession royalties to the main concessionaire.

In 1956, the Refuge reached a milestone of 1 million annual visitors. Nine years later visitation surpassed 2 million annual visits. Visitation fell as additional State and federal recreational areas were constructed in Southern Illinois. Today the annual visitation averages 1 million.

A wide spectrum of recreational activities continues to occur on and around Crab Orchard, Devils Kitchen and Little Grassy lakes. The activities include boating, water-skiing, swimming, camping, picnicking, hunting, fishing, wildlife observation, environmental education, environmental interpretation, horseback riding, and photography. Public use facilities include campgrounds, marinas, boat ramps, fishing piers, beaches, picnic areas, hiking trails, auto tour, visitor center, environmental education complex, observation decks, and photo blinds.

3.6.1 Hunting

Several species of small game, big game, and migratory waterfowl are hunted on the Refuge. Federal and State hunting regulations apply. Recreational trapping requires a special use permit. Refuge records show only a few trappers setting traps on the Refuge in the last few years.

Most hunting occurs outside the restricted use area. The public use area of the Refuge makes up approximately 23,000 acres and is open to all hunting activities in accordance with State hunting seasons. Hunting includes muzzleloader, archery, shotgun and pistol deer hunting, waterfowl hunting, archery and shotgun wild turkey hunting, small game hunting (rabbit, squirrel, quail, and woodchuck), game bird hunting (dove, woodcock, snipe and crow) and furbearer hunting (raccoon, opossum, fox and coyote).

A controlled white-tailed deer and wild turkey hunt occur in the restricted use area. Other hunting programs include controlled goose hunting, youth deer hunting and deer hunting for people with physical disabilities. Hunting is prohibited in zones around the youth camps on Little Grassy Lake and industrial areas in the restricted use area.

Restricted Use Area Deer Hunt: Since 1973, white-tailed deer hunting in the restricted use area has been an important management tool and a popular recreational activity. The Refuge conducts two hunts that coincide with State seasons. Five hundred permits are issued each season for a total of 1,000 permits.

From 1973 through 1994, hunters could take either sex of deer. They were encouraged to take antlerless deer with the intent of keeping the Refuge's deer population strong and healthy by limiting the herd size and balancing the sex ratio. However,

Marion Boat Club, 1945

Figure 26: 1948 Area Designations, Crab Orchard NWR

the Refuge did not achieve this goal. Therefore, in 1995, the first gun deer hunting season was designated antlerless only.

Restricted Use Area Spring Wild Turkey Hunt: In the spring of 2001, the Refuge implemented a spring turkey hunt in the Restricted Use Area. The Refuge requested 15 State-issued permits for each of four seasons for a total of 60 permits. When the State went to five seasons in 2002, the Refuge chose to keep the same total number of permits (60) so 12 permits were issued for each season. The State also added a youth season, so 12 additional Restricted Use Area permits were added in 2002. A total of 72 permits are currently offered. The public use area portion of the Refuge is open to all turkey hunters who have an appropriate permit from the State. This can result in hunter competition for prime hunting areas and lower success rates. The Refuge goal for the Restricted Use Area hunt has been to offer an experience that focuses on lower numbers of hunters and higher success rates. Hunter success rates in the Restricted Use Area during 2001-2004 have been 75 percent, 43 percent, 52 percent, and 35 percent, respectively. The State-wide hunter success rate is about 20 percent.

Controlled Goose Hunting: The area for this hunt is within the portion of the Refuge open to public hunting. The controlled goose hunting areas, contain 18 land blinds and 15 water blinds. Two of the blinds are accessible to people with disabilities and can be reserved daily.

Youth and Disabled Persons Deer Hunt: In 1991, volunteers constructed blinds and implemented the hunts, which have been very successful. The hunts coincide with the first shotgun deer hunt season. The Refuge reserves permits for 25 disabled hunters and 25 youth hunters and a portion of the Restricted Use Area is designated for these hunts. Hunters are required to have an aide or adult with them in the field.

3.6.2 Fishing

Fishing is one of the more popular visitor pastimes on the Refuge. Crab Orchard, Little Grassy and Devils Kitchen Lakes are available for fishing year-round with one exception. The eastern portion of Crab Orchard Lake is closed to boating from October 1 to March 14 to provide resting area for wintering waterfowl. The main species of fish sought by the anglers are largemouth bass, crappie, bluegill and channel catfish.

There are several bank fishing areas on the Refuge (see Figure 27). Although there are many other good fishing areas, the areas described in the following paragraphs receive the highest visitation and the most noticeable resource impacts.

Visitor's Pond is a popular fishing site on the Refuge. It is located in the restricted use area behind the visitor information center. The pond is open from March 15 to September 30. A universally accessible asphalt trail leading to a fishing pier allows easy access to the pond.

Wolf Creek Recreation Area consists of a causeway and a peninsula where pan fishing is popular year-round. There are two gravel parking areas, a restroom, fish attractors, and six accessible fishing platforms along the causeway. Picnic tables and benches are provided for day use.

Blue Heron Pond is located in the restricted use area. The pond is open from March 15 to September 30. Because it is out of the way, the pond receives far fewer visits than other ponds in the restricted use area.

A-41 Pond is located in the restricted use area. People walk from a gravel parking area approximately one-half mile to the pond. The pond is open from March 15 to September 30. The opening coincides with cattle pasturing in the same area.

Manager's Pond is accessible from Old Route 13 near Carterville. The pond receives light use, possibly due to the scarcity of parking facilities and the heavy algae growth covering the pond during most of the summer.

Honker's Corner Pond is located on Old Route 13 approximately 1 mile west of Route 148. There is ample roadside parking. The pond is used consistently in early spring, but slows as algae growth covers the pond during most of the summer months.

Route 148 North is located on the northeast end of the Route 148 causeway. There is a large gravel parking lot and kiosk. The area receives moderate use from spring to fall. Mostly anglers fish for pan fish and channel catfish in Crab Orchard Lake.

Route 148 South is located on the southeast end of the Route 148 causeway. There is a small gravel parking lot. The area usually has one or more cars in the parking lot during fishing season.

Cambria Neck Area is located on a peninsula off Cambria Road. The area is used by anglers often during the height of fishing season. There are picnic

Figure 27: Bank Fishing Sites on Crab Orchard NWR

facilities, a restroom, a parking lot and a grassy recreation area. The area is visible from New Route 13, which may account for a lot of first-time visitors.

Ann Manns Pond is located on Spillway Road, 2 miles south of the Crab Orchard Lake Dam. Bank fishing and fishing from non-motorized boats is permitted year around. There is a small parking area.

Bluegill Pond is located along the southern boundary of the Restricted Use Area. People walk from a gravel parking area approximately one-half mile to the pond. The pond is open from March 15 to September 30. The opening coincides with cattle pasturing in the same area.

Fishing Tournaments

Five fishing tournaments are held annually on the Refuge's three lakes under special use permits. The tournaments are well established and require minimal assistance from Refuge staff, although the Refuge's law enforcement staff and Illinois DNR officers do run spot checks during the tournaments. Approximately 500 anglers participate in these events. Anglers and biologists have expressed concern over the lack of vegetation for spawning bass and, with respect to tournaments, to post-release mortality.

Fish-Offs

The three major lakes receive many visits from fishing clubs hosting club events called "fish-offs." A fish-off is defined as an organized club fishing event of 20 boats or fewer. The Refuge registered over 130 fish-offs in 2001 and more occur without being registered. The Refuge recently instituted new rules restricting fish-offs to one per club, per lake, per year. All fish caught must be returned to the lake and aerated live wells are required for all boats.

3.6.3 Camping

At one time camping was allowed throughout open areas of the Refuge. Because of litter and trash problems, camping was restricted to a concession-operated campground on each of the three major lakes. Campground locations are shown in Figure 1 on page 2.

Crab Orchard Campground began operation in 1964 under a concession contract. In 1969, the Refuge assumed operation of the campground and upgraded electric service, restrooms and showers. The campground returned to a concession contract in 1972.

Today Crab Orchard Campground is the largest of the four campgrounds with 250 electric and non-electric sites. Restroom and shower facilities are located on each of the six loops. In addition, there is a fish cleaning area, a store and a swimming beach. The campground is open from April 1 through October 31. With management approval, campsites may be made available during the off-season. There is no limit on campground stays.

Little Grassy Campground is a concession-operated campground and marina that has 130 electric and non-electric campsites. There is a restroom and shower facility. A store offers bait, food items and boat rental. The campground is open from April 1 through October 31 with limited campsites available during the off season.

Devils Kitchen Campground is a concession-operated campground and marina that has 45 electric and non-electric campsites. The campsites are tiered, because they are located on a steep hill. There is a restroom and shower facility. A store offers bait, food items and boat rental. The campground is open from April 1 through October 31 with limited campsites during the off season.

Crab Orchard Boat & Yacht Club, a private organization, operates a marina and a campground with 40 electric campsites under a lease contract. Membership is required to use any part the facility. Camping is permitted with an annual membership.

Figure 28 summarizes campground visits to the Refuge.

3.6.4 Wildlife Observation

Wildlife observation is the most popular activity occurring on the Refuge, and there are many good observation areas on the Refuge. Points of interest, trails, auto tours and viewing blinds have been developed in an effort to encourage and enhance wildlife viewing. Figure 29 identifies existing observation blinds and decks.

The Route 148 observation platform is located approximately 2 miles south of the Visitor Center. The platform has interpretive signs and offers a good view of an open field, but only adequate viewing of a pond area. There is a large, paved parking lot.

Wolf Creek Causeway is a very popular location when wintering waterfowl are present. The parking lot is used to view birds from automobiles.

Figure 28: Crab Orchard NWR Campground Visits Per Year

Waterfowl Display Pond is located on Wolf Creek Road about one-half mile north of the causeway. There is a roadside pull-off area from which visitors can view waterfowl at the 1-acre pond, which is about 100 yards west of the road.

Bald Eagle Lane is located off Spillway Road and offers a view of Grassy Bay and an occasional Bald Eagle sighting. There is a Bald Eagle's nest not too far from this site.

The Devils Kitchen Dam observation area offers good viewing of the lake. The area has a restroom, parking lot, picnic table, grassy area and trail leading to the bottom of the dam.

Devils Kitchen Line No. 11 offers a good view of the lake.

Little Grassy Lake Dam overlook offers an excellent view of the lake. The area has enough room for a few automobiles and is occasionally congested when anglers use it as a parking lot.

3.6.5 Hiking Trails

Hiking is permitted throughout the public use area of the Refuge. Refuge volunteers maintain seven trails that are open to the general public and one trail that is provided for educational purposes only. Numerous fire trails have served as hiking trails on the Refuge. The following is a list of maintained trails.

Harmony Trail: The trail is about 1 mile long and is a self-guided, non-interpretive trail. The trail has an A-frame structure with interpretive panels at the trailhead. The trail receives heavy use, especially during the spring and fall.

Prairie Trail: Located across from the Harmony Trail, this trail makes a circle through a 7-acre prairie restoration area. Currently the trail is used very little, because it is not well defined or interpreted.

Wild Turkey Trail: Located across from Devils Kitchen Line No. 12 on Tacoma Lake Road, the 2-mile trail zigzags through a pine plantation and continues along a ridge top, ending at a gravel parking lot on Grassy Road. The trail has been signed at the trailheads and throughout the trail.

Devils Kitchen Line No. 17: This loop trail is an asphalt road that has been closed to automobile traffic. It borders and offers access to the Crab Orchard Wilderness. There is a large, paved parking lot at the trailhead.

Visitor Center Trail: The trail is located next to the Visitor Center. The first quarter mile is universally accessible and has three benches and four interpretive signs. A new half-mile section completes the loop trail. The new section awaits an asphalt surface.

Homestead Trail: The gravel, 1-mile loop trail next to Refuge Headquarters is designed as an environmental education trail. It has an observation deck and a study platform.

Rocky Bluff Trail: The trail is the most popular trail on the Refuge. Located across from Devils Kitchen Line No. 11, the trail offers a magnificent view of the unglaciated part of the Refuge. The 1.5 mile loop trail crosses the Wild Turkey Trail at midpoint. During the spring, volunteers lead wildflower walks along the trail.

Figure 29: Observation Areas on Crab Orchard NWR

The National Trail System Act of 1968 (Public Law 90-543) authorized creation of a national trail system comprised of National Recreation Trails, National Scenic Trails and National Historic Trails. Legislation is pending in Congress to add National Discovery Trails as a new category of long-distance trails and designate the American Discovery Trail as the first National Discovery Trail. The proposed American Discovery Trail covers more than 6,000 miles from Delaware to California. The Southern Midwest Route of the American Discovery Trail crossing Illinois would overlay most of the River to River Trail, which runs about 146 miles from Battery Rock on the Ohio River to Grand Tower on the Mississippi River for a distance of about 176 miles (River to River Trail Society, 1995).

In late 1997, the Shawnee National Forest drafted a memorandum of understanding (MOU) between the Shawnee National Forest, the Refuge, and the River to River Trail Society to formalize maintenance responsibilities and alignment of the River to River Trail along a tentative route through the Crab Orchard Wilderness. The parties have not agreed to or signed the MOU.

3.6.6 Boating

Boating has long been a popular activity on the Refuge. When Crab Orchard Lake was completed in 1940, it was the largest man-made lake in Illinois. Crab Orchard Lake hosted professional outboard motor races in 1947. In 1953, the Southern Illinois Sailing Club moved from St. Louis to Crab Orchard Lake. Over the past 50 years boating on Crab Orchard Lake has changed with the times, from 25 hp outboards in the 1940s to jet skis and house boats today.

The Refuge offers boating on Crab Orchard, Devils Kitchen, and Little Grassy lakes. Crab Orchard Lake has 13 improved boat launching facilities; three ramps are provided on Devils Kitchen Lake; four are provided at Little Grassy Lake (see Figure 30). The lakes and boating facilities are described in the following paragraphs.

3.6.6.1. Crab Orchard Lake

Crab Orchard Lake is the largest of the three main lakes and covers approximately 7,000 acres. The area west of Wolf Creek Road is open all year and serves as a multi-recreation area for pleasure boating of all types (jet skis, house boats, runabouts, sail boats, and pontoons) and fishing. The area east of Wolf Creek Road is open March 15 to September 30. Thirteen boat ramps offer access to the lake.

Three marinas are operated on Crab Orchard Lake. The Refuge operates Playport Marina and the former Images Marina. Crab Orchard Boat & Yacht Club offers docks, slips, a picnic area and campsites to members only.

3.6.6.2. Devils Kitchen Lake

The smallest and most scenic of the three lakes, Devils Kitchen Lake covers approximately 800 acres. Care must be used when boating in the lake because numerous trees lie just under the water's surface. The lake is used for boating, canoeing, and fishing. Outboard motors on the lake are limited to 10 horsepower. There are three public boat ramps and one marina on the lake.

3.6.6.3. Little Grassy Lake

Little Grassy Lake covers approximately 1,000 acres. The lake is heavily used by the public, four group camps and Southern Illinois University's Touch of Nature Environmental Center for fishing, boating, swimming and canoeing. The lake is scenic and has some underwater hazards from trees. Outboard motors on the lake are limited to 10 horsepower. There are four public boat ramps and one marina on the lake.

3.6.7 Swimming

Swimming has long been a popular activity on the Refuge. At one time the Refuge supported six public beaches – four on Crab Orchard Lake and one each on Devils Kitchen Lake and Little Grassy Lake.

The Soil Conservation Service ran two concession-operated beaches on Crab Orchard Lake at the time the area was transferred to the Department of the Interior. Each beach had a beach house with showers, changing area, and vending area. Subsequently, the Fish and Wildlife Service ran these beaches (Hogan's Point and Crab Orchard) as fee areas. The Service also created beaches at Carterville and Lookout Point. In 1973, the Crab Orchard Beach and Hogan's Point Beach were closed and Carterville and Lookout Point were placed under concession contracts.

Today swimming is allowed in Crab Orchard and Little Grassy lakes and prohibited in Devils Kitchen Lake. In 1994, Carterville and Lookout Point beaches were removed from concession contract. The Service then ran Carterville Beach as a recreational area and Lookout Point was closed. Because the Refuge was not able to meet public health standards at Carterville Beach, the beach was closed in 1998. The Refuge expanded the beach at the Crab Orchard Campground and the concessionaire

Figure 30: Boat Launches on Crab Orchard NWR

Beach on Crab Orchard Lake

opened the beach to the general public. The Little Grassy Campground also operates a beach that is open only to campers.

3.6.8 Picnicking

From the late 1940s through the 1960s, picnicking was a very popular activity on the Refuge. In 1961 there were 20 designated picnic areas with more than 200 picnic tables. When the Refuge experienced a $75,000 budget cut in non-program uses in 1973, several picnic areas were closed. Today picnicking is encouraged in four locations on the Refuge. The areas vary in size, character and type of use (see Figure 31).

Cambria Neck: This is the largest of the picnic areas. The area has several picnic tables with grills, a restroom, a gravel boat ramp and parking lot. The area is open during warm season months for picknicking and fishing.

Greenbriar: This area has a parking lot, a restroom, an accessible fishing dock and three picnic tables and grills. The area is used mostly by anglers fishing along the bank.

Harmony Trail: The area has a heated restroom, a large parking lot and two concrete picnic tables. The area is used mainly by school groups and trail visitors.

Wolf Creek Recreation Area: This area is mostly used by anglers fishing from the bank. The area has five picnic tables and grills, a restroom, and fishing access.

3.6.9 Horseback Riding

Regulations controlling horseback riding on Crab Orchard NWR have seen several changes over the years. During the 1960s and up to 1979, horseback riding was permitted only in areas designated by signs or on marked horseback trails. In 1979, the regulation permitted horseback riding only on existing paved or graveled roads in the open area (public use area) of the Refuge. In 1984, the regulation prohibited horses in concession, agriculture and grazing areas.

Even though the 1984 regulation allowed horseback riding in most of the public use area, this activity is concentrated in the more wild and scenic southern portion of the Refuge. In 1976, much of this southern portion was designated as the Crab Orchard Wilderness and horseback riding was not allowed. In the past two decades, probably as a result of lax enforcement, horseback riding in the Wilderness has become increasingly common. Equestrians typically ride on old abandoned roads and user-defined trails within the Wilderness and adjacent lands. Recently there has been a marked increase in the development of unauthorized trails in the Wilderness.

Several organizations have proposed developing trails in the Wilderness for hiking and horseback riding. In 1980 the Shawnee Trails Conference, Inc. proposed the 130-mile MISHIO trail traversing southern Illinois from Grand Tower on the Mississippi River to Cave-in-Rock on the Ohio River. The Refuge Manager decided not to authorize any trail construction in the Wilderness based on the unsuitable soil and steep slopes. The Refuge's Master Plan, finalized in 1979, also recommended that no trails be developed for these same reasons. The Crab Orchard Wilderness Management Plan (1985) states: "No trail construction will be undertaken in the future …" In 1993 The River to River Trail Society sought permission to realign the River to River Trail from public, paved roads to a route through the Wilderness. The Refuge Manager requested more details from the Society regarding design criteria, layout, construction and maintenance, as well as modes of travel and expected levels of public use, to assess the impacts on the Wilderness and the Refuge in general. In 1997 volunteers laid out and cleared a tentative route, but the proposal has not been formally evaluated. Later that year a formal Memorandum of Understanding between the Society, the Refuge and the U.S. Forest Service was drafted to define trail alignment and maintenance responsibilities, but it has not been signed.

3.6.10 Group Camps

Four group camps are located on Little Grassy Lake. The camps operate under a cooperative agreement with the Refuge.

Figure 31: Picnic Areas on Crab Orchard NWR

Figure 32: Annual Group Camp Attendance at Crab Orchard NWR, 1997-2001

Annually, approximately 5,700 people attend the United Methodist Church Camp and 1,200 attend Camp Carew, a Presbyterian Church camp.

The Boy Scouts of America camp, Pine Ridge, is primarily a day use facility that is active throughout the year. Approximately 6,000 Scouts attend the camp each year.

The Girl Scouts camp, Camp Cedar Point, is recognized as one of the oldest Girl Scout camps in the nation. The camp is active throughout the year. Approximately 7,000 Scouts attend this camp.

Almost 20,000 campers participate in group camping activities on the Refuge every year (Figure 32).

3.6.11 Environmental Education

The Refuge provides educational assistance to area teachers, educators, and Refuge group camps. Refuge staff, interns, and volunteers present both on-site and off-site educational programs to area school groups, Boy Scout groups, and other organizations upon request. In addition, each group camp is required to provide a minimum of 1 hour of environmental education each day to campers. The Refuge provides camp instructors with workshops and lesson plans prior to each camping season.

Educational materials (books, posters, videos, and other supplies) are maintained by the Refuge and are available for loan to area educators. Educational kits focusing on key concepts and resources are also available for loan. In addition, Refuge staff provide assistance with curriculum development and with special event programs conducted by other agencies and organizations.

3.6.12 Interpretation

Interpretive programs are given by Refuge staff and volunteers to school, civic and other groups. The programs are presented through automobile tours, talks and walks. Some of the better attended programs include Bald Eagle tours, wildflower walks and owl prowls. The Refuge also presents its interpretive message through bulletin boards, signs and wayside exhibits. Visitor services staff presented 114 programs to more than 3,400 individuals in 2001.

3.6.13 Visitor Center

The Visitor Center contains an information and exhibit area, auditorium/conference room, book store and office space for visitor services staff. Built in 1941, the building originally housed a fire station. The building was renovated in 1993 and has 3,455 square feet. Approximately 1 million people visit the Refuge every year, and the Center receives approximately 40,000 of those visitors. Visitor Center staff answer questions, issue user passes, host workshops and conferences, present interpretive programs, and check-in deer and turkey hunters.

3.6.14 Existing Transportation Patterns and Visitor Facilities

Crab Orchard NWR is located in southern Illinois relatively close to Arkansas, Indiana, Kentucky, Missouri and Tennessee. Interstate highways 24, 55, 57, and 64 provide high speed routes to southern Illinois. Several state and county roads provide access to and within Refuge boundaries.

State Route 148 passes through the Refuge from north to south, passes the Visitor Center and has an average daily traffic count of 5,800. New State

Route 13 crosses the northern portion of the Refuge and has an average daily traffic count of 25,000. New State Route 13 provides the primary access to the developed recreation sites in the northwestern portion of the Refuge. Interstate 57 passes through the eastern portion of the Refuge and has an average daily traffic count of 26,900.

The Refuge also maintains an extensive system of roads within its boundaries. According to a 2001 survey of Refuge roads completed by the U.S. Department of Transportation, Crab Orchard National Wildlife Refuge maintains 38 miles of paved surface roads and 17 miles of gravel roadway for a total of 56 roadway miles. And additionally, 1.1 million square feet of parking area, 21 boat launch ramps, and three universally accessible areas are also maintained by Refuge personnel.

3.7 Special Management Areas

3.7.1 Wilderness

Congress designated the Crab Orchard Wilderness as a unit of the National Wilderness Preservation System on October 19, 1976, when it enacted Public Law 94-557. The 4,050-acre Wilderness was the first in the State of Illinois; seven additional wilderness areas have since been established on the Shawnee National Forest. The Crab Orchard Wilderness is located in the extreme southern portion of the Refuge bordering the shores of Devils Kitchen and Little Grassy lakes. (See Figure 1 on page 2.) A Wilderness Management Plan was approved for the Crab Orchard Wilderness in 1985.

The rugged terrain of this unglaciated land is interlaced with numerous creeks. The vegetation cover in the Crab Orchard Wilderness is predominantly second growth deciduous forest on slopes and typical old-fields with scattered trees, brush and small grassy openings along ridges. There are more than 700 acres of plantations, including 400 acres of hardwood (mostly black-locust) and 325 acres of non-native pine and pine-hardwood. Invasive species, such as autumn-olive, multiflora rose, Japanese honeysuckle, Amur honeysuckle and Oriental bittersweet, are common throughout the Wilderness, and likely to become more problematic. The Wilderness contains numerous old house sites with relic exotic ornamental plants, sandstone pillars, open wells, ponds and trash. There is one known cemetery (Baker) located in the north central portion. Rocky Comfort Road, which is maintained by Williamson County, runs north and south through the area.

Crab Orchard Wilderness Area

The Wilderness Act of 1964 permits certain activities within designated wilderness areas that do not alter natural processes. Wilderness values are preserved through a "minimum tool" approach that requires the Refuge to use the least intrusive methods, equipment and facilities necessary for administering the areas. The Refuge staff maintains boundary signs and barricades to prevent vehicle trespass and occasionally patrols in the area. There are no research projects presently being conducted within the Wilderness.

Visitor activities in the Crab Orchard Wilderness include hunting, hiking, horseback riding, nature study, and mushroom picking. Although horseback riding was prohibited when the Wilderness was designated, this use has become increasingly common in the years since then, likely as a result of lax enforcement. Hikers and horseback riders generally follow old roads and user-defined trails, which have become eroded in some places especially on the steeper slopes. Horse traffic, though generally light, has disturbed the fragile soils along the trails. Most damage occurs during winter and spring when the ground is wet and soft.

The Crab Orchard Wilderness is located near the population center of southern Illinois and is readily accessible to visitors who seek solitude in a natural

setting. The primary access points are along Rocky Comfort Road, Devils Kitchen Lines #9 and #17, Antioch Cemetery Road, and West Liberty Cemetery Road. The Wilderness is also accessible by boat from Little Grassy and Devils Kitchen lakes. The number and distribution of visitors in the Wilderness are not well documented. A study was conducted by Reeder (1977) soon after Wilderness designation to characterize public use by surveying 128 visitors. A more detailed study by McCurdy and others (1994) described the demographics and recreation use patterns of visitors to five wilderness areas on the Shawnee National Forest, one of which was Panther Den Wilderness which is adjacent to the Crab Orchard Wilderness.

3.7.1.1. Inholdings and Lands Contiguous to the Crab Orchard Wilderness

The entire northern boundary and almost all of the western boundary of the Wilderness border other Refuge land (see Figure 5 on page 27). Much of the northern boundary is formed by the Little Grassy and Devils Kitchen lakes, which are man-made reservoirs. At the time of designation, the Wilderness designation excluded an inholding and another parcel surrounded by Wilderness on three sides, both owned by Southern Illinois University. Through a land exchange in 1979, the Refuge acquired these tracts, which together constitute about 120 acres. An additional 558-acre tract contiguous with the southern boundary of the Crab Orchard Wilderness was acquired in the same land exchange. Rocky Comfort Road runs north-south through this tract.

Lands on the southern boundary of the Wilderness include the 779-acre Panther Den Wilderness, managed by the USDA Forest Service. Additional lands are owned by Southern Illinois University and private individuals. Neighboring lands are primarily second growth forest with a few fields making up the rest of the boundary. Lands adjacent to the eastern boundary of the Wilderness are primarily fields in private ownership.

3.7.2 Research Natural Areas

The Service administratively designates research natural areas (RNA), which are part of a national network of reserved areas under various ownerships. RNAs are intended to assist in the preservation of examples of all significant natural ecosystems for comparison with those influenced by man, to provide educational and research areas for scientists to study the ecology, successional trends, and other aspects of the natural environment, and to serve as gene pools and preserves for rare and endangered species of plants and animals. In RNAs, as in designated Wilderness, natural processes are allowed to predominate without human intervention. Under certain circumstances, deliberate manipulation may be used to maintain the unique features for which the RNA was established. Activities such as hiking, bird watching, hunting, fishing, wildlife observation, and photography are permissible, but not mandated, in RNAs. Thirteen RNAs totaling 1,353 acres have been established on the Refuge (Figure 33 and Table 13).

3.7.3 Conservation Easements

When the Farm Services Agency (FSA), formerly the Farmers Home Administration (FmHA), acquires property through default of loans, it is required to protect wetland and floodplain resources on the property prior to resale to the public. The Service assists the FSA in identifying important wetland and floodplain resources on the property. Once those resources have been identified, FSA protects the areas through a perpetual conservation easement and transfers management responsibility to the Service. The authority and direction comes from the Consolidated Farm and Rural Development Act (7 U.S.C. 1981 and 1985, as amended); Executive Order 11990 providing for the protection of wetlands; and Executive Order 11988 providing for the management of floodplain resources. The Service administers the easements as part of the National Wildlife Refuge System.

The Refuge manages 24 conservation easement areas totaling 490 acres located within the Crab Orchard Fish and Wildlife Management District, a 21-county area in southern Illinois (see Figure 34). Inadequate staffing levels have impeded proper management of the widely dispersed easements. Some of the easements have not been surveyed or marked on the ground. The easements should be inspected regularly, but some have not been inspected in over ten years. Without appropriate monitoring the easements and their resources can not be protected from the myriad forms of encroachment.

3.8 Industrial Use Status and Trends

In 1942, the eastern portion of the Crab Orchard Creek Project was transferred to the War Department for construction of the Illinois Ordnance Plant.

Figure 33: Research Natural Areas on Crab Orchard NWR

Table 13: Research Natural Areas on Crab Orchard NWR

Name	Area (Acres)	Date Established
Crab Orchard Creek Bottoms	105	1970
Devils Kitchen Dam	130	1970
Post Oak Flats	22	1970
Area 10	40	1972
Big Grassy Creek	210	1972
Crab Orchard Cemetery	70	1972
Devils Kitchen Lake	136	1972
Little Grassy Creek	20	1972
Pigeon Creek	40	1972
Post Oak Flats Addition	50	1972
The Oxbow	160	1972
Wolf Creek Bay	40	1972
Wolf Creek East Tributaries	330	1972
Total	1,353	

The War Department acquired additional lands for its purposes. The Illinois Ordnance Plant was built during 1942 as a loading site for high explosive shells, land mines, bombs and components.

Initially, the Illinois Ordnance Plant contained 536 buildings with approximately 2.3 million square feet of space, water and sewage treatment plants and distribution systems, power and telephone utility systems, 88 miles of railroad track, 93 miles of access and service roads, parking for 6,900 vehicles, nine steam generating plants and a peak wartime employment of approximately 10,000 workers. The Illinois Ordnance Plant ceased ordnance operations in 1945 with the end of World War II.

When the War Department and Soil Conservation Service lands were transferred to the Department of the Interior in 1947, approximately 1.6 million square feet of space suitable for industrial leasing were included in the transfer.

From 1947 to 1978, the Refuge leased buildings to a variety of tenants. Conventional buildings were used for the manufacture of munitions, boats, stencil board, marking machines, mobile homes, inks and brushes. A vocational training school also operated in the buildings. Cold storage warehouses were used for washer/dryer parts storage, beverage distributorship, freight terminal and office space, among other things. Igloo type buildings were leased primarily by munitions manufacturers, fireworks distributors, and coal mining companies for storage of explosives or explosive components.

In 1978, in a master planning process, the Service considered divesting the industrial operations on the Refuge. A 250-acre tract of land was identified on the north boundary of the Refuge as an industrial park for the relocation of existing industrial tenants. The industrial park concept failed due to distance requirements of munitions manufacturing, costs related to relocation of industrial operations, and the industrial purpose specified in the public law that created the Refuge.

In 1981, in a cooperative effort with the Industrial Tenant Association, the Service implemented a new industrial policy and new lease contracts. The policy and leases have served as guidelines in the administration of the industrial complex since 1981. The industrial complex currently consists of about 1.2 million square feet. The Refuge collects about $500,000 in rental receipts each year. Rental receipts are returned to the Refuge and are used as part of its operation and maintenance budget.

3.9 Agriculture

The Refuge began farm management in 1948. The original focus of management was to:

- # reclaim farmland that had been fallow during ordnance plant operations,
- # improve soil fertility,
- # improve farm practices,
- # emphasize establishment of pasture, and
- # use crops to help establish a wintering flock of Canada Geese.

The Refuge started with 35 cooperative and 18 cash farmers in 1948. By 1952, there were 60 cooperative farmers and no cash farmers. .Common crops included corn, soybeans, wheat, sudan grass, oats, rye, and barley. Crop fields were in a 5-year rotation that included 2-3 years of grass or legumes. Pastures of cheat (*Bromus tectorum*) and bluegrass (*Poa* sp.) were grazed by cattle along with some horses and sheep. There were no permanent hay fields.

Hay crops were red clover (*Trifolium pratense*), lespedeza, red top (*Agrostis alba*), and timothy (*Phleum pratense*). The number of cooperators was high and the number of acres allocated to each cooperator was relatively small. In 1953, there were 99

Figure 34: Conservation Easements Administered by Crab Orchard NWR

cooperators with an average of 110 acres per cooperator (Figure 35). By 1979, there were 28 cooperators with an average of 280 acres per cooperator. In 2001, there were 20 cooperators with an average of 315 acres per cooperator

Efforts to reclaim farmland continued through the 1950s and 1960s (Figure 36). Some bottomland forest was converted to farmland. In 1963, for example, 170 acres of bottomland forest were cleared and converted to crop production. During this period, the common rotation was: corn, soybeans, winter grain, hay, hay. In 1966, 2,500 geese died from impaction of soybeans in their crops. In 1967, soybeans were dropped from the rotation and replaced with milo, and 1967 was the first year in 10 with no impaction mortality of geese on the Refuge. Soybeans were added back into the rotation in 1992. More has been learned about crop impaction in geese and there has been no subsequent impaction-related mortality.

Current row crop management emphasizes soil protection and integrated pest management. Management consists of crop rotation, no-till planting, higher weed tolerance, restricted use of herbicides, and no insecticide use.

The current rotation, which was implemented in 1994, is:

- Year 1 – corn followed by rye
- Year 2 – soybeans (drilled) followed by winter wheat (drilled)
- Year 3 – corn
- Year 4 – clover
- Year 5 – clover

Approximately 300 acres are in a continuous rotation of corn and soybeans, because these areas are too wet to produce clover.

Until recently, cooperators signed 5-year agreements. In anticipation of comprehensive conservation planning, the agreements were changed to 1-year agreements until a management direction for

Figure 35: Number of Agricultural Cooperators at Crab Orchard NWR, 1953, 1979, and 2001

Figure 36: Total Area of Agricultural Fields on Crab Orchard NWR, 1947-2001

the Refuge is specified within a plan. Cooperators bear the expense of all planting and harvesting costs. Cooperators receive 75 percent of the corn, 100 percent of the soybean harvest, and 100 percent of any second year clover they cut for hay. Crab Orchard NWR receives 25 percent of the corn and 100 percent of the winter wheat. The Refuge's share of corn and wheat are left unharvested to be used by geese and other wildlife. In 2001, approximately 4,464 acres were planted in corn, beans or clover (Figure 37). There were 244 fields with an average size of 18 acres.

The current grazing program consists exclusively of cattle grazing on fescue pastures. The grazing period runs from April 15 to September 30. To make pastures more attractive to geese, cooperators are required to have their pastures grazed or mowed to 6 inches or lower in height by October. The Refuge's pastures are in relatively poor condition with low soil fertility. Cooperators currently sign a 1-year special use permit. The grazing fee is $8.95 per animal unit month (AUM). Cooperators pay the fee through a mowing credit of $2.53/AUM and by fertilizing the pasture. In 2001, there were 10 pastures with an average size of 108 acres – approximately 863 acres were grazed and 220 acres were cut for hay.

The current hay program consists of improved timothy fields and unimproved fields that are mostly old fescue pastures. Cooperators are allowed as

Figure 37: Area of Row Crop Fields, Pastures and Hay Fields in 1953, 1979, and 2001

many cuttings as a field will produce each year, and they are required to cut their field to 6 inches or shorter by October. The Refuge's hay fields currently have low soil fertility. In 2001, cooperators paid $8.50 per ton of hay. Payment is made by fertilizing their field. In 2001, approximately 767 acres were cut for hay. There were 22 fields with an average size of 34 acres.

3.10 Archaeological and Cultural Values[2]

Several investigations have shown that humans have exploited southern Illinois, with its great variations in topography, geology, and vegetation, for over 10,000 years. People of the nomadic hunter-gatherer PaleoIndian (10,000 to 8,000 BC) and Archaic (8000 to 600 BC) cultures found rich lithic resources for tools, rock overhangs for shelter, and animals and plants from both forests and prairies for subsistence. Late Archaic people began farming the prairies to supplement their hunting and gathering procurement. People of the Woodland culture (600 BC to AD 1000) acquired pottery and the bow and arrow and increased reliance on farming, with cultural influences that came from the west via the Mississippi River and from the east via the Ohio and Illinois rivers. The Refuge area was the center for the Woodland Crab Orchard Tradition, the archeological site type now flooded by Crab Orchard Lake. Woodland people were further influenced by the flowering of the Hopewellian and Mississippian culture (AD 1000 to 1500), resulting in the establishment of small agricultural communities in the Refuge area. Southern Illinois essentially became depopulated from about AD 1500 until after the first European contact in AD 1673, although groups of displaced eastern tribes intermittently settled the area.

Euro-American settlers began arriving in the early 19th century, primarily from Kentucky, Tennessee, and the Carolinas. Even earlier, George Rogers Clark passed through Williamson County and possibly the Refuge area in 1788 while taking Illinois from British control. Subsequent settlers constructed fortifications for protection; three blockhouses were located on or near the Refuge.

Settlements established before the mid-1800s near what is now the Refuge were Russell Corners on Eight Mile Prairie, Bainbridge and Phelps Prairie on Phelps Prairie, Cottage Home and Fredonia. One settlement located on what is now Refuge land was the village of Chamnesstown (later known as Mousertown), which became a center for agricultural trade.

By the 1930s farmsteads and small towns covered the Refuge area. Documents indicate at least 28 farmsteads and habitations, 34 cemeteries, three churches, 12 schools, and two towns within the Refuge boundaries.

2. *This section of the Final EIS is derived from the report, "Cultural Resource Management Plan for Cultural Resources Within the Crab Orchard NWR" (3 vols.) by Anthony Godfrey and Donna Stubbs, dated August 2001, as well as other cultural resources reports of studies at the Refuge from 1951 to the present.*

Peithman Collection, Crab Orchard NWR

About 1,000 acres of the Refuge have been subjected to controlled and reported archeological survey and investigation. One hundred and thirty-six prehistoric sites have been reported on the Refuge, and human remains have been identified for at least 98 persons. Moreau Maxwell conducted the important excavation of the Sugar Camp Hill site 11-WM-1 in 1939 and identified the Crab Orchard Tradition before the site was covered by Crab Orchard Lake. The artifacts from this work have been dispersed to various museums; many artifacts can no longer be located.

Some subsequent investigations at the Refuge in the 1950s and 1960s have had similar or worse problems. Reyman reported a survey from which artifacts, field notes and other documents have all been lost. The Refuge contracted, as part of its 1978 master planning, for an inventory of 28 recorded and reported sites on the Refuge, but documentation was still incomplete. During the 1980s and 1990s several investigations have occurred on the Refuge for which reports have been completed and collections are curated at appropriate repositories. Recent studies indicate settlement patterns in the Crab Orchard Creek basin may be more complex than previously thought.

As of October 1, 2001, there were no National Register properties on or in the vicinity of the Refuge.

The area of the Refuge having been vacated of most human occupancy from approximately 1500 and resettled by historic period tribes from the 17th to 19th centuries, modern descendants of prehistoric cultures have not been identified. Three historic period tribes have legal or occupancy claims to the Refuge area. The Kaskaskia (part of the Illiniwek or Illinois, now part of the Peoria Tribe) were declared by the Indian Claims Commission as having jurisdiction over most of southern Illinois. The Piankashaw, a sub-group of the Miami tribe, historically were in southern Indiana, then in southeastern Illinois with a short-term reservation 75 miles northeast of the Refuge, but actual occupation there was historically late, brief, and tenuous. The Indian Claims Commission determined the Piankashaw to be legally part of the Peoria tribe and later became the United Peoria and Miami. The third tribe was the Shawnee, who had homes in Ohio and Missouri and used southern Illinois as transient travelers. The Indian Claims Commission identified Shawnee villages in the 18th century in Illinois south of the Kaskaskia on the Mississippi, south of Grayville on the Wabash, and along the Ohio River.

Although Indian tribes are generally considered to have concerns about traditional cultural properties, the several church groups (and possibly other groups) formerly within the Refuge boundaries could also have similar concerns.

The Refuge archeological collections contain prehistoric artifacts currently not associated with any modern tribe. Furthermore, the collections contain human remains but no funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act. Although sites of historic period Indian occupation have not been identified on the Refuge, they may exist and contain cultural items.

3.11 Law Enforcement

Enforcement of Federal wildlife laws, regulations specific to the Refuge System, and State laws is an essential part of Refuge operation. Law enforcement plays a crucial role in ensuring that natural and cultural resources are protected and that visitors have a safe environment. The Refuge currently has five employees, three full-time and two collateral duty, who conduct law enforcement duties on the Refuge. Cooperative relationships exist with state conservation officers and all county sheriff departments in the area. Table 14 displays the most frequently cited offences between 1997 and 2001.

Table 14: Most Frequently Cited Offences on Crab Orchard NWR, 1997-2001

Offence	1997	1998	1999	2000	2001	Totals
Trespass	73	109	118	93	68	461
No Entrance Pass	57	103	91	73	49	373
State Vehicle Code	9	15	11	10	9	54
State Hunting Law	8	10	13	9	6	48
No Fishing License	25	21	14	19	17	96
Underage Drinking	16	21	29	20	10	96
Under Influence	3	11	14	8	5	41
Unauthorized Fire	7	5	12	9	6	39
Violate Posted Sign	4	6	9	7	8	34
Illegal Transport Alcohol	33	41	54	19	21	168
Special Regulations	17	15	29	12	28	101
Public Indecency	15	11	7	14	6	53
Possession of Controlled Substance	43	52	39	31	24	189
Off-road Vehicle	6	9	6	10	4	35
Total	316	429	446	334	261	1,788

3.12 Socioeconomic Environment

3.12.1 Economic Setting

The study area for estimating the economic effects of the recreational, agricultural and commercial use of the Refuge is defined as Williamson and Jackson counties. Most visitors to the Refuge (about 89 percent) come from within a 50-mile radius of the Refuge, and about 90 percent of these visitors come from Williamson and Jackson counties. Since most visitors come from these two counties, most of the economic impact of Refuge visitation occurs within these counties. All of the commercial activities that take place on the Refuge are within these counties.

Williamson County contains almost all of the Refuge lands. Williamson County was established in 1839 with Marion as the county seat. Major communities include Marion, Herrin, Carterville, Johnston City, Pittsburg and Creal Springs.

Jackson County contains portions of Little Grassy Lake. The county was established in 1816. Most of the county's residents live in one of three cities: Carbondale, DeSoto, and Murphysboro, which is the county seat.

3.12.1.1. Population

Table 16 compares the population growth of Williamson and Jackson counties, Illinois, and the United States from 1980 to 2000. Williamson County population grew at a slower rate than the state but substantially less than the U.S. from 1980 to 2000. The 1990s was a period of significantly increased growth for both Williamson County and the state, but both lagged behind national population growth.

Jackson County population declined while the State and U.S. population grew from 1980 to 2000. From 1990 to 2000, Jackson County lost population compared with significant increases in the state and U.S. population.

Demographic information for Williamson and Jackson counties is provided in Table 17.

3.12.1.2. Employment

Table 18 shows full- and part-time employment by major business sector in Williamson County in 1980 and 2000. The majority (68 percent) of county employment in 1980 was in four sectors: services, retail trade, government and manufacturing. These four sectors accounted for 75 percent of county employment in 2000.

Employment growth in Williamson County generally outpaced state growth from 1980 to 2000. Williamson County has had a substantially higher unemployment rate than either the state or the U.S. However, since 1983, Williamson County unemployment rates have slowly declined so that they more closely resemble state and national unemployment rates.

Table 15: Employment by Major Business Sector, Jackson County, 1980 and 2000

Sector	1980	Percent of Total Employment	2000	Percent of Total Employment	Percent Change in Employment 1980-2000
Farming	1,061[1]	3.50	973	2.50	-12.70
Mining	662	2.20	89	0.20	-86.60
Construction	1,119	3.70	1,729	4.50	54.50
Manufacturing	1,742	5.70	1,469	3.80	-15.70
Transportation/Public Utilities	1,473	4.90	1,062	2.70	-27.90
Wholesale Trade	488	1.60	460	1.20	-5.70
Retail Trade	5,548	18.30	7,285	18.80	31.30
Finance, Insurance and Real Estate	1,663	5.50	2,056	5.30	23.60
Services	5,828	19.20	9,920	25.50	70.20
Government	10,783	35.50	13,784	35.50	27.80
Total Employment	30,367	100.00	38,827	100.00	27.90
Illinois Total Employment	5,688,054	100.00	7,442,406	100.00	30.80

1.Equals 5-year average 1980-84.

Table 16: Williamson County and Jackson County, Illinois and the United States Population, Percentage Change 1980, 1990, 2000

				Percent Change		
	1980	1990	2000	1980-1990	1990-2000	1980-2000
Williamson County	56,846	57,717	61,296	1.5	6.20	7.8
Jackson County	61,846	61,055	59,612	-1.30	-2.40	-3.60
Illinois	11,434,702	11,446,979	12,419,293	0.10	8.50	8.60
United States	227,224,719	249,464,396	281,421,906	9.80	12.80	23.90

Table 17: Demographic Profile of Jackson County, Williamson County, Illinois and the United States

	Jackson County	Williamson County	Illinois	USA
Population, percent change 1990-2000	-2.40	6.20	8.60	13.10
White, percent	80.80	95.30	73.50	75.10
Black or African American, percent	13.00	2.50	15.10	12.30
American Indian and Alaska Native, percent	0.30	0.30	0.20	0.90
Asian, percent	3.00	0.50	3.40	3.60
Hispanic or Latino origin, percent	2.40	1.20	12.30	12.50
Home ownership rate, percent	53.3.	73.60	67.30	66.20
Persons per household	2.21	2.35	2.63	2.59
Persons below poverty level, percent	21.00	14.90	11.30	13.30

Table 18: Employment by Major Business Sector, Williamson County, 1980 and 2000

Sector	1980	Percent of Total Employment	2000	Percent of Total Employment	Percent Change in Employment, 1980-2000
Farming	788	3.80	591	1.90	-25.00
Mining	1,046	5.00	124	0.40	-88.10
Construction	1,443	6.90	2,105	6.80	45.90
Manufacturing	3,440	16.50	3,119	10.10	-9.30
Transportation/Public Utilities	1,293	6.20	1,681	9.50	30.00
Wholesale Trade	942	4.50	837	2.70	-11.10
Retail Trade	3,541	16.90	6,174	20.10	74.40
Finance, Insurance, and Real Estate	1,226	5.90	2,414	7.90	96.90
Services	3,615	17.30	8,166	26.60	125.90
Government	3,488	16.70	5,534	18.00	58.70
Total Employment	20,909	100.00	30,745	100.00	47.00
Illinois Total Employment	5,688,059	100.00	7,442,406	100.00	30.80

Table 15 shows the major employment sectors in Jackson County for 1980 and 2000. In 1980, the major sectors – government, services and retail trade – totaled 73 percent of county employment. In 2000, government, services and retail trade accounted for 80 percent of county employment.

3.12.1.3. Employment Earnings and Personal Income[3]

Employment earnings in Williamson County totaled $604 million in 1980 and $789 million in 2000, an increase of 31 percent. This compares with a 51 percent statewide increase. Table 19 shows employment earnings for Williamson County by major employment sectors for 1980 and 2000.

Employment earnings in Jackson County totaled just under $750 million in 1980 and about $985 million in 2000, an increase of 32 percent. Table 20 shows employment earnings for the major employment sectors in Jackson County.

Table 21 shows per capita personal income (PCPI) for Williamson and Jackson counties, Illinois, and the U.S. for 1980, 1990 and 2000. During the 1980s, PCPI growth in Williamson County was significantly lower than both the state and the U.S. However, in the 1990s county PCPI growth was fairly even with state growth and much higher than national growth. While growth rates were similar for Jackson County and the state, 2000 PCPI is almost 55 percent higher for the state than Jackson County (Table 21). Overall, from 1980 to 2000, Williamson County PCPI grew at a substantially lower rate than the state and national economies.

3.12.2 Impact of the Refuge Budget

Refuge budget expenditures contribute to local and regional economies. Table 22 summarizes the economic impact of both salary and non-salary budget expenditures. Separate input-output models were used to estimate the impacts of local spending, regional (in-state but not local), and out-of-state spending for both salary and non-salary expenditures. These estimates are based on the annual average Refuge budget from 1996 to 2000.

Table 23 shows the tax revenues generated by budget expenditures for each of the three spending areas and by salary and non-salary expenditures.

3.12.3 Economic Impacts of Refuge Recreation

The Refuge has averaged between 1.1 and 1.2 million visits per year during the 1990s. During this period, four major recreational activities – hunting, fishing, boating and wildlife observation – comprised from 37 to 89 percent of total Refuge visits.

3. All dollar figures have been adjusted for inflation for year 2000 dollars.

Table 19: Employment Earnings by Major Business Sector, Williamson County, 1980 and 2000

Sector	1980 (thousands)	Percent of Total Employment	2000 (thousands)	Percent of Total Employment	Percent Change in Employment, 1980-2000
Farming	$1,985	0.30	$3,418	0.40	72.20
Mining	$75,082	12.40	$2,655	0.30	-96.50
Construction	$59,209	9.80	$56,674	7.20	-4.30
Manufacturing	$111,770	18.50	$102,425	13.00	-8.40
Transportation/ Public Utilities	$56,286	9.30	$75,755	9.60	34.60
Wholesale Trade	$29,358	4.90	$28,209	3.60	-3.90
Retail Trade	$72,557	12.00	$92,471	11.70	27.40
Finance, Insurance and Real Estate	$16,200	2.70	$41,944	5.30	158.90
Services	$77,965	12.90	$166,231	21.10	113.20
Government	$103,644	17.20	$219,532	27.80	111.80
Total Employment Earnings	$604,056	100.00	$789,314	100.00	30.70
Illinois Total Employment Earnings	$194,155,230	100.00	$293,692,287	100.00	51.30

Table 20: Employment Earnings by Major Business Sector, Jackson County, 1980 and 2000

Sector	1980 (thousands)	Percent of Total Employment	2000 (thousands)	Percent of Total Employment	Percent Change in Employment, 1980-2000
Farming	$5,420	0.70	$12,347	1.30	127.80
Mining	$51,687	6.90	$3,342	0.30	-93.50
Construction	$43,395	5.80	$51,886	5.30	19.60
Manufacturing	$45,965	6.20	$41,334	4.20	-10.10
Transportation/Public Utilities	$57,067	7.60	$47,429	4.80	-16.90
Wholesale Trade	$13,131	1.80	$11,373	1.20	-13.40
Retail Trade	$93,030	12.50	$98,023	9.90	5.40
Finance, Insurance and Real Estate	$23,438	3.10	$30,692	3.10	30.90
Services	$12,253	16.10	$234,441	23.80	95.00
Government	$297,359	39.80	$454,432	46.10	52.80
Total Employment Earnings	$749,284	100.00	$985,299	100.00	32.00
Illinois Total Employment Earnings	$194,155,230	100.00	$293,692,287	100.00	51.30

From 1995 to 2000, these activities averaged about 44 percent of all Refuge visits. Activities making up the remaining Refuge visits include Visitor Center visits, environmental education and tours.

Based on the average annual visitation over the 5-year span between 1996-2000, 66 percent of all visits were made by residents of the study area and 34 percent were made by non-residents (people residing outside the two-county study area). About 80 percent of Refuge visitors reside within 20 miles of

Table 21: Williamson County and Jackson County Per Capita Income, 1980, 1990 and 2000

				Percent Change		
	1980	1990	2000	1980-90	1990-2000	1980-2000
Williamson County	$18,109	$19,698	$22,641	8.80	14.90	25.00
Jackson County	$15,092	$17,559	$21,676	16.30	23.50	43.80
Illinois	$22,625	$27,419	$31,856	21.20	16.20	40.10
United States	$20,799	$27,127	$29,469	30.40	8.60	41.70

Table 22: Annual Economic Impact of Refuge Budget Expenditures

	Expenditures	Economic Output	Jobs	Labor Income
Salary Impacts				
Two-county Study Area	$1,212,390	$1,625,313	25.2	$547,998
Illinois	$166,888	$288,957	3.4	$106,369
United States	$18,793	$32,539	0.4	$11,978
Total Salary Impacts	$1,398,071	$1,946,809	29	$666,345
Non-salary Impacts				
Two-county Study Area	$525,030	$691,622	7.8	$213,173
Illinois	$61,605	$98,776	0.8	$33,718
United States	$184,302	$295,457	2.5	$100,864
Total Non-salary Impacts	$770,937	$1,085,855	11.1	$347,755
Total Impacts	$2,169,008	$3,032,664	40.1	$1,014,100

the Refuge. A significant portion of non-resident visitors come from the St. Louis and Chicago metropolitan areas.

From 1996 to 2000, hunting visits averaged close to 44,000 annually. Most of the hunting on the Refuge is migratory waterfowl hunting (62 percent), followed by deer hunting (26 percent) and small game hunting (12 percent). Overall, about 74 percent of annual hunting visits are made by non-residents. Annually, non-residents make up about 85 percent of deer hunters, 15 percent of small game hunters and 80 percent of migratory waterfowl hunters.

During the period from 1996 to 2000, annual fishing visits to the Refuge have averaged over 210,000. Residents of the two-county area account for about 70 percent of total Refuge fishing visits.

Boating use on the Refuge has increased from 73,334 visits in 1996 to 109,420 in 2000, an increase of 49 percent. Residents make up about 60 percent of annual boating use on the Refuge.

Wildlife observation has increased from 93,692 annual visits in 1996 to 154,869 visits in 2000, an increase of over 65 percent. Most of the wildlife observation visits come from residents, comprising 80 percent of annual Refuge wildlife observation visitation.

Camping and picnicking on the Refuge averages 193,400 visits annually. Residents comprise about 80 percent of annual camping and picnicking visitation.

Recreation on the Refuge results in significant expenditures for both travel-related goods and services and activity-related equipment purchases. Table 24 shows expenditures by recreational activity along with estimates of the economic output, employment and income associated with these expenditures. The impacts were estimated using regional input-output models[4] for each of the six recreational activities.

4. *The economic impacts of recreational spending were derived using IMPLAN, a regional input-output modeling and software system. For additional information, see MIG, Inc., IMPLAN System and Olson and Lindall, IMPLAN Professional Software, Analysis and Guide.*

Table 23: Annual Tax Impacts of Refuge Expenditures

	Federal Taxes	State and Local Taxes	Total Taxes
Salary Tax Impacts			
Two-county Area	$144,950	$114,805	$259,755
Illinois	$30,631	$19,885	$50,516
United States	$3,449	$2,239	$5,688
Total Salary Tax Impacts	$179,030	$136,929	$315,959
Non-salary Tax Impacts			
Two-county Area	$52,359	$27,325	$79,684
Illinois	$9,352	$4,373	$13,725
United States	$27,376	$13,802	$41,178
Total Non-salary Tax Impacts	$89,087	$45,500	$134,587
Total Tax Impacts	$268,117	$182,429	$450,546

Table 24: Economic Impacts of Refuge Recreation in Two-county Study Area

Activity	Total Expenditures	Economic Output	Employment	Labor Income
Big game hunting	$451,620	$581,414	11	$238,742
Small game hunting	$168,260	$205,545	4	$75,604
Migratory waterfowl hunting	$1,163,229	$1,480,497	27	$624,816
Fishing	$7,347,787	$9,260,444	181	$3,972,468
Boating	$2,757,469	$3,459,091	84	$2,068,264
Wildlife observation	$4,923,785	$6,088,532	118	$2,477,711
Camping	$2,901,000	$3,655,260	72	$1,569,180
Refuge Total	$19,713,150	$24,730,783	497	$11,026,785

Total expenditures shows the total annual expenditures associated with the indicated recreational activity. The figures include spending by both residents and non-residents in the two-county study area.

Economic output shows the total industrial output generated by recreation-related expenditures. Total output is the production value (alternatively, the value of all sales plus or minus inventory) of all output generated by recreation expenditures. Total output includes the direct, indirect and induced effects of these expenditures. Direct effects are simply the initial effects or impacts of spending money; spending money in a grocery store for a fishing trip or purchasing ammunition or a pair of binoculars are examples of direct effects. The purchase of the ammunition by a sporting goods retailer from the manufacturer or the purchase of canned goods by a grocery from a food wholesaler are examples of indirect effects. Finally, induced effects refer to the changes in production associated with changes in household income (and spending) caused by changes in employment related to both direct and indirect effects. More simply, people who are employed by the grocery, by the food wholesaler, and by the ammunition manufacturer spend their income on various goods and services which in turn generate a given level of output. The dollar value of this output is the induced effect of the initial (or direct) recreation expenditures. [5]

5. *More technically, direct effects are production changes associated with the immediate effects ofchanges in final demand (in this case, changes in recreation expenditures); indirect effects are production changes in those industries directly affected by final demand; induced effects are changes in regional household spending patterns caused by changes in regional employment (generated from the direct and indirect effects) Taylor et al. 1993, Appendix E, p. E-1.*

Table 25: Recreation Expenditures and Economic Impacts for Non-resident Visitors to the Refuge

Activity	Total Expenditures	Economic Output	Employment	Labor Income
Big game hunting	$383,877	$494,202	9	$202,931
Small game hunting	$33,652	$41,109	1	$15,121
Migratory waterfowl hunting	$930,583	$1,184,398	21	$499,853
Fishing	$2,204,336	$2,778,133	54	$1,191,740
Boating	$1,102,988	$1,383,636	33	$827,306
Wildlife Observation	$984,757	$1,217,706	24	$495,542
Camping	$580,200	$731,052	14	$313,836
Refuge Total	$6,220,393	$7,830,236	156	$3,546,329

The economic impact of a given level of expenditures depends, in part, on the degree of self-sufficiency of the area under consideration. For example, a county with a high degree of self-sufficiency (out-of-county imports are comparatively small) will generally have a higher level of impact associated with a given level of expenditures than a county with significantly higher imports (a comparatively lower level of self-sufficiency). Consequently, the economic impact of a given level of expenditures will generally be less for rural and other less economically integrated areas compared with other, more economically diverse areas or regions.

Employment and labor income include direct, indirect and induced effects in a manner similar to total industrial output. Employment includes both full-time and part-time jobs, with a job defined as one person working for at least part of the calendar year, whether one day or the entire year. Labor income in the IMPLAN system consists of both employee compensation and proprietor income (Minnesota IMPLAN Group, Inc. 1999).

Table 25 shows recreation expenditures and economic impacts for non-resident visitors to the Refuge.

The economic impacts from recreation expenditures estimated in this report are gross area-wide (two-county area) impacts. Information on where expenditures may occur locally and the magnitude and location of resident and non-resident expenditures is not currently available. Generally speaking, non-resident expenditures bring "outside" money into the area and thus generate increases in real income or wealth. Spending by residents is simply a transfer of expenditures on one set of goods and services to a different set within the same area. In order to calculate "net" economic impacts within a given area derived from resident expenditures, much more detailed information would be necessary on expenditure patterns and visitor characteristics. Since this information is not currently available, the gross area-wide estimates are used as an upper-bound for the net economic impacts of total resident and non-resident spending in the two-county area. The economic impacts of non-resident spending in Table 22 represents a real increase in wealth and income for the two-county area (for additional information, see Loomis p. 191 and U.S. Department of Commerce pp. 7-9).

3.12.4 Tax Impacts of Refuge Recreation Spending

Table 26 shows Federal, state and local tax revenue derived from Refuge-related recreational spending in the two-county area by both residents and non-residents. These estimates are based on tax regulations and policies in effect in 1998.

Table 27 shows tax revenue generated by non-resident recreation spending in the two-county area.

3.12.5 Economic Impacts of Refuge Agriculture, Grazing, Timber Harvesting and Commercial Use

Several different types of commercial activities take place on the Refuge. Commercial uses include: (1) the leasing of Refuge land for an industrial park and storage facilities; (2) the use of lakes within the Refuge for boat docks and marina concessions; (3) timber harvesting; (4) grazing; and (5) farming.

The industrial park currently has 14 firms leasing space. These 14 firms employ 551 people. Annual rental receipts total $506,051. Eleven buildings are currently vacant, which if leased would employ about 20 people and bring in about $55,000 in rental revenue.

Table 26: Federal, State and Local Tax Revenue Derived From Refuge-related Recreational Spending by Residents and Non-residents

	Federal Taxes	State and Local Taxes	Total Tax Revenue
Big game hunting	$46,672	$42,306	$89,043
Small game hunting	$13,013	$11,893	$24,924
Migratory waterfowl hunting	$115,180	$106,828	$222,171
Fishing	$665,325	$604,459	$1,270,722
Boating	$248,213	$175,679	$424,259
Wildlife Observation	$393,536	$375,150	$769,244
Camping	$232,080	$212,785	$444,865
Totals	$1,714,019	$1,529,100	$3,243,119

Table 27: Tax Revenue Generated by Non-resident Refuge Recreation Spending

	Federal Taxes	State and Local Taxes	Total Tax Revenue
Big game hunting	$39,671	$35,960	$75,687
Small game hunting	$2,602	$2,378	$4,984
Migratory waterfowl hunting	$92,144	$85,462	$177,736
Fishing	$199,598	$181,338	$381,217
Boating	$99,285	$70,272	$169,704
Wildlife Observation	$78,707	$75,030	$153,849
Camping	$46,416	$42,557	$88,973
Totals	$558,423	$492,997	$1,051,420

Table 28: Annual Concession Revenue and Fees Paid for Crab Orchard NWR Recreational Facilities

Recreational Facility	Revenue	Fees Paid
Devils Kitchen Marina and Campground	$53,805	$1,076
Boat & Yacht Club	$94,547	$9,454
Crab Orchard Campground	$148,553	$14,682
Little Grassy Marina and Campground	$97,582	$11,210
Playport Marina	$97,625	NA
Images Marina	$43,255	NA
Total	$535,367	$36,422

Table 29: Recreation and Refuge Budget Expenditures Compared with Study Area

Area	Industrial Output	Employment	Employment Income
Williamson County	$2,280 million	30,745	$789 million
Jackson County	$2,070 million	38,827	$985 million
Study Area Total	$4,350 million	69,572	$1,770 million
Refuge Impacts	$27.8 million	537	$12.0 million
Refuge Impacts as Percent of Study Area Total	0.64%	0.77%	0.68%

The Refuge has three boat docks, four campgrounds and two marinas. Table 28 shows annual concession revenue and fees paid for each of these facilities.

The Refuge's forests are managed strictly for wildlife conservation. Forest habitat management activities, such as thinning, sometimes generate merchantable timber as a by-product. Some types of timber the Refuge has sold include pine pulpwood, pine sawtimber, and hardwood pulpwood. Since 1989, there have been about 35 timber sales which produced $264,266 in stumpage receipts. Most of the timber harvested has been pine pulpwood, amounting to over 10,000 tons. About 2,800 tons of pine sawtimber and 425 tons of hardwood pulpwood have been harvested over the same period. On average about 1,927 tons are harvested annually with a value of $6,641.

The Refuge currently allocates 863 acres to support 375 head of cattle and 1,726 animal unit months 3 (AUM) with a value of $172,500. We assume that all cattle are yearlings, and are thus sold at the end of each grazing period. The period for cattle grazing on the fescue pastures runs from April 15 to September 30. Also, the grazing fee is $8.95 per AUM, and is paid through a mowing credit of $2.53 per AUM and by fertilizing the pasture.

In recent years, about 5,200 acres annually have been farmed on the Refuge. Crops include corn (1,877 acres with a market value of $507,000), clover (1,484 acres with a value of $320,000), soybeans (1,179 acres with a value of $212,000) and hay (767 acres with a value of $164,905). Total market value of crops grown on the Refuge is $1.2 million.

3.12.6 Comparison of Refuge-Related Economic Impacts to Study Area Economy

Current recreational and commercial use of the Refuge generates a considerable amount of economic effects. However, compared with either of the two counties individually or in total, the economic effects generated by the Refuge are comparatively minor. This is not to say that businesses in certain sectors in specific locations may not be significantly affected by major changes in Refuge management policy; however, in general the Refuge plays a relatively minor role in the study area economy as whole.

Tables 22 to 28 compare Refuge-related impacts to the study area economy. Table 29 compares the two major sources of Refuge economic impacts, recreation and Refuge budget expenditures, with the two-county study area. Annual industrial output for the study area (based on 1998 data) totals $4.35 billion. Refuge recreation and budget impacts total $27.8 million, 0.64 percent of the study area total. Similarly, Refuge recreation and budget impacts account for 0.77 percent of total study area employment and 0.68 percent of study area employment income.

Table 30 shows the annual number of acres farmed on the Refuge and production value compared with the study area. Farming on the Refuge typically accounts for less than 2 percent of total acres farmed in the study area. If only Williamson County is considered, the Refuge accounts for 5.7 percent of total acres farmed in the county. Farming on the Refuge comprises about 3 percent of total crop value in the study area. Compared with Williamson County only, Refuge crop value is 12 percent of total county crop value.

Table 31 shows Refuge grazing and value compared with the study area. The 375 head of cattle on the Refuge constitute 2.9 percent of all cattle grazed in the study area and 7.2 percent of all cattle grazed in Williamson County. Grazing value on the Refuge is 2.8 percent of the study area total and is 7.8 percent of total grazing value for Williamson County.

Table 32 shows the amount of timber harvested on the Refuge compared with the study area. Average annual tons harvested on the Refuge is 1,927, which is 3.4 percent of total tons harvested in the study area and about 32 percent of total tons harvested in Williamson County. Williamson and Jackson counties harvest approximately 56,000 tons of hardwoods annually, receiving about $900,000 annually. Timber value on the Refuge is 1 percent of the study area total and 7 percent of total timber value for Williamson County.

Currently, the Refuge leases about 1.2 million square feet of commercial and industrial building space. As of March 2001, the Greater Marion, Illinois, area had industrial parks and sites that included 2,231 acres (Regional Economic Development Corporation, 2002).

Table 30: Annual Number of Refuge Acres Farmed and Production Value Compared with the Study Area

Area	Acres[1]	Value[2]
Williamson County	92,289	$10.1 million
Jackson County	202,558	$32.6 million
Study Area Total	294,847	$42.7 million
Refuge Impacts	5,231	$1.2 million
Refuge Impacts as a Percent of Study Area Total	1.8%	3.00%

1. *County data source: U.S. Department of Agriculture, 1999.*
2. *Value is based on statewide average market prices.*

Table 31: Annual Refuge Grazing and Value Compared with the Study Area

Area	Total Head[1]	Value[2]
Williamson County	5,185	$2.2 million
Jackson County	7,900	3.9 million
Study Area Total	13,085	$6.1 million
Refuge Impacts	375	$172,500
Refuge Impacts as Percent of Study Area Total	2.90%	2.80%

1. *County data source: U.S. Department of Agriculture, 1999.*
2. *Value is total county sales based on 1997 Census of Agriculture.*

Table 32: Annual Amount of Timber Harvest on the Refuge Compared with the Study Area[1]

Area	Tons Harvested	Value
Williamson County	6,090	$97,440
Jackson County	49,778	$796,448
Study Area Total	55,868	$893,888
Refuge Impacts	1,927	$6,641
Refuge Impacts as Percent of Study Area Total	3.45%	

1. *Value for Williamson and Jackson counties is based on the average price received for hardwood stumpage ($140/mbf in Illinois, November 1999 to August 2000. Value for the Refuge is based upon average stumpage receipts received by the Refuge.*

3.12.7 Current Staff and Budget

3.12.7.1. Staff

The Refuge's staffing as of January 2003 is illustrated in Figure 38.

3.12.8 Budget

Based on the annual average Refuge budget between 1996 and 2000, the Refuge budget includes $1.4 million in salaries and $770,937 in non-salary expenditures.

3.13 Partnerships

The Refuge has many partnerships with local, state, and national organizations. These partnerships benefit the Refuge in many ways, including fostering good community relations and enhancing Refuge habitats and wildlife populations. The Refuge intends to continue partnerships such as the following:

Southern Illinois Hunting and Fishing Days, Inc. is a non-profit organization that partners with the Refuge to promote hunting and fishing in the area. The Refuge initiated this program in the early 1980s. SI Hunting and Fishing Days assumed the lead for this activity in the early 1990s. Several thousand people now attend an annual weekend event, which is held at John A. Logan College.

Take Pride in America has been organized and worked with the Refuge since 1988. Take Pride in America has built courtesy docks for boat landings at all three lakes. Take Pride in America organized the construction of bass-rearing ponds and maintains Take Pride in America Point (formerly known as Hogan's Point) for fish-offs.

The Crab Orchard Waterfowl Association has provided funds for the construction of moist soil units on the Refuge. Quail Unlimited has provided native grass seed for Refuge prairie restoration.

Southern Illinois University, Touch of Nature, the Friends of Crab Orchard NWR and the Refuge's Visitor Services Program have partnered to provided environmental education opportunities for local schools.

With the help of the following partners, the Refuge has been able to provide one of the most successful Kids Fishing Derby events in the area:

University of Illinois Extension
Illinois DNR
Southern Illinois National Hunting and Fishing Days
Timberline Fisheries
Zimmer Radio Group
WalMart
Silkworm Inc.
Marion Pepsi-Cola
Crab Orchard Boat & Yacht Club

The Refuge has many dedicated groups and volunteers who assist with a variety of tasks. The Friends of Crab Orchard National Wildlife Refuge, John A. Logan College, University of Southern Illinois, Southern Illinois Audubon Society, Williamson County Tourism Bureau, and Marion U.S. Penitentiary are just a few of the organizations that contribute time to the Refuge.

Figure 38: Crab Orchard NWR Current Staffing Chart

Chapter 4: Environmental Consequences

4.1 Introduction

This chapter describes the environmental consequences of implementing each of the alternatives. It provides the scientific and analytic basis for the comparisons of the alternatives. It describes the probable consequences, impacts, and effects of each alternative on the topics discussed in Chapter 3. The discussion of each alternative begins with a summary of the alternative and the management actions that would be initiated under each alternative. It is these management actions that would result in the impacts or effects that are the subject of this chapter. The sections of this chapter are organized as follows: Section 4.2 describes the effects and impacts common to all alternatives, Section 4.3 describes Alternative A by impact topic, Section 4.4 describes Alternative B, Section 4.5 describes Alternative C, Section 4.6 describes Alternative D, and Section 4.7 describes Alternative E.

Note that Alternative A (No Action) represents anticipated conditions if the current programs and trends at the Refuge of recent years were to continue for the next 15 years, the planning horizon for the Comprehensive Conservation Plan. Alternative A serves as a baseline for comparison with the consequences of the other alternatives and thus is often referenced when discussing Alternatives B through E.

4.1.1 Quantifying Effects of Alternatives on Wildlife Species

We used a modeling process developed by USGS scientists (Rohweder et al. 2002) to examine the relative effects of different alternatives on selected wildlife that use the Refuge. For each species of interest, habitat potential for each land cover type

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was given a rank of 0, 1, 2 or 3 (no, low, medium, and high potential, respectively). This resulted in a weighted average Potential Species Occurrence (PSO) score for each species or group of species for the year 2000 and for each alternative in 2015 and 2100. For example, if the entire Refuge were high potential habitat for a given species, it would receive a PSO score of 3.0. If half of the Refuge were medium potential habitat for a given species, and half were low, it would receive a PSO score of 1.5. Habitat potential ranks were based on the integrated life cycle needs of each species as determined by FWS biologists (Appendix N). Refuge

land cover types were identified and quantified by USGS scientists (Hop 2001). The year 2000 land cover type data were manipulated using Geographic Information System (GIS) to develop the 2015 and 2100 land cover alternatives.

In order to assess the broad impacts of the Comprehensive Conservation Plan, one mammal species and 29 birds were chosen to represent several important habitat types found on the Refuge (Table 33). We selected the species because they are Region 3 conservation priority species (USFWS 2002) that use the major habitat types on the Refuge. Potential Species Occurrence scores were calculated for Bald Eagle (threatened), Indiana bat (endangered), five groups of species (all 30 species, nine forest birds, four grassland birds, five shrubland birds, and seven species of waterfowl).

Potential Species Occurrence scores for 2000 ranged from 0.14 for grassland birds to 1.39 for forest birds and the projected effects of the different alternatives are quite variable (Table 34). Bald Eagle and waterfowl PSO scores remain nearly the same as 2000 scores under all alternatives. This is because most of the habitats used by Bald Eagles and waterfowl will remain available in quantities similar to those found in 2000. Potential Species Occurrence scores for forest birds and Indiana bat increase under all alternatives as a result of planned forest enhancement activities and the succession of young forests and fallow areas into more mature forest habitat. Grassland and shrubland bird PSO scores decrease under all alternatives as a result of succession of open grass and shrub habitats to forest habitat. The amount of Refuge habitat for grassland and shrubland birds is relatively limited, so losses of these habitats will have larger effects on PSO scores.

Potential Species Occurrence scores are rough estimates of the effects of different alternatives and focus more on habitat quantity than quality. Factors not considered in this modeling process will also affect the value of a given habitat to wildlife. For example, much of the Refuge's forests are relatively young and their value to wildlife will change as they continue to mature. Alternatives B, C, D and E would manage for large blocks of forest, which should result in better nesting habitat for area-sensitive forest birds because predation and nest parasitism would be reduced. All five alternatives also call for conversion of pine plantations to hardwoods that are more valuable to wildlife. Some alternatives also plan for improved wildlife management of pastures and hay fields: delayed mowing of hay to reduce the rate of nest destruction, conversion of fescue pastures to more desirable warm- and cool-season grasses, and removal of woody vegetation to make grassland more attractive to grass nesting birds. These proposed management activities would enhance these habitats for many wildlife species, but this is not reflected in the PSO scores.

4.1.2 Effects on Archaeological and Cultural Values

The activities that are most positive for cultural resources are those that reduce or eliminate activities on the Refuge. In general, recreation activities and invasive species control have little potential to affect cultural resources and are envisioned as having a neutral effect on cultural resources. However, non-motorized use of trails may have a negative impact on cultural resources by increasing visitor traffic to sensitive cultural areas. Cultural resources are sensitive to ground disturbing activities. Activities that may have a negative impact on cultural resources include timber harvesting, grazing, farming, and construction of new trails or facilities. Fire suppression activities can also damage archaeological sites if new roads and firelines are constructed while combating wildland fires.

The impacts of the alternatives on cultural resources were evaluated with the assumption that significant, but as yet unidentified, cultural resources may occur on the Refuge. Under any alternative, site specific actions such as construction of facilities will be subject to additional environmental review in accordance with the National Environmental Policy Act, which affords protection to significant cultural resources as prescribed by the National Historic Preservation Act and other applicable regulations and guidelines. Although avoidance is the preferred approach, mitigation of effect is an acceptable treatment and development activities may, therefore, result in a net loss of resources.

Livestock grazing can have a negative impact on cultural resources by encouraging erosion, trampling and displacement of artifacts. All alternatives would reduce the possible negative impacts of grazing on cultural resources by reducing the erosion around water. The possible trampling and displacement of artifacts, if it is occurring, would continue, but be limited to areas delineated as pastures. Farming, like grazing, can have a negative effect on cultural resources through excavation and displacement of artifacts. Farming would remain essentially

Table 33: Resource Conservation Priority Species Used to Assess the Broad Impacts of the Comprehensive Conservation Plan

Species	Refuge Breeder	Habitat	Regional Concerns	Refuge Abundance
Double-crested Cormorant	N	Lakes and adjacent forests	Nuisance	Common
Canada Goose (Resident)	Y	Wetlands, agricultural fields	Recreation/economic value	Common
Canada Goose (Migrant)	N	Wetlands, agricultural fields	Recreation/economic value	Abundant
Wood Duck	Y	Wetlands, bottomland forests	Recreation/economic value	Common
American Black Duck	N	Wetlands	Recreation/economic value	Uncommon
Mallard	Y	Wetlands, bottomland forest	Recreation/economic value	Common
Blue-winged Teal	N	Wetlands	Recreation/economic value	Common
Northern Pintail	N	Wetlands	Recreation/economic value, rare-declining	Uncommon
Canvasback	N	Lakes, wetlands	Recreation/economic value	Uncommon
Bald Eagle	Y	Lakes, forests	Bald Eagle Protection Act	Uncommon
Red-shouldered Hawk	Y	Forests	Rare/declining	Uncommon
American Woodcock	Y	Wet meadows, wet shrubs	Recreation/economic value, rare/declining	Uncommon
Chuck-will's-widow	Y	Forests	Rare/declining	Uncommon
Whip-poor-will	Y	Forests	Rare/declining	Uncommon
Red-headed Woodpecker	Y	Forests	Rare/declining	Uncommon
Northern Flicker	Y	Forests	Rare/declining	Uncommon
Acadian Flycatcher	Y	Forests	Rare/declining	Uncommon
Loggerhead Shrike (migrans)	Y	Grasslands, shrublands	Rare/declining	Occasional
Bell's Vireo	Y	Shrublands	Rare/declining	Occasional
Wood Thrush	Y	Forests	Rare/declining	Uncommon
Blue-winged Warbler	Y	Shrublands	Rare/declining	Occasional
Prairie Warbler	Y	Shrublands	Rare/declining	Uncommon
Cerulean Warbler	Y	Forests	Rare/declining	Rare
Worm-eating Warbler	Y	Forests	Rare/declining	Uncommon
Louisiana Waterthrush	Y	Forests	Rare/declining	Uncommon
Kentucky Warbler	Y	Forests	Rare/declining	Uncommon
Field Sparrow	Y	Shrublands, grasslands	Rare/declining	Uncommon
Grasshopper Sparrow	N	Grasslands	Rare/declining	Occasional
Dickcissel	Y	Grasslands	Rare/declining	Common
Eastern Meadowlark	Y	Grasslands	Rare/declining	Common
Indiana bat	N	Forests, caves	Endangered	Unknown

Table 34: Potential Species Occurrence Scores for Threatened and Endangered Species or Groups for the Year 2000 and For Each Alternative in 2015 and 2100[1]

	2000	2015					2100				
Species		Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Bald Eagle	0.56	0.56	0.56	0.57	0.56	0.56	0.56	0.56	0.57	0.56	0.56
Indiana bat	0.58	0.63	0.63	0.62	0.64	0.63	0.67	0.68	0.67	0.68	0.68
All Species Scored	0.74	0.76	0.76	0.76	0.77	0.76	0.81	0.81	0.80	0.81	0.81
Forest Birds[2]	1.39	1.50	1.51	1.49	1.52	1.51	1.65	1.66	1.63	1.67	1.66
Grassland Birds[3]	0.14	0.09	0.08	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Shrubland Birds[4]	0.23	0.17	0.17	0.17	0.17	0.17	0.15	0.16	0.16	0.16	0.16
Waterfowl[5]	0.60	0.59	0.59	0.59	0.58	0.59	0.59	0.59	0.60	0.59	0.59

1. *Alternative A is No Action; Alternative B is Reduced Habitat Fragmentation, Wildlife-dependent Recreation; Alternative C is Open Land Management, Consolidate and Improve Recreation; Alternative D is Forest Land Management, Consolidate and Improve Recreation; and Alternative E is Reduce Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative).*
2. *Acadian Flycatcher, Cerulean Warbler, Chuck-will's-widow, Kentucky Warbler, Louisiana Waterthrush, Red-shouldered Hawk, Whip-poor-will, Wood Thrush, and Worm-eating Warbler.*
3. *Dickcissel, Eastern Meadowlark, Field Sparrow, and Grasshopper Sparrow.*
4. *Bell's Vireo, Blue-winged Warbler, Field Sparrow, Loggerhead Shrike, and Prairie Warbler.*
5. *American Black Duck, Blue-winged Teal, Canada Goose, Canvasback, Mallard, Northern Pintail, Wood Duck.*

Source:

Hop, Kevin D. 2001. Crab Orchard NWR land cover and land use spatial database (2000) project report, December 2001. U.S. Geological Survey report, LaCrosse, Wis., 29 pp.

Rohweder, Jason J., Timoth J. Fox, Kevin P. Kenow, Carl E. Korschgen, and Henry CC. DeHaan. 2002. GIS tools for national wildlife refuge comprehensive conservation plans; users manual. U.S. Geological Survey report, LaCrosse, Wis., 74 pp.

the same under all alternatives. Farming would have a small possible negative impact on cultural resources under all alternatives. The industrial pro grams on the Refuge are not expected to change markedly under any alternative and the effect on cultural resources is expected to be neutral. Fire suppression and management activities are expected to be consistent across alternatives and the possible impact on cultural resources is expected to be neutral.

Forest management activities, such as and thinning and reforestation of old farm fields, can have a negative effect on cultural resources through site disturbance. The five alternatives include slight variations on the acres affected by these activities. The effect of forest management activities on cultural resources is seen as being essentially equivalent across all alternatives with the potential of having a slightly negative effect on cultural resources. In the long term, the forest habitat will have few ground disturbing activities applied to it and cultural resource sites will be protected. Overall, the effect on cultural resources by forest management activities is seen as neutral.

4.2 Effects Common to All Action Alternatives

4.2.1 Threatened and Endangered Species

In a broad interpretation, each alternative would accomplish the purposes of the Refuge. Federally listed threatened and endangered species would be protected under each alternative. We conducted a Section 7 review concurrent with the preparation of the Final EIS. The Section 7 review examines the proposed actions of the preferred alternative.

4.2.2 Cooperative Fishery Management

Under each alternative the Refuge would cooperate with the State of Illinois to maintain a recreational fishery in the Refuge's lakes and ponds.

4.2.3 Canada Geese

Under each alternative, the Refuge would provide sufficient habitat for wintering Canada geese (6.4 million goose-use-days) to support historic population levels and provide opportunities for wildlife observation and photography and Refuge hunting programs.

4.2.4 Communication and Community Support

Under each alternative the Refuge's relationship with the community would improve through improved communication and community participation. The volunteer opportunities and Refuge support groups would be expected to increase and result in increased support for the Refuge and its programs.

4.2.5 Wilderness

The area designated as Wilderness would increase under each alternative. The Wilderness would be managed similarly under each alternative. Because the areas that would be designated as Wilderness are already managed as Wilderness, there would be no change from the current condition.

4.2.6 Climate Change Impacts

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

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."

Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, perpetual ice and desert – 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 this Comprehensive Conservation Plan would preserve or restore land and water, and would thus enhance carbon sequestration. This in turn contributes positively to efforts to mitigate human-induced global climate changes.

4.2.7 Prescribed Fire

We have included detail here about the effects of prescribed fire to fully document the Refuge's recent Fire Management Plan in compliance with the National Environmental Policy Act.

4.2.7.1. Social Implications

A prescribed burn on the Refuge will benefit 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 fire-breaks 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 reduced through management actions, which include: use of traffic control, signing, altering ignition techniques and sequence, halting ignition, suppressing the fire, and use of local law enforcement officers to assist with control traffic. Burning will be done only when the smoke will not be blown across the community or when the wind is sufficient to prevent 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 wind, and distance from population centers. In the event of wind direction change, mitigative measures will be taken to assure 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 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, may also be conducted on and off the Refuge.

4.2.7.2. 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.

Constructing firebreaks usually involves some shallow ground disturbance that could damage or destroy these resources. If a firebreak is needed on undisturbed ground, the area will be surveyed prior to construction to protect any cultural or archaeological resources.

4.2.7.3. 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 brush will be scorched. Trees may be scorched. Because of wet ground conditions or discontinuous fuel, there may be areas within the burn unit that are untouched by the fire.

In 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 two or three weeks the ground will be covered. In some cases, young trees will re-sprout. Some of the less fire resistant trees will show signs of wilting and may succumb. After one season of regrowth, most signs of the prescribed burn will be difficult to detect without close examination.

Other signs of the burn will remain for longer periods. The firebreaks will be maintained for use in containing wildland fires and future prescribed burns. Vehicle tracks through the burn are visible on the freshly burned ash and may be longer lived if the vehicle 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 an escape occurs and cannot be controlled by any other method. The trench of the plow would be repaired by filling, which would eliminate it from view after several years.

4.2.7.4. Fauna

Many faunal communities have adapted in a fire environment to survive the pattern of fire frequency, severity, and uniformity in their associated habitat. The prescribed burning program will mainly affect animals through changes in their habitat structure and composition. Prescribed fire will be applied judiciously to maximize benefits and minimize detrimental effects to wildlife.

The extent to which an animal's habitat is altered corresponds with the severity of the fire. Our prescribed fires are generally of low intensity, which causes minor to moderate changes to the habitat structure. For small animals, short-term loss of cover is usually the most visible post-fire habitat structure change. New growth of grasses and forbs provides cover soon after a fire event, as well as unburned pockets of vegetation. Larger animals, with their more extensive home ranges, are opportunistic and not usually negatively affected by fire.

Fire events often cause short-term increases in forage availability, palatability, and productivity. Browsers typically find plenty of young, tender sprouts from woody vegetation following fire events. More intense fires in woodlands can create snags which are used by variety of wildlife species.

4.2.7.5. Listed Species

All prescribed fires will be at least 0.5 mile from known active Bald Eagle nests. Prescribed fires will also occur outside of the breeding season of Indiana bats. We conducted a Section 7 review concurrent with the preparation of the Final EIS. The Section 7 review examines the prescribed fire program.

4.2.7.6. Soils

The effect of fire on 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, cooler headfires. 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 speed up the nutrient release 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.

4.2.7.7. Escaped Fire

The possibility exists that prescribed fire may escape to 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 factors that can lead to a loss of control. An escaped fire can turn into a very serious situation. On the Refuge's wildlands, an escaped fire would cause less severe damage than on land where buildings, equipment, and land improvements could 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 control when burning areas that are near developed areas or the Refuge boundary.

Tundra Swans, Crab Orchard NWR. Glenn Smart

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 Lake Egypt Fire Protection District 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.

4.3 Alternative A: Current Management/No Action

4.3.1 Impacts on Resources

4.3.1.1. Land cover

Under this alternative, the primary change in land cover of the Refuge over the next 15 years would be a decrease in fallow herbaceous fields (about 1,500 acres) and an increase in mixed hardwood upland forest (about 2,000 acres). Over the longer term, 100 years, the primary change would occur in the forests as pine plantations, shrubland, and red-cedar forests succeed to hardwood forest. Other changes in the shorter and longer terms are the succession of fallow and old fields to shrubland and forest cover types. The acres of land cover at the Refuge in 2000 and the acres projected for 2015 and 2100 under each alternative, along with the change from 2000, are shown in Table 35. The distribution of land cover for the years 2000, 2015, and 2100 are shown in Figure 21 on page 86, Figure 6 on page 36, and Figure 7 on page 37, respectively. .

Table 35: Areas of Land Cover at Crab Orchard NWR in 2000 and Acres Projected for 2015 and 2100 Under Each Alternative, With Change from 2000 Shown in Parentheses (Land Cover for Alternative E is the Same as Alternative B)

Land Cover	2000	2015				2100			
		Alt. A (No Action	Alts. B and E (Preferred)	Alt. C (Open Land)	Alt. D (Forest)	Alt. A (No Action)	Alts. B and E (Preferred)	Alt. C (Open Land)	Alt. D (Forest)
Agricultural Field	4,540	4,540 (0)	4,412 (-128)	4,751 (+211)	4,302 (-238)	4,540 (0)	4,412 (-128)	4,751 (+211)	4,301 (-238)
Aquatic Herbaceous Marsh	365	365 (0)	365 (0)	365 (0)	365 (0)	365 (0)	365 (0)	365 (0)	365 (0)
Bald-cypress Plantation, Swamp Forest	44	44 (0)	44 (0)	44 (0)	44 (0)	44 (0)	44 (0)	44 (0)	44 (0)
Buttonbush Swamp Shrubland	81	81 (0)	81 (0)	81 (0)	81 (0)	81 (0)	81 (0)	81 (0)	81 (0)
Cattail Marsh	25	25 (0)	25 (0)	25 (0)	25 (0)	25 (0)	25 (0)	25 (0)	25 (0)
Common Reed Marsh	7	7 (0)	7 (0)	7 (0)	7 (0)	7 (0)	7 (0)	7 (0)	7 (0)
Developed Land	1,138	1,138 (0)	1,138 (0)	1,138 (0)	1,138 (0)	1,138 (0)	1,138 (0)	1,138 (0)	1,138 (0)
Early Successional Oak Forest (reforested)	5	5 (0)	0 (-5)	0 (-5)	0 (-5)	0 (-5)	0 (-5)	0 (-5)	0 (-5)
Eastern Red-cedar, Mixed Hardwood Forest (old field)	1,006	1,006 (0)	1,006 (0)	1,006 (0)	1,006 (0)	0 (-1,006)	0 (-1,006)	0 (-1,006)	0 (-1,006)
Eastern Red-cedar Forest (old field)	71	71 (0)	71 (0)	71 (0)	71 (0)	0 (-71)	0 (-71)	0 (-71)	0 (-71)
Fallow Herbaceous Field	1,567	62 (-1,505)	172 (-1,395)	212 (-1,355)	174 (-1,393)	62 (-1,504)	172 (-1,394)	212 (-1,355)	174 (1,392)
Forest Regeneration Herbaceous Land	168	0 (-168)	0 (-168)	0 (-168)	0 (-168)	0 (-168)	0 (-168)	0 (-168)	0 (-168)
Mixed Hardwood Bottomland Forest	1,907	1,977 (+70)	2,042 (+135)	1,982 (+75)	2,042 (+135)	1,977 (+69)	2,042 (+135)	1,982 (+74)	2,042 (+135)
Mixed Hardwood Upland Forest	18,923	20,908 (+1,985)	21,148 (+2,225)	20,703 (+1,780)	21,297 (+2,374)	25,777 (+6,854)	25,869 (+6,946)	25,352 (+6,430)	26,030 (+7,107)
Open Water	9,082	9,082 (0)	9,082 (0)	9,082 (0)	9,082 (0)	9,082 (0)	9,082 (0)	9,082 (0)	9,082 (0)
Perennial Grass Crops	1,725	1,725 (0)	1,564 (-161)	1,659 (-66)	1,513 (-212)	1,725 (0)	1,564 (-160)	1,659 (-66)	1,513 (-212)
Pine Plantation / Mixed Hardwood Forest	1,633	1,633 (0)	1,633 (0)	1,633 (0)	1,633 (0)	0 (-1,633)	0 (-1,633)	0 (-1,633)	0 (-1,633)
Pine Plantation Forest	1,665	1,665 (0)	1,665 (0)	1,665 (0)	1,665 (0)	0 (-1,665)	0 (-1,665)	0 (-1,665)	0 (-1,665)
Restored native Grassland	240	240 (0)	261 (+21)	261 (+21)	260 (+20)	240 (0)	261 (+21)	261 (+21)	260 (+20)
Upland Mixed Shrubland (old field)	872	489 (-383)	347 (-525)	379 (-493)	358 (-514)	0 (-872)	0 (-872)	104 (-768)	0 (-872)
Wet Herbaceous Meadow	389	389 (0)	389 (0)	389 (0)	389 (0)	389 (0)	389 (0)	389 (0)	389 (0)
Willow Wet Shrubland	3	3 (0)	3 (0)	3 (0)	3 (0)	3 (0)	3 (0)	3 (0)	3 (0)

Table 36: Predicted Difference in Land Cover by Alternative for 2000, 2015 and 2100

	2000	2015	2100	2015	2100	2015	2100	2015	2100
Land Cover		Alt. A No Action	Alt. A No Action	Alts. B and E (Preferred Alternative)	Alts. B and E (Preferred Alternative)	Alt. C Open Land	Alt. C Open Land	Alt. D Forest	Alt. D Forest
Area of Forest (acres)	25,254	27,309	27,798	27,609	27,995	27,103	27,378	27,758	28,116
Percent of Refuge Forested	56	60	61	61	62	60	60	61	62
Percent of Non-Open Water Refuge Forested	69	75	76	76	77	75	75	76	77
Total Core of Area of Upland (acres)	4,300	5,741	11,824	6,155	12,117	5,709	11,616	6,185	12,156
Percent of Refuge in Upland Hardwood Core Area	9	13	26	14	27	13	26	14	27
Percent of Non-Open Water Refuge in Upland Hardwood Core Area	12	16	33	17	33	16	32	17	33

4.3.1.2. Threatened and Endangered Species

Under Alternative A (No Action), the PSO score (habitat potential) for Bald Eagles would remain the same (Table 34 on page 132). The amount of open water (feeding) habitat would remain the same (Table 35). Forest (nesting) habitat would increase about 8 percent by the end of the 15-year planning period and 10 percent by the year 2100 (Table 36). These increases would result mostly from the maturation of existing forests and the succession of fallow fields and shrub lands into forest. The majority of new forest habitat would probably be far enough away from open water to limit its potential as nesting habitat for Bald Eagles. Nesting habitat would improve somewhat as existing forest continues to mature resulting in more trees that are large enough to support a nest.

Under Alternative A (No Action), the PSO score for Indiana bats would increase by 9 percent by the end of the 15-year planning period and 16 percent by the year 2100 (Table 34 on page 132). Forest habitat would increase about 8 percent by the end of the 15-year planning period and 10 percent by the year 2100 (Table 36). These increases would result mostly from the maturation of existing forests and the succession of fallow fields and shrub lands to forest.

4.3.1.3. Area-sensitive Forest Bird Species

Under Alternative A (No Action), the PSO score for area-sensitive forest birds would increase by 8 percent by the end of the 15-year planning period and 19 percent by the year 2100 (Table 34 on page 132). Forest habitat for area-sensitive forest birds, such as Acadian Flycatcher, Wood Thrush, and Worm-eating Warbler, would increase about 8 percent by the end of the 15-year planning period and 10 percent by the year 2100. Most of these increases would result from the maturation of existing forests and the succession of fallow fields and shrub lands into forest.

To evaluate the potential effects of changing forest cover on area-sensitive forest species, we measured the number of acres of upland hardwood forest (our most abundant, natural forest type) that were more than 100 meters from the edge of other land cover. This provides a measure of forest core area: the interior portion of the forest that is far enough away from the forest edge to have decreased rates of nest predation and nest parasitism. Under this alternative, the amount of upland hardwood forest core area would increase about 31 percent over the 15-year planning period and 189 percent by the year 2100. Most of the increase will come from the conversion of pine plantations and the succession of red-cedar habitat to upland hardwood forest. Some

of the increase in upland hardwood core area will be a result of fallow fields and shrublands succeeding to forest habitat.

4.3.1.4. Waterfowl and Other Water Bird Species

Under Alternative A (No Action), the PSO for waterfowl would decrease by 2 percent by the end of the 15-year planning period and then remain stable through the year 2100 (Table 34). Habitat for Wood Ducks would improve as forests mature and increase in coverage. Habitat for Canada Geese would decrease slightly, mostly due to succession of fallow fields to shrub land (Table 35 and Table 36) and small decreases in row crop and hay field acreages (Table 2 on page 43). The amount of potential food for wintering Canada Geese would decrease by 3 percent, but there would still be an amount adequate for providing 6.4 million goose-use-days (Table 3 on page 44). Current goose management activities would continue: seasonal closure of the east end of Crab Orchard Lake, management of existing moist soil management units, and annual fall mowing of the shorelines of selected ponds. The lakes, ponds, moist soil units, and other Refuge wetlands would continue to provide habitat for shorebirds and other water birds.

4.3.1.5. Grassland Birds

Under Alternative A (No Action), the PSO score for grassland birds, such as Dickcissel and Eastern Meadowlark, would decrease by 36 percent by the end of the 15-year planning period and 43 percent by the year 2100 (Table 34 on page 132). Most of these decreases would result from the succession of fallow fields to shrub land and forest (Table 35 on page 136). Nesting conditions for grassland birds would be improved by the prohibition of mowing in clover and hay fields until August 1 of each year.

4.3.1.6. Shrubland Birds

Under Alternative A (No Action), the PSO score for shrub land birds, such as Bell's Vireo and Field Sparrow, would decrease by 26 percent by the end of the 15-year planning period and 35 percent by the year 2100 (Table 34). Most of these decreases would result from the succession of shrub land to forest (Table 35).

4.3.1.7. Water Quality

Working with farmers on the Refuge to establish buffer strips and keep stock away from riparian areas and bodies of water would affect water quality in this alternative. We expect that sedimentation in Crab Orchard Lake would decrease a small amount over the next 15 years. The resulting changes in the water chemistry would be minor. The water quality in the other lakes and streams on the Refuge would remain unchanged. Investigation by CERCLA and remediation of contaminated sites should result in improved water quality in portions of Crab Orchard Lake.

4.3.1.8. Wilderness

Under Alternative A (No Action) the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness would be thinned to promote establishment and growth of native hardwoods. Thinning would be conducted in several phases over a 10- to 15-year period to mimic the natural process of succession where pines are gradually replaced by hardwoods. Individual pines would be killed by cutting, girdling or injecting herbicide. No trees would be removed from the site. Treatments would be conducted so that the results would appear natural as much as possible. However, trees along heavily used trails may need to be felled to avoid personal injury to visitors, in which case this zone may appear unnatural for several years. Eventual removal of all the non-native pines would restore the natural vegetative cover of the area and enhance wilderness characteristics.

In conjunction with thinning the pine and pine-hardwood stands, prescribed burning would be conducted during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration. Control lines would be established by hand tools where necessary, using natural firebreaks as much as possible. Fire is a natural force in the ecosystem that should be reintroduced to provide many beneficial effects with minimal impacts.

Under Alternative A unauthorized sections of the River to River Trail would continue to pass through the Crab Orchard Wilderness. In addition, people would continue to ride horses and walk on other existing unauthorized trails and develop new ones. Trail erosion would continue and likely worsen because of increased foot and horse traffic and the lack of a hardened surface. Horses depositing dung along the trails may introduce invasive and exotic plants in the surrounding natural communities. An increased number of trail users, especially hikers, would express dissatisfaction with their trail experience.

The Wilderness would still be accessible to boaters from Devils Kitchen Lake using gas motors of 10 horsepower or less. The lake is not designated Wilderness, but the southern fingers of the lake extend far into the Wilderness.

4.3.2 Impacts on Public Uses

4.3.2.1. Wildlife-dependent Recreational Uses

Under Alternative A (No Action), wildlife-dependent recreational use levels would continue at the level experienced in 2000 with a slight increase over time due to population growth in the surrounding communities. Because the facilities would be gradually improved under this alternative, the quality of the recreational experience for visitors would gradually improve over the next 15 years. Goose hunting opportunities on and around the Refuge would remain unchanged.

4.3.2.2. Other Land- and Water-based Recreation

Camping

Four campgrounds would continue operation under this alternative. The facilities would be improved gradually over the next 15 years. The quality of the facilities and the camping experience would continue to be below the level available in nearby state park campgrounds.

Swimming

The opportunities and quality of experiences would remain unchanged from present conditions.

Picnicking

The opportunities and quality of experiences would gradually improve over the next 15 years as the current facilities are gradually improved.

Motorboating/sailing

Current management would continue under this alternative. Spatial and temporal zoning on Crab Orchard Lake would continue. Motors on Devils Kitchen and Little Grassy Lakes would continue to be limited to ten horsepower or less.

Water-skiing

The opportunities and quality of experiences would remain unchanged from present conditions. Conflicts would continue at the present level between users on Crab Orchard Lake.

Marinas

The capacity and condition of the marinas remain unchanged under this alternative.

Group Camps

Under this alternative camps and camp administration would remain unchanged from current conditions.

Private Clubs

Under this alternative clubs and their administration would remain unchanged from current conditions.

Horseback Riding

Under this alternative trails would continue to develop independent of plans and regulations. Trail erosion would continue and likely increase. The introduction of exotic plants would increase. An increased number of hikers would express dissatisfaction with their trail experience.

4.3.3 Volunteers and Support Groups

Under this alternative volunteer support and support from friends groups would increase gradually over the next 15 years.

4.3.4 Impacts on Industrial Use

Under this alternative the industrial operations on the Refuge would remain unchanged from current conditions.

4.3.5 Impacts on Agricultural Use

Under Alternative A (No Action), there would be few changes in agricultural operations on the Refuge when compared to current conditions. There would be little planned change in the number of acres farmed and grazed (Table 2 on page 43). Mowing of clover and hay fields would be prohibited until August 1 of each year.

4.3.6 Impact on Archaeological and Cultural Values

The impacts on archaeological and cultural values under Alternative A would remain unchanged from present conditions.

4.3.7 Boundary Modification

Under this alternative the existing boundaries of the Refuge would remain the same. We expect development to continue on inholdings and lands adjacent to the Refuge. There would be increased challenges to accomplishing the Refuge's wildlife conservation purpose.

4.4 Alternative B, Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis With Land Exchange

4.4.1 Impacts on Resources

4.4.1.1. Land Cover

Under this alternative, the primary change in land cover of the Refuge over the next 15 years would be a decrease in fallow herbaceous fields (about 1,400 acres) and shrubland (about 500 acres) and an increase in mixed hardwood upland forest (about 2,200 acres). Over the longer term, 100 years, the primary change would occur in the forests as pine plantations, shrubland, and red-cedar forests succeed to hardwood forest. Other changes in the shorter and longer terms are the succession of fallow and old fields to shrubland and forest cover types. There would also be a reduction in land used for row crops (about 100 acres) and hay fields (about 200 acres). The acres of land cover at Crab Orchard NWR in 2000 and the acres projected for 2015 and 2100 under each alternative, along with the change from 2000, are shown in Table 35 on page 136. The distribution of land cover types for the years 2000, 2015, and 2100 are shown in Figure 21 on page 86), Figure 9 on page 46, and Figure 10 on page 47, respectively. If the land exchange occurred, the forest land cover would be slightly more than is shown in the tables.

None of these changes would be large compared to the No Action Alternative. The predicted difference in land cover for Alternative A and Alternative B in 15 years is depicted in Figure 39.

4.4.1.2. Threatened and Endangered Species

Under Alternative B, the PSO score (habitat potential) for Bald Eagles would be the same as in Alternative A (Table 34 on page 132). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35 on page 136). The amount of forest (nesting) habitat would be 1 percent larger than in Alternative A (Table 36 on page 137).

Relative to Alternative A, the PSO score for Indiana bats would be the same over the 15-year planning period and be 1 percent larger by the year 2100 (Table 34).

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4.4.1.3. Area-sensitive Forest Bird Species

Under Alternative B, the PSO score for area-sensitive forest birds would be 1 percent larger than under Alternative A (Table 34). Increases in forest habitat would be 1 percent larger than in Alternative A (Table 35). Relative to Alternative A, the amount of core area habitat would be 7 percent larger by the end of the 15-year planning period and 2 percent larger by the year 2100 (Table 36). Management of two portions of the Refuge would focus on reducing forest fragmentation by reforestation of 490 acres of open habitats and burning and thinning pine plantations to encourage succession to more desirable hardwood forest.

4.4.1.4. Waterfowl and Other Water Bird Species

Under Alternative B, the PSO score for waterfowl would be the same as in Alternative A (Table 34 on page 132). The amount of food producing habitat would be 1 percent less than under Alternative A (Table 2 on page 43). Relative to Alternative A, there would be 16 percent less potential food for wintering Canada Geese, but there would still be an amount adequate for providing 6.4 million goose-use-days (Table 3 on page 44). Most of the additional decrease in potential goose food results from conversion of pasture cover from fescue to native, warm-season grasses.

4.4.1.5. Grassland Birds

Under Alternative B, the PSO score for grassland birds would be 11 percent lower by the end of the 15-year planning period and be the same by the year 2100, when compared to Alternative A (Table 34 on page 132). As in Alternative A, nesting conditions for grassland birds would be improved by the prohibition of mowing in clover and hay fields until August 1 of each year. Under Alternative B, nesting conditions for grassland birds would be improved by changes in grazing operations, including the conversion of pasture cover from fescue to native, warm-season grasses. Under Alternative B,

Figure 39: Differences in Land Cover, Crab Orchard NWR (Alternative A (No Action) / Alternative B and Alternative E (Preferred Alternative), 2015

124 acres of linear forest habitat and 8 miles of hedge rows would be removed to enhance nesting habitat for grassland birds.

4.4.1.6. Shrubland Birds

Under Alternative B, the PSO score for shrub land birds would be the same by the end of the 15-year planning period and 7 percent lower by the year 2100, when compared to Alternative A (Table 34). Under Alternative B, some potential shrub land bird habitat (124 acres of linear forest habitat and 8 miles of hedge rows) would be removed to enhance nesting habitat for grassland birds.

4.4.1.7. Water Quality

In addition to working with farmers on the Refuge to establish buffer strips and keep stock away from riparian areas and bodies of water, under this alternative the Refuge staff would work with landowners in the watershed beyond the Refuge boundaries. We would expect less sedimentation in Crab Orchard Lake under this alternative than under Alternative A over the next 15 years. Investigation by CERCLA and remediation of contaminated sites should result in improved water quality in portions of Crab Orchard Lake, similar to Alternative A. The water quality in the other lakes and streams on the Refuge would also improve compared to Alternative A. The high quality water of Devils Kitchen Lake would be better protected under this alternative than under Alternative A.

4.4.1.8. Wilderness

Under Alternative B the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness would be thinned to promote establishment and growth of native hardwoods. Thinning would be conducted in several phases over a 10- to 15-year period to mimic the natural process of succession where pines are gradually replaced by hardwoods. Individual pines would be killed by cutting, girdling or injecting herbicide. No trees would be removed from the site. Treatments would be conducted so that the results would appear natural as much as possible. However, trees along heavily used trails may need to be felled to avoid personal injury to visitors, in which case this zone may appear unnatural for several years. Eventual removal of all the non-native pines would restore the natural vegetative cover of the area and enhance wilderness characteristics.

In conjunction with thinning the pine and pine-hardwood stands, prescribed burning would be conducted during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration. Control lines would be established by hand tools where necessary, using natural firebreaks as much as possible. Fire is a natural force in the ecosystem that should be reintroduced to provide many beneficial effects with minimal impacts.

Under Alternative B the proposed River to River Trail route through the Crab Orchard Wilderness would become an officially designated trail for horseback riding and hiking. The trail would require substantial rehabilitation and regular maintenance to protect the fragile soils from increased foot and horse traffic. Horses depositing dung along the trail may introduce invasive and exotic plants in the surrounding natural communities. Since equestrians would be restricted to the River to River Trail, horseback riding on trails elsewhere in the Wilderness, and the associated impacts, would be eliminated.

Gas boat motors would be prohibited on the southern part of Devils Kitchen Lake. There would be a decline in visits, particularly for big game hunting, in the Wilderness bordering the shores of Devils Kitchen Lake because of the greater difficulty of access.

4.4.2 Impacts on Public Uses

4.4.2.1. Wildlife-dependent Recreational Uses

As a function of increased opportunities, accessibility, and improved facilities, under this alternative wildlife-dependent recreational use levels and quality of experiences would increase more than in Alternative A. Because the opportunities for teachers and students to use the Refuge would increase, a secondary effect would be a long-term increase in the community's conservation ethic. An increase in wildlife observation and photography would contribute to a minimal increase in wildlife disturbance. Goose hunting opportunities around the Refuge would remain the same as under Alternative A.

4.4.2.2. Other Land- and Water-based Recreation

Camping

One concession-operated campground on Little Grassy Lake would continue under this alternative. The facilities would be improved to industry standards within 5 years. The campground at Devils Kitchen would be discontinued and the area re-veg-

etated. The campground on Crab Orchard Lake, owned and managed by Southern Illinois University, would be improved. The quality of the facilities and the camping experience would be at the level available in nearby state park campgrounds. In comparison to the No Action Alternative, the campgrounds would be improved more rapidly under this alternative. The traditional users of the Devils Kitchen Campground would need to find alternative campgrounds, most likely at Giant City and Ferne Clyffe State Parks or the Little Grassy Campground. At Little Grassy Campground, we would limit the length of stay to 14 nights comparable with other Federal and State campgrounds in the area. For the first 2 years, approximately one-half of the campsites would remain available for long-term camping and the other half for stays up to 14 days maximum. The second 2-year period would permit up to one-third of campsites be available for 28-day stays and the remaining two-thirds would be limited to 14-day maximum stays. Finally, beginning in the fifth year, a 14-day maximum stay would apply to all campsites. We would require persons to remove all camping equipment from the campground for 48 hours at the end of any consecutive 14-day stay. Storage of equipment such as recreational vehicles and trailers would be prohibited. In addition, a reservation system would be developed for the campground. People who are accustomed to using a particular campsite for the entire season would be displaced. There would be greater opportunity and equity among visitors using the campground and the selection of prime sites.

Swimming

There would be increased swimming opportunities and higher quality of experiences in the Crab Orchard Lake area under this alternative. The concepts of Southern Illinois University include a water park, which would provide better opportunities compared to the No Action Alternative. There would be no developed beaches for the general public on other parts of the Refuge. Swimming would continue at the group camps and the campground on Little Grassy Lake. Under this alternative, some members of the local community would perceive a better fulfillment of their concept of the recreation purpose for the area, although the purpose would be achieved by Southern Illinois University rather than the Fish and Wildlife Service.

Picnicking

There would be increased picnicking opportunities and higher quality experiences in the Crab Orchard Lake area under this alternative. The opportunities for picnicking on other parts of the Refuge would improve to industry standards within five years as facilities were improved. Opportunities for picnicking on the Refuge would be provided to support wildlife-dependent recreation. The purpose would be achieved through actions by Southern Illinois University and the Fish and Wildlife Service.

Motorboating/sailing

Because gas motors would be prohibited south of the southernmost boat ramp on Devils Kitchen Lake, visitors to the lake would experience a quieter environment. Boaters who wanted to travel in the southern half of Devils Kitchen Lake would have to rely on electric trolling motors, paddling, or rowing for mobility. Boating use is not expected to change significantly on Devils Kitchen Lake.

Water-skiing

Because additional no-wake zones would be implemented under this alternative compared to Alternative A, anglers would have a better experience on Crab Orchard Lake. Conflict between anglers and personal watercraft users/waterskiers would be reduced. There would be fewer acres of water available for water-skiing under this alternative.

Marinas

Under this alternative the marinas on Crab Orchard Lake would be part of the land exchange with Southern Illinois University. The marinas at Little Grassy and Devils Kitchen Lakes would remain unchanged in quality and capacity. The marina facilities and related amenities on Crab Orchard Lake would increase under this alternative. The community interest in more developed facilities would be better met than under the No Action Alternative. There would be some increase in the local economy from increased tourist dollars. Students would receive training for careers in recreation management. There would be more intensive use on Crab Orchard Lake with a possible change in the nature of water-based recreation. Traditional users may feel more crowded under this alternative than under the No Action Alternative.

Group Camps

Campers will receive environmental education and the Refuge will be more actively involved in environmental education programming.

Private Clubs

Under this alternative the private clubs – The Haven and the Crab Orchard Boat & Yacht Club – would be part of the land transfer to Southern Illinois University. The expectation would be that the current use of The Haven would be accommodated at SIU facilities such as Touch of Nature or at the present site. The Boat & Yacht Club would continue its current operations under SIU ownership.

Horseback Riding

Horseback riding would be regulated under this alternative. Trail erosion and vegetative impacts would be reduced compared to Alternative A. The introduction of exotic species would be limited to a smaller area than in Alternative A. Hikers would have an improved trail experience compared to Alternative A.

4.4.3 Volunteer and Support Groups

Under this alternative volunteer support and support from friends groups would increase more over the next 15 years than in Alternative A.

4.4.4 Impacts on Industrial Use

Under this alternative, tenants would be expected to bring the leased facilities up to prescribed health and safety standards prior to moving into the facility. Therefore, initial costs to tenants would be greater than under Alternative A.

4.4.5 Impacts on Agricultural Use

Under Alternative B, agricultural operations on the Refuge would change little from current conditions. Relative to Alternative A, there would be 100 fewer acres of land farmed for row crops and 200 fewer acres mowed for hay. As in Alternative A, mowing of clover and hay fields would be prohibited until August 1 of each year.

4.4.6 Impacts on Archaeological and Cultural Values

Compared to Alternative A, Alternative B would have a neutral effect on cultural resources. The wildlife-dependent recreation component of the visitor services program would expand, but the majority of the expansion would not be related to ground disturbing activities. Horse traffic may increase erosion where trails pass through archaeological sites. The proposed plan will require horses to stay on a designated trail, which will protect any areas with sensitive resources. Under Alternative B, horseback use would be restricted to designated trails with possible unknown effect on cultural resources. Overall, the change in management of horseback use is viewed as having a slightly positive effect on cultural resources.

Indigo Bunting, Glenn Smart

Little or no impacts to cultural resources would occur as a result of the land exchange proposed in Alternative B. Although there is the potential for more ground disturbing activities as Southern Illinois University develops recreation facilities on the exchanged lands, Federal agencies must ensure that the significant values of federally owned historic properties will be preserved or enhanced. The Fish and Wildlife Service cannot dispose of historic properties unless the conservation of those resources are ensured by another agency or entity.

4.4.7 Boundary Modification

Under this alternative the authorized boundaries of the Refuge would expand. Over the long-term the Refuge would acquire additional property or property rights from willing sellers.

Acquired lands would contribute to the goals of the CCP by reducing habitat fragmentation, removing disruptions to public access, reducing disturbance to wildlife, and reducing potential interference with management activities. Acquiring inholdings creates the potential to restore habitats and further reduce fragmentation, particularly in the forested southwest portion of the Refuge. The Refuge contributes to a large block of forest in southern Illinois that includes contiguous lands managed by Southern Illinois University (Touch of Nature), State of Illinois (Giant City State Park), and U.S. Forest Service (Shawnee National Forest).

The reduced fragmentation would benefit area-sensitive forest birds, such as pileated woodpecker, yellow-billed cuckoo, and Kentucky warbler. The increased forested area also would provide more potential habitat for the endangered Indiana bat. If the inholdings were acquired, there would be increased opportunity for the public to pursue wildlife-dependent recreation on the Refuge. Because maintaining a boundary requires money and staff time, acquiring inholdings would lessen the demand on the Refuge budget and staff as boundaries internal to the Refuge are eliminated.

Because developed property is often accompanied by increased human activity and pets, which can disturb wildlife, acquisition of inholdings and potentially developed property up to the well defined boundary of a road would lead to potentially less disturbance of wildlife. Some Refuge management activities, prescribed burning and hunting, for example, benefit from well defined boundaries. By moving the Refuge boundary to a road and acquiring inholdings, management, particularly burning and hunting programs, would be made more efficient and safer.

Currently, if a landowner wishes to sell or exchange land that is outside the authorized boundary of the Refuge, the Service must complete an analysis for the individual parcel and complete environmental documents related to the transaction. This tract-by-tract analysis is inefficient and does not provide for an overall, cumulative analysis of the land transactions. Under this alternative the entire boundary modification is evaluated so that delays in land transactions, which may be detrimental to the seller, should be reduced.

Land acquired by the Refuge would be taken off the county tax rolls. However, payments in lieu of taxes (revenue sharing) would be made to the respective counties. These payments are expected to be nearly equivalent to taxes. Eventually a larger block of unfragmented forest would exist with increased benefit to area sensitive forest species compared to Alternative A.

The consequences of the land exchange portion of the boundary modification are discussed under the recreation, economic, and cumulative effects consequences sections of this chapter. As proposed, a land exchange would result in a loss to federal government (based on the appraisal value of the land). The loss might be as much as $20 million.

4.5 Alternative C: Open Land Management, Consolidate and Improve Recreation

4.5.1 Impacts on Resources

4.5.1.1. Land Cover

Under this alternative, the primary change in land cover of the Refuge over the next 15 years would be a decrease in fallow herbaceous fields (about 1,400 acres) and shrubland (about 500 acres) and an increase in mixed hardwood upland forest (about 1,800 acres). Over the longer term, 100 years, the primary change would occur in the forests as pine plantations, shrubland, and red-cedar forests succeed to hardwood forest. Other changes in the shorter and longer terms are the succession of fallow and old fields to shrubland and forest cover types. There would also be an increase in land used for row crops (about 200 acres) and a decrease in hay fields (about 100 acres). The acres of land cover at Crab Orchard NWR in 2000 and the acres projected for 2015 and 2100 under each alternative, along with the change from 2000, are shown in Table 35 on page 136. The distribution of land cover for the years 2000, 2015, and 2100 are shown in Figure 21 on page 86, Figure 14 on page 60, and Figure 15 on page 61, respectively.

The predicted difference in land cover for Alternative A and Alternative C in 15 years is depicted in Figure 40.

4.5.1.2. Threatened and Endangered Species

Under Alternative C, the PSO score (habitat potential) for Bald Eagles would be 1 percent greater than under Alternative A (Table 34 on page 132). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35

Figure 40: Predicted Difference in Land Cover, Alternative A (No Action) / Alternative C (Open Land Management), 2015

on page 136). The amount of forest (nesting) habitat would be less than 1 percent smaller than in Alternative A (Table 36 on page 137).

Relative to Alternative A, the PSO score for Indiana bats would be 2 percent smaller by the end of the 15-year planning period and the same by the year 2100 (Table 34).

4.5.1.3. Area-sensitive Forest Bird Species

Under Alternative C, the PSO score for area-sensitive forest birds would be 1 percent smaller than under Alternative A (Table 34 on page 132). The amount of forest habitat would be less than 1 percent smaller than in Alternative A (Table 35). Relative to Alternative A, the amount of core area habitat would be 1 percent smaller by the end of the 15-year planning period and 2 percent smaller by the year 2100 (Table 36 on page 137).

4.5.1.4. Waterfowl and Other Water Bird Species

Under Alternative C, the PSO score for waterfowl would be the same by the end of the 15-year planning period and 2 percent smaller by the year 2100 than Alternative A (Table 34 on page 132). The amount of food-producing habitat would be 2 percent greater than under Alternative A (Table 2 on page 43). Relative to Alternative A, there would be 7 percent less potential food for wintering Canada Geese, but there would still be an amount adequate for providing 6.4 million goose-use-days (Table 3 on page 44). Most of the additional decrease in potential goose food results from conversion of pasture cover from fescue to native, warm-season grasses.

4.5.1.5. Grassland Birds

Under Alternative C, the PSO score for grassland birds would be the same as under Alternative A (Table 34). As in Alternative A, nesting conditions for grassland birds would be improved by the prohibition of mowing in clover and hay fields until August 1 of each year. Under Alternative C, nesting conditions for grassland birds would be improved by changes in grazing operations, including the conversion of pasture cover from fescue to native, warm-season grasses. Under Alternative C, 124 acres of linear forest habitat and 8 miles of hedge rows would be removed to enhance nesting habitat for grassland birds.

4.5.1.6. Shrubland Birds

Under Alternative C, the PSO score for shrub land birds would be the same by the end of the 15-year planning period and 7 percent larger by the year 2100, when compared to Alternative A (Table 34). Under Alternative C, some potential shrub land bird habitat (124 acres of linear forest habitat and 8 miles of hedge rows) would be removed to enhance nesting habitat for grassland birds.

4.5.1.7. Water Quality

Same as Alternative A (page 138).

4.5.1.8. Wilderness

Under Alternative C the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness would not be artificially thinned to promote more rapid establishment and growth of native hardwoods. Eventually, all the non-native pines should die naturally, thus restoring the native vegetative cover of the area and enhancing its wilderness character. However, it is estimated that this purely natural process could take 30 to 60 years – or perhaps longer if pines were to regenerate from seed. The continued presence of non-native pines would have long-term (but decreasing) negative impacts on ecosystem integrity and wilderness character.

The pine and pine-hardwood stands in the Wilderness would not be prescribed burned to enhance habitat conditions and promote desirable hardwood regeneration. Fire is a natural force in the ecosystem which can provide many beneficial effects with minimal impacts. Without the use of fire the forest would likely have a greater proportion of sugar maple and a smaller component of oaks. Since oaks generally provide higher quality wildlife habitat than sugar maple, exclusion of fire would reduce the overall quality of habitat.

Under Alternative C the proposed River to River Trail route through the Crab Orchard Wilderness would become an officially designated trail for horseback riding and hiking. The trail would require substantial rehabilitation and regular maintenance to protect the fragile soils from increased foot and horse traffic. Horses depositing dung along the trail may introduce invasive and exotic plants in the surrounding natural communities. Since equestrians would be restricted to the River to River Trail, horseback riding on trails elsewhere in the Wilderness, and the associated impacts, would be eliminated.

Gas boat motors would be prohibited on the southern part of Devils Kitchen Lake. There would be a decline in visits, particularly for big game hunting, in the Wilderness bordering the shores of Devils Kitchen Lake because of the greater difficulty of access.

4.5.2 Impacts on Public Uses

4.5.2.1. Wildlife-dependent Recreational Uses

As a function of somewhat increased opportunities, accessibility, and improved facilities, under this alternative wildlife-dependent use levels and quality of experiences would increase more than in Alternative A, but less than in Alternative B for hunting, fishing, observation and photography. As in Alternative B, the quality of the interpretive experience would increase. The improvements that would be made under this alternative would be implemented at a pace between that in Alternative A and B. Thus, the increases in use and quality of experiences would not be as rapid as under Alternative B. Because the opportunities for teachers and students to use the Refuge would increase, a secondary effect would be a long-term increase in the community's conservation ethic. An increase in wildlife observation and photography would contribute to a minimal increase in wildlife disturbance. Goose hunting opportunities around the Refuge would remain the same as under Alternative A.

4.5.2.2. Other Land- and Water-based Recreation

Camping

Three concession-operated campgrounds on the Refuge would continue under this alternative. In an effort to speed the improvement in the quality of facilities, the size of the campgrounds would be reduced. Limited resources would thus be directed at improving fewer facilities. The facilities would gradually be improved to standards comparable to others in the area over the next 10 years. The quality of the facilities and the camping experience would continue at a level below that available in nearby state park campgrounds for the next 10 years. In comparison to the No Action Alternative, there would be fewer camping opportunities, but they would be brought to standards comparable to others in the area in fewer years. The opportunity to occupy a campsite indefinitely would be discontinued as a 14-day stay limit was implemented. People who are accustomed to using a particular campsite for the entire season would be displaced. There would be greater opportunity and equity among visitors using the campground and the selection of prime sites.

Swimming

Same as Alternative A (page 139).

Picnicking

Same as Alternative A (page 139).

Motorboating/sailing

Same as Alternative A (page 139).

Water-skiing

There would be fewer acres of water available for water-skiing under this alternative than Alternative A. Because all bays on Crab Orchard Lake would be closed to water-skiing under this alternative and there would be additional no-wake zones, anglers would have a better experience on Crab Orchard Lake and conflict between anglers and personal watercraft users and waterskiers would be reduced, compared to Alternative A.

Marinas

The marinas at Little Grassy and Devils Kitchen Lakes would remain unchanged in quality and capacity compared to the No Action Alternative. Under this alternative the former Images Marina slips would be moved and consolidated at the Playport Marina. The present Images Marina site would become a multi-lane public boat ramp. The changes would result in a consolidated marina operation on Crab Orchard Lake. Boat access to Crab Orchard Lake would be increased, improved, and made safer compared to the No Action Alternative. The amount of use on Crab Orchard Lake would not change significantly compared to the No Action Alternative.

Group Camps

Same as Alternative B (page 143).

Private Clubs

Under this alternative, after 2 years the Crab Orchard Boat & Yacht Club would become a public, non-member facility operated as a concession. The Boat & Yacht Club tradition would end. The social atmosphere at the Club would become less personal.

Horseback Riding

Same as Alternative B (page 144).

4.5.3 Volunteer and Support Groups

Same as Alternative B (page 144).

4.5.4 Impacts on Industrial Use

Under this alternative existing tenants would continue at their option as long as they met the conditions of their lease. Leases would not be granted to any new tenants. Because there would be fewer leases from loss by attrition, there would be less rental revenue for the Refuge. The demand for cold storage facilities would increase in the local area. The local industrial parks would experience less

competition from the federal government under this alternative compared to the No Action Alternative. The total employment in the local area would not change. The industrial areas on the Refuge would be consolidated. Former industrial areas would be reclaimed, which would result in an increase in wildlife habitat compared to the No Action Alternative.

4.5.5 Impacts on Agricultural Use

Under Alternative C, agricultural operations on the Refuge would change little from current conditions. Relative to Alternative A, there would be 300 more acres of land farmed for row crops. As in Alternative A, mowing of clover and hay fields would be prohibited until August 1 of each year.

4.5.6 Impacts on Archaeological and Cultural Values

Compared to Alternative A, Alternative C would have a slightly positive effect on cultural resources. Grazing, farming, timber harvest, fire suppression, and revegetation of fields are all essentially the same or are only slightly modified. A positive program change includes the increased control of horseback riding. Because there would be less development of recreation facilities under Alternative C, there would be fewer ground disturbing activities and less potential effect on cultural resources.

4.5.7 Boundary Modification

Under this alternative the authorized boundary of the Refuge would expand as in Alternative B, but without the land exchange with SIU. The consequences would be similar to Alternative B.

4.6 Alternative D: Forest Land Management, Consolidate and Improve Recreation

4.6.1 Impacts on Resources

4.6.1.1. Land Cover

Under this alternative, the primary change in land cover of the Refuge over the next 15 years would be a decrease in fallow herbaceous fields (about 1,400 acres) and shrubland (about 500 acres) and an increase in mixed hardwood upland forest (about 2,400 acres). Over the longer term, 100 years, the primary change would occur in the forests as pine plantations, shrubland, and red-cedar forests succeed to hardwood forest. Other changes in the shorter and longer terms are the succession of fallow and old fields to shrubland and forest cover types. There would also be a decrease in land used for row crops (about 200 acres) and a decrease in hay fields (about 200 acres). The acres of land cover at Crab Orchard NWR in 2000 and the acres projected for 2015 and 2100 under each alternative, along with the change from 2000, are shown in Table 35 on page 136. The distribution of land cover types for the years 2000, 2015, and 2100 are shown in Figure 21 on page 86, Figure 16 on page 68 and Figure 17 on page 69, respectively.

The predicted difference in land cover for Alternative A and Alternative D in 15 years is depicted in Figure 41.

4.6.1.2. Threatened and Endangered Species

Under Alternative D, the PSO score (habitat potential) for Bald Eagles would be the same as under Alternative A (Table 34 on page 132). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35 on page 136). Relative to Alternative A, the amount of forest (nesting) habitat would be 2 percent greater by the end of the 15-year planning period and 1 percent greater by the year 2100 (Table 36 on page 137).

Relative to Alternative A, the PSO score for Indiana bats would be 2 percent greater by the end of the 15-year planning period and by the year 2100 (Table 34 on page 132).

4.6.1.3. Area-sensitive Forest Bird Species

Under Alternative D, the PSO score for area-sensitive forest birds would be 1 percent greater than under Alternative A (Table 34). Relative to Alternative A, the amount of forest habitat would be 2 percent greater by the end of the 15-year planning period and 1 percent greater by the year 2100 (Table 36 on page 137). Relative to Alternative A, the amount of core area habitat would be 1 percent greater by the end of the 15-year planning period and 3 percent greater by the year 2100 (Table 36).

4.6.1.4. Waterfowl and Other Water Bird Species

Under Alternative D, the PSO score for waterfowl would be 2 percent smaller by the end of the 15-year planning period and the same by the year 2100 as in Alternative A (Table 34). The amount of food producing habitat would be 3 percent less than under Alternative A (Table 2 on page 43). Relative

Figure 41: Predicted Difference in Land Cover, Alternative A (No Action) / Alternative D (Forest Land Management), 2015

to Alternative A, there would be 7 percent less potential food for wintering Canada Geese, but there would still be an amount adequate for providing 6.4 million goose-use-days (Table 3 on page 44). Most of the additional decrease in potential goose food results from conversion of pasture cover from fescue to native, warm-season grasses.

4.6.1.5. Grassland Birds

Under Alternative D, the PSO score for grassland birds would be 11 percent less by the end of the 15-year planning period and the same by the year 2100 as under Alternative A (Table 34 on page 132). As in Alternative A, nesting conditions for grassland birds would be improved by the prohibition of mowing in clover and hay fields until August 1 of each year. Under Alternative D, 15 acres of linear forest habitat and 2 miles of hedge rows would be removed to enhance nesting habitat for grassland birds.

4.6.1.6. Shrubland Birds

Under Alternative D, the PSO score for shrub land birds would be the same during the 15-year planning period and 7 percent larger by the year 2100, when compared to Alternative A (Table 34). Under Alternative D, some potential shrub land bird habitat (15 acres of linear forest habitat and 2 miles of hedge rows) would be removed to enhance nesting habitat for grassland birds.

4.6.1.7. Water Quality

Same as Alternative A (page 138).

4.6.1.8. Wilderness

Under Alternative D the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness would be thinned to promote establishment and growth of native hardwoods. Thinning would be conducted in several phases over a 10- to 15-year period to mimic the natural process of succession where pines are gradually replaced by hardwoods. Individual pines would be killed by cutting, girdling or injecting herbicide. No trees would be removed from the site. Treatments would be conducted so that the results would appear natural as much as possible. However, trees along heavily used trails may need to be felled to avoid personal injury to visitors, in which case this zone may appear unnatural for several years. Eventual removal of all the non-native pines would restore the natural vegetative cover of the area and enhance wilderness characteristics.

In conjunction with thinning the pine and pine-hardwood stands, prescribed burning would be conducted during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration. Control lines would be established by hand tools where necessary, using natural firebreaks as much as possible. Fire is a natural force in the ecosystem that should be reintroduced to provide many beneficial effects with minimal impacts.

Under Alternative D horseback riding would not be permitted anywhere on the Refuge. Therefore, the River to River Trail would not be officially routed through the Crab Orchard Wilderness. Existing trails in the Wilderness would continue to be used by hikers, but the trails likely would become overgrown with vegetation without horse traffic. Invasive and exotic plants would not be introduced in the surrounding natural communities by horses depositing dung.

The Wilderness would still be accessible to boaters from Devils Kitchen Lake using gas motors of 10 horsepower or less. The lake is not designated Wilderness, but the southern fingers of the lake extend far into the Wilderness.

4.6.2 Impacts on Public Uses

4.6.2.1. Wildlife-dependent Recreational Uses

Same as Alternative C for hunting, fishing, and wildlife observation and photography. Same as Alternative B for interpretation and environmental education.

4.6.2.2. Other Land- and Water-based Recreation

Camping

Same as Alternative C (page 148).

Swimming

Same as Alternative A (page 139).

Picnicking

Same as Alternative A (page 139).

Motorboating/sailing

Because gas motors would be prohibited on Devils Kitchen Lake, visitors to the lake would experience a quieter environment. Boaters who wanted to travel on Devils Kitchen Lake would have to rely on electric trolling motors, paddling, or rowing for mobility. There would be some shift in the anglers, in particular, using the lake as some current anglers would choose not to fish at the lake under the new

restriction and new anglers would be drawn to the lake because of the quiet setting. Overall, boating on the lake would decrease.

Water-skiing

Same as Alternative C (page 148).

Marinas

Same as Alternative C (page 148).

Group Camps

Same as Alternative B (page 143).

Private Clubs

Same as Alternative C (page 148).

Horseback Riding

Under this alternative horseback riding would be excluded from the Refuge. Horseback riders on the River to River Trail would continue to travel a less scenic route bypassing the Refuge. There would be less trail erosion and fewer introductions of exotic plants than in Alternative A. Hikers on the trails in the Crab Orchard Wilderness would walk on a smoother tread and some hikers would report a better experience than under Alternative A.

4.6.3 Volunteer and Support Groups

Same as Alternative B (page 144).

4.6.4 Impacts on Industrial Use

Same as Alternative C (page 148).

4.6.5 Impacts on Agricultural Use

Under Alternative D, agricultural operations on the Refuge would change little from current conditions. Relative to Alternative A, there would be 200 fewer acres of land farmed for row crops and 200 fewer acres of land mowed for hay. Farming in fields smaller then 5 acres would be discontinued. As in Alternative A, mowing of clover and hay fields would be prohibited until August 1 of each year.

4.6.6 Archaeological and Cultural Values

Alternative D is similar to Alternative C, except for some slight modifications that make this alternative slightly more positive toward cultural resources. The prohibition of horseback use on the Refuge would lessen slightly the potential effect on cultural resources.

4.6.7 Boundary Modification

Same as Alternative C (page 149).

4.7 Alternative E, Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)

4.7.1 Impacts on Resources

4.7.1.1. Land Cover

Under this alternative, the primary change in land cover of the Refuge over the next 15 years would be a decrease in fallow herbaceous fields (about 1,400 acres) and shrubland (about 500 acres) and an increase in mixed hardwood upland forest (about 2,200 acres). Over the longer term, 100 years, the primary change would occur in the forests as pine plantations, shrubland, and red-cedar forests succeed to hardwood forest. Other changes in the shorter and longer terms are the succession of fallow and old fields to shrubland and forest cover types. There would also be a reduction in land used for row crops (about 100 acres) and hay fields (about 200 acres). The acres of land cover at Crab Orchard NWR in 2000 and the acres projected for 2015 and 2100 under each alternative, along with the change from 2000, are shown in Table 35 on page 136. The distribution of land cover types for the years 2000, 2015, and 2100 are shown in Figure 21 on page 86, Figure 9 on page 46 and Figure 10 on page 47, respectively.

None of these changes would be large compared to the No Action Alternative. The predicted difference in land cover for Alternative A and Alternative E in 15 years is depicted in Figure 39 on page 141.

4.7.1.2. Threatened and Endangered Species

Under Alternative E, the PSO score (habitat potential) for Bald Eagles would be the same as in Alternative A (Table 34 on page 132). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35 on page 136). The amount of forest (nesting) habitat would be 1 percent larger than in Alternative A (Table 36 on page 137).

Relative to Alternative A, the PSO score for Indiana bats would be the same over the 15-year planning period and be 1 percent larger by the year 2100 (Table 34).

4.7.1.3. Area-sensitive Forest Bird Species

Under Alternative E, the PSO score for area-sensitive forest birds would be 1 percent larger than under Alternative A (Table 34). Increases in forest habitat would be 1 percent larger than in Alternative A (Table 35). Relative to Alternative A, the amount of core area habitat would be 7 percent larger by the end of the 15-year planning period and 2 percent larger by the year 2100 (Table 36). Management of two portions of the Refuge would focus on decreasing forest fragmentation by reforestation of 490 acres of open habitats and burning and thinning pine plantations to encourage succession to more desirable hardwood forest.

4.7.1.4. Waterfowl

Under Alternative E, the PSO score for waterfowl would be the same as in Alternative A (Table 34). The amount of food producing habitat would be 1 percent less than under Alternative A (Table 35). Relative to Alternative A, there would be 16 percent less potential food for wintering Canada Geese, but there would still be an amount adequate for providing 6.4 million goose-use-days (Table 3 on page 44). Most of the additional decrease in potential goose food results from conversion of pasture cover from fescue to native, warm-season grasses.

4.7.1.5. Grassland Birds

Under Alternative E, the PSO score for grassland birds would be 11 percent lower by the end of the 15-year planning period and be the same by the year 2100, when compared to Alternative A (Table 34 on page 132). As in Alternative A, nesting conditions for grassland birds would be improved by the prohibition of mowing in clover and hay fields until August 1 of each year. Under Alternative E, nesting conditions for grassland birds would be improved by changes in grazing operations, including the conversion of pasture cover from fescue to native, warm-season grasses. Under Alternative E, 124 acres of linear forest habitat and 8 miles of hedge rows would be removed to enhance nesting habitat for some grassland birds.

4.7.1.6. Shrubland Birds

Under Alternative E, the PSO score for shrub land birds would be the same by the end of the 15-year planning period and 7 percent lower by the year 2100, when compared to Alternative A (Table 34). Under Alternative E, some potential shrub land bird habitat (124 acres of linear forest habitat and 8 miles of hedge rows) would be removed to enhance nesting habitat for grassland birds. About 300 acres of early successional habitat would be maintained: prescribed fire or mechanical treatment to disturb about 200 acres every 3 to 5 years and about 100 acres of 30-foot-wide borders of native warm-season grasses would be established in row crop fields in the open portion of the Refuge.

Wood Thrush, U.S. Fish & Wildlife Service

4.7.1.7. Water Quality

In addition to working with farmers on the Refuge to establish buffer strips and keep stock away from riparian areas and bodies of water, under this alternative the Refuge staff would work with landowners in the watershed beyond the Refuge boundaries. We would expect less sedimentation in Crab Orchard Lake under this alternative than under Alternative A over the next 15 years. Investigation by CERCLA and remediation of contaminated sites should result in improved water quality in portions of Crab Orchard Lake, similar to Alternative A. The water quality in the other lakes and streams on the Refuge would also improve compared to Alternative A. The high quality water of Devils Kitchen Lake would be better protected under this alternative than under Alternative A.

4.7.1.8. Wilderness

Under Alternative E (Preferred Alternative) the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness would be thinned to promote establishment and growth of native hardwoods. Thinning would be conducted in several phases over a 10- to 15-year period to mimic the natural process of succession where pines are gradually replaced by hardwoods. Individual pines would be killed by cutting, girdling or injecting herbicide. No trees would be removed from the site. Treatments would be conducted so that the results would appear natural as much as possible. However, trees along heavily used trails may need to be felled to avoid personal injury to visitors, in which case this zone may appear unnatural for several years. Eventual removal of all the non-native pines would restore the natural vegetative cover of the area and enhance wilderness characteristics.

In conjunction with thinning the pine and pine-hardwood stands, prescribed burning would be conducted during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration. Control lines would be established by hand tools where necessary, using natural firebreaks as much as possible. Fire is a natural force in the ecosystem that should be reintroduced to provide many beneficial effects with minimal impacts.

Under Alternative E the proposed River to River Trail route through the Crab Orchard Wilderness would become an officially designated trail for horseback riding and hiking. The trail would require substantial rehabilitation and regular maintenance to protect the fragile soils from increased foot and horse traffic. Horses depositing dung along the trail may introduce invasive and exotic plants in the surrounding natural communities. Since equestrians would be restricted to the River to River Trail, horseback riding on trails elsewhere in the Wilderness, and the associated impacts, would be eliminated.

Because gas boat motors would be prohibited on the southern part of Devils Kitchen Lake, visitors to the lake would experience a quieter environment. There would be a decline in visits, particularly for big game hunting, in the Wilderness bordering the shores of Devils Kitchen Lake because of the greater difficulty of access.

4.7.2 Impacts on Public Uses

4.7.2.1. Wildlife-dependent Recreational Uses

As a function of somewhat increased opportunities, accessibility, and improved facilities, under this alternative wildlife-dependent recreational use levels and quality of experiences would increase more than in Alternative A, but less than in Alternative B for hunting, fishing, observation and photography. As in Alternative B, the quality of the interpretive experience would increase. The improvements that would be made under this alternative would be implemented at a pace between that in Alternative A and B. Thus, the increases in use and quality of experiences would not be as rapid as under Alternative B. Because the opportunities for teachers and students to use the Refuge would increase, a secondary effect would be a long-term increase in the community's conservation ethic. An increase in wildlife observation and photography would contribute to a minimal increase in wildlife disturbance. Goose hunting opportunities around the Refuge would remain the same as under Alternative A.

4.7.2.2. Other Land- and Water-based Recreation

Camping

Concession-operated campgrounds on the Refuge would increase from three to four under this alternative. In an effort to speed the improvement in the quality of facilities, the size of the campgrounds would be reduced. Limited resources would thus be directed at improving fewer facilities. The facilities would gradually be improved to standards comparable to others in the area over the next 10 years. The quality of the facilities and the camping experience would continue at a level below that available in nearby state park campgrounds for the next 10 years. In comparison to the No Action Alternative, there would be fewer camping opportunities, but they would be brought to standards comparable to others in the area in fewer years. The opportunity to occupy a campsite indefinitely would be discontinued as a 14-day stay limit was implemented. People who are accustomed to using a particular campsite for the entire season would be displaced. There would be greater opportunity and equity among visitors using the campground and the selection of prime sites.

Swimming

Swimming opportunities would remain unchanged from present conditions. Scuba diving would be prohibited on the Refuge.

Picnicking

The opportunities and quality of experiences would gradually improve over the next 15 years as the current facilities are gradually improved.

Motorboating/sailing

Because gas motors would be prohibited on the southeastern-most portion of Devils Kitchen Lake, visitors would experience a quieter environment. Boaters who wanted to travel in the southeastern-most portions of Devils Kitchen Lake would have to rely on electric trolling motors, paddling or rowing for mobility. Boating use is not expected to change significantly on Devils Kitchen Lake.

Water-skiing

There would be fewer acres of water available for water-skiing under this alternative than Alternative A. Because all bays on Crab Orchard Lake would be closed to water-skiing under this alternative and there would be additional no-wake zones, anglers would have a better experience on Crab Orchard Lake and conflict between anglers and personal watercraft users and waterskiers would be reduced, compared to Alternative A.

Marinas

The marinas at Little Grassy and Devils Kitchen Lakes would remain unchanged in quality and capacity compared to the No Action Alternative. Under this alternative the former Images Marina slips would be moved and consolidated at the Playport Marina. The present Images Marina site would become a four-lane boat ramp. The changes would result in a consolidated marina operation on Crab Orchard Lake. Boat access to Crab Orchard Lake would be increased, improved, and made safer compared to the No Action Alternative. The amount of use on Crab Orchard Lake would not change significantly compared to the No Action Alternative.

Group Camps

Campers will receive environmental education and the Refuge will be more actively involved in environmental education programming.

Private Clubs

Under this alternative, after 2 years the Crab Orchard Boat & Yacht Club would become a public, non-member facility operated as a concession. The Boat & Yacht Club tradition would end. The social atmosphere at the Club would become less personal.

Horseback Riding

Horseback riding would be regulated under this alternative. Trail erosion and vegetative impacts would be reduced compared to Alternative A. The introduction of exotic species would be limited to a smaller area than in Alternative A. Hikers would have an improved trail experience compared to Alternative A.

4.7.3 Volunteer and Support Groups

Under this alternative volunteer support and support from friends groups would increase more over the next 15 years than in Alternative A.

4.7.4 Impacts on Industrial Use

Under this alternative, tenants would be expected to bring the leased facilities up to prescribed health and safety standards prior to moving into the facility. Therefore, initial costs to tenants would be greater than under Alternative A.

4.7.5 Impacts on Agricultural Use

Under Alternative E, agricultural operations on the Refuge would change little from current conditions. Relative to Alternative A, there would be 100 fewer acres of land farmed for row crops and 200 fewer acres mowed for hay. As in Alternative A, mowing of clover and hay fields would be prohibited until August 1 of each year.

4.7.6 Impacts on Archaeological and Cultural Values

Compared to Alternative A, Alternative E would have a neutral effect on cultural resources. The wildlife-dependent recreation component of the visitor services program will expand, but the majority of the expansion will not be related to ground disturbing activities. Horse traffic may increase erosion where trails pass through archaeological sites. The proposed plan will require horses to stay on a designated trail, which will protect any areas with sensitive resources. Under Alternative A horseback use would continue with ill-defined restrictions and with possible unknown effect on cultural resources. Overall, the change in management of horseback use is viewed as having a slightly positive effect on cultural resources.

4.7.7 Boundary Modification

Under this alternative the authorized boundaries of the Refuge would expand. Over the long-term the Refuge would acquire additional property or property rights from willing sellers.

If acquired, the lands would contribute to the goals of the CCP by reducing habitat fragmentation, removing disruptions to public access, reducing disturbance to wildlife, and reducing potential interference with management activities. Acquiring inholdings creates the potential to restore habitats and further reduce fragmentation, particularly in the forested southwest portion of the Refuge. The Refuge contributes to a large block of forest in southern Illinois that includes contiguous lands managed by Southern Illinois University (Touch of Nature), State of Illinois (Giant City State Park), and U.S. Forest Service (Shawnee National Forest).

The reduced fragmentation would benefit area-sensitive forest birds, such as pileated woodpecker, yellow-billed cuckoo, and Kentucky warbler. The increased forested area also would provide more potential habitat for the endangered Indiana bat. If the inholdings were acquired, there would be increased opportunity for the public to pursue wildlife-dependent recreation on the Refuge. Because maintaining a boundary requires money and staff time, acquiring inholdings would lessen the demand on the Refuge budget and staff as boundaries internal to the Refuge are eliminated.

Because developed property is often accompanied by increased human activity and pets, which can disturb wildlife, acquisition of inholdings and potentially developed property up to the well defined boundary of a road would lead to potentially less disturbance of wildlife. Some refuge management activities, prescribed burning and hunting, for example, benefit from well defined boundaries. By moving the refuge boundary to a road and acquiring inholdings, management, particularly burning and hunting programs, would be made more efficient and safer.

Currently, if a landowner wishes to sell or exchange land that is outside the authorized boundary of the Refuge, the Service must complete an analysis for the individual parcel and complete environmental documents related to the transaction. This tract-by-tract analysis is inefficient and does not provide for an overall, cumulative analysis of the land transactions. Under this alternative the entire boundary modification is evaluated so that delays in land transactions, which may be detrimental to the seller, should be reduced.

Land acquired by the Refuge would be taken off the county tax rolls. However, payments in lieu of taxes (revenue sharing) would be made to the respective counties. These payments are expected to be nearly equivalent to taxes. Eventually a larger block of unfragmented forest would exist with increased benefit to area sensitive forest species compared to Alternative A.

4.8 Summary of Economic Effects of Alternatives

4.8.1 Economic Effects of Recreation

4.8.1.1. Introduction

This section estimates the economic effects of implementing the action alternatives and potentially changing the scope and magnitude of public use on the Refuge.

Economic effect categories include changes in:

- # activity days;
- # net economic value (consumer surplus);
- # total expenditures;
- # economic output;
- # employment; and
- # employment income (these categories are defined and discussed in Chapter 2, Study Area Economic Profile).

The dollar values and employment figures in Table 37 and Table 38 are for the two-county study area as a whole. The first column summarizes current conditions; the next three columns show the net change from Alternative A (decreases are shown with a minus sign [-]). Note that the figures shown in the last three columns are net, one-time changes to the current situation; they are not accumulative in the sense that $10,000 indicates a $10,000 increase each year over the time span of the project. For example, say net economic value under Alternative A is $100,000 and under Alternative B is $10,000. This indicates that the implementation of Alternative B would increase net consumer surplus to $110,000 per year, not that Alternative B would result in an annual increase of $10,000 each year, so that year 1 would be $110,000, year 2 would be $120,000, etc.

Table 37: Comparison of Annual Economic Effects of Alternatives on Hunting in the Study Area

		Change from Alt. A	
Category	**Alt. A (No Action)**	**Alt. B**	**Alts. C, D and E**
Activity Days	43,679	0	0
Net economic value	$1,005,964	0	0
Total expenditures	$1,783,109	0	0
Economic Output	$2,267,456	0	0
Employment (number of jobs)	41.2	0	0
Labor Income	$939,162	0	0

Table 38: Comparison of Annual Economic Effects of Alternatives on Fishing in the Study Area

		Change from Alt. A	
Category	**Alt. A (No Action)**	**Alt. B**	**Alts. C, D and E**
Activity Days	210,478	10,572	0
Net economic value	$3,472,887	$174,438	0
Total Expenditures	$7,347,787	$369,069	0
Economic output	$9,260,444	$465,138	0
Employment (number of jobs)	180.5	9	0
Labor income	$3,972,468	$198,073	0

4.8.1.2. Hunting

There would be essentially no change in hunting use on the Refuge from implementation of any of the four action alternatives. Alternatives B, C, D and E would implement controlled hunts to maintain the quality of the hunting experience on the Refuge, which may increase the number of hunters in the restricted use area during the hunting season. However, this is not expected to change the overall annual use of the Refuge for hunting.

Table 37 shows a comparison of the annual economic effects of the No Action alternative with the four action alternatives. The economic effects shown for Alternative A encompass big game, small game and migratory waterfowl hunting.

4.8.1.3. Fishing

Analysis of Alternative B is based on the assumption that four new facilities are added to increase access to Refuge fisheries. Alternative B would also enhance fisheries habitat to improve the fishing experience on the Refuge. Consequently, a 5 percent increase in Refuge fishing activity is anticipated with implementation of Alternative B. Alternatives C, D and E are expected to have similar impacts as Alternative A. (Table 38)

4.8.1.4. Wildlife Observation and Photography

Analysis of Alternative B assumes four major effects that would increase wildlife observation activities on the Refuge by about 10 percent annually:

- # the number of photo blinds will increase from two to four;
- # the number of observation platforms increases from one to three;
- # several additional wildlife observation sites are to be established on the Refuge; and
- # an annual wildlife photography contest will be initiated.

Alternatives C, D and E are similar to Alternative B with the exception that additional wildlife observation sites are not part of Alternatives C, D and E. Consequently, it is anticipated that Alternatives C, D and E would result in a 2.5 percent annual

Table 39: Comparison of Annual Economic Effects of Alternatives on Wildlife Observation

		Change from Alt. A	
Category	Alt. A (No Action)	Alt. B	Alts. C, D and E
Activity days	110,105	11,323	2,831
Net economic value	$1,613,258	$165,905	$41,480
Total expenditures	$4,923,785	$506,353	$126,560
Economic output	$6,088,532	$626,134	$156,547
Employment (number of jobs)	118	12	3
Labor income	$2,477,711	$251,971	$62,993

Table 40: Comparison of Annual Economic Effects of Alternatives on Boating

		Change from Alt. A	
Category	Alt. A (No Action)	Alt. B	Alts. C, D and E
Activity days	92,997	$4,856	0
Net economic value	$2,462,486	$128,583	0
Total expenditures	$2,757,469	$143,986	0
Economic output	$3,459,091	$180,622	0
Employment (number of jobs)	83.6	4.4	0
Labor income	$2,068,264	$108,856	0

increase in wildlife observation and photography on the Refuge (Table 39).

4.8.1.5. Boating

The major effects of implementing Alternatives B, C, D or E are the potential changes to available facilities and the number of available marina slips (Table 40).

4.8.1.6. Facilities and Marina Slips

Alternative B would transfer three marinas to SIU. It is assumed that SIU would manage these marinas in a manner consistent with current operations and facility capacity. Under Alternatives C, D and E, Images Marina and Playport Marina would be consolidated at the Playport site. The Boat & Yacht Club marina would be maintained as a concession-operated facility after 2 years.

Alternative B would generally improve the quality of the boating experience on the Refuge and improve boating access and associated parking. Consequently, it is anticipated that Alternative B would result in a 5 percent annual increase in boating activity on the Refuge. Implementation of Alternatives C, D and E would not result in any net change from Alternative A for the next 10 years.

4.8.1.7. Camping / Day Use

Alternative B would keep 130 sites at Little Grassy Campground, close Devils Kitchen Campground eliminating 45 sites, and transfer Crab Orchard Campground to SIU. Consequently there would be a net loss of 45 sites (assuming SIU continues to operate Crab Orchard Campground at current use levels). Little Grassy Campground would be brought up to public health and other use and design standards comparable to Illinois State Parks standards. The Devils Kitchen Campground is currently under-utilized; eliminating these sites would not materially affect the amount of camping taking place on the Refuge. It is expected that campground quality improvements and other infrastructure improvements would result in a higheroverall campground utilization rate compared with Alternative A. Alternatives C, D and E would not materially affect the amount of camping taking place on the Refuge (Table 41).

Table 41: Comparison of Annual Economic Effects of Alternatives on Camping and Picnicking

		Change from Alt. A	
Category	**Alt. A (No Action)**	**Alt. B**	**Alts. C, D and E**
Activity days	193,400	9,000	0
Net economic value ($28.36/day)	$5,484,824	$252,240	0
Total expenditures ($15/day)	$2,901,000	$135,000	0
Economic output	$3,655,260	$170,100	0
Employment (number of jobs)	71.3	3.3	0
Labor income	$1,569,180	$72,626	0

Table 42: Summary of Economic Effects of Alternatives on Public Use

		Change from Alt. A	
Category	**Alt. A (No Action)**	**Alt. B**	**Alts. C, D and E**
Activity days	650,659	35,751	2,831
Net economic value	$14,039,419	$721,166	$41,480
Total expenditures	$19,713,150	$1,154,408	$126,560
Economic output	$24,730,783	$1,441,994	$156,547
Employment (number of jobs)	494.6	28.7	3
Labor income	$11,026,785	$631,526	$62,993

4.8.1.8. Summary of Recreation Economic Effects

Implementation of any of the action alternatives would increase the economic effects of public use of the Refuge compared with Alternative A. Public use includes hunting, fishing, wildlife observation, boating, camping and picnicking. A major assumption behind the economic effects estimates is that enhancing the quality of the recreational experience on the Refuge (whether by enhancements to the physical and biological environment or by enhancements to facilities or by increasing convenient access to the Refuge) provides an incentive for longer, more frequent or new recreational visits to the Refuge. Compared to the No Action Alternative, Alternative B would increase Refuge recreational visitation by about 5 percent while Alternatives C, D and E would result in a 0.5 percent increase overall. (Table 42)

4.8.2 Economic Effects of Commercial Use

4.8.2.1. Introduction

This section discusses the economic impacts of the action alternatives on the Refuge's commercial uses. Commercial uses include agriculture, grazing, timber harvesting, and industry. As noted in the previous section that discussed public uses on the Refuge, the changes depicted in the summary tables represent net, one-time changes from the baseline.

4.8.2.2. Agriculture

An analysis of each alternative as it affects agriculture is described below. Each alternative's impact on acreage is assumed to be distributed to the same proportions of the 2001 baseline (41 percent corn, 33 percent clover, and 26 percent soybeans). Value per acre is the average crop value for the two-county study area. Impacts are summarized in Table 43. Under Alternative A, only changes to the management of hay fields would occur. Hay would not be mowed until after August 1, which would result in a

Table 43: Comparison of Annual Average Crop Values in Study Area

			Change from Alternative A					
	2001 Baseline (Alt. A)		Alts. B and E (Preferred Alternative)		Alternative C (Open Land)		Alternative D (Forest)	
	Acres	Value[1]	Acres	Value	Acres	Value	Acres	Value
Corn	1,877	$506,784	-53	-$14,288	87	$23,553	-99	$26,679
Clover[2]	1,484	$319,153	-42	-$8,998	69	$14,833	-78	-$16,801
Soybeans	1,179	$212,146	-33	-$5,981	55	$9,860	-62	-$11,168
Hay[3]	767	$82,453	-167	-$17,953	0	$0.0	-267	-$28,703
Total Impact	5,307	$1,120,536	-295	-$47,220	211	$48,246	-506	-$83,350

1. *Value is depicted in year 2000 dollars.*
2. *The price per ton for hay is used as a proxy for clover.*
3. *We assume that the two-county study aea has two hay cuttings per year. We further assume that the hay revenue is equally distributed between the two cuttings. Therefore, 50 percent of the value per acre in the two-county study area is attributable to the value per acre for one hay cutting at the Refuge.*

decrease from two hay cuttings to one hay cutting. We establish the one hay cutting as the baseline for the analysis.

Under Alternatives B and E, various additional conservation practices would be emphasized on certain fields. Because hay and clover would not be mowed until after August 1, we assumed only one cutting of hay. Buffers would be adjusted where erosion is a problem. Furthermore, the rate charged for hay would be updated to account for inflation. Some farmed lands would be removed, other acres would be reclaimed. The net change of land use for crops (corn, soybeans, and clover) would be an increase of 90 acres, thereby increasing corn, clover, and soybeans by 37, 29, and 23 acres respectively (Table 43). There would be no change to hay acreage. Assuming a proportional increase in harvest, total crop value would increase to about $1.07 million. Although crop acreage will increase, we do not expect an increase in the number of cooperators. However, economic output and labor income should increase accordingly with the increase in agricultural output.

Similar to the previous alternative, Alternative C would also emphasize adding new conservation practices. There would be no change in hay acreage, but this alternative would still result in a net increase of 212 acres to the farming program. An increase in production would result in a 4 percent increase in total value from the 2001 baseline. As in Alternative B, crop acreage will increase but we do not expect an increase in the number of cooperators. Again, economic output and labor income should increase in accordance with the increase in agricultural output.

Unlike the above alternatives, Alternative D would not emphasize new conservation practices. A limited amount of soybeans could be planted in 2 successive years. Also, the rate charged for hay would be updated to account for inflation. Alternative D would result in 239 fewer acres in the farming program for corn, clover and soybeans. There would also be a decrease in hay acreage by 267 acres. The net decrease in crop and hay acreage would result in a decline of total sales by about $83,000 annually. Hay would be impacted the most, as a 35 percent decrease in hay sales. We expect this decrease in sales to have only a minor impact on the region because $83,000 represents less than 1 percent of the region's agricultural value for these four crops.

4.8.2.3. Grazing

The Refuge currently allocates about 1,000 acres to support about 375 head of cattle and about 1,726 animal unit months (AUM). We assume that all cattle are yearlings, and are thus sold at the end of each grazing period. The period for cattle grazing on the fescue pastures normally runs from April 15 to September 30. Also, the grazing fee is $8.95 per AUM, and is paid through mowing credits of $2.53 per AUM and fertilizing. .

Alternatives B, C and E would emphasize conservation by implementing limited rotational grazing to provide vegetation structure that supports grassland birds. Although rotational grazing would also enhance the quality of the forage, 10 percent fewer head of cattle would be permitted on the pastures. There would be no impact on total pasture acres. The grazing period would increase by one month in the fall. Thus, cooperators would be less dependent

Table 44: Comparison of Economic Effects of Grazing at Crab Orchard NWR

		Change from Alternative A		
	Alt. A	Alt. B and Alt. E	Alt. C	Alt. D
Total Acres	1,000	0	0	1,000
Total Head	375	-37	-37	38
No. of Months	5.5	1	1	1
Total Value[1]	$172,500	-$17,020	-$17,020	$17,480

1. *Total value is equal to Total Head multiplied by the average price per head in the five-county area. Value is depicted in 2000 dollars.*

upon other grazing areas off the Refuge. Grazing fees and mowing credits would be updated to account for inflation. Cooperators may be slightly impacted because they would need to graze 37 head of cattle elsewhere. (This impact would be distributed evenly among the 10 cooperators.) If the cooperators choose not to graze elsewhere and to decrease the total head by 37, then total sales would decrease by about $17,000. The impacts are depicted in Table 44.

Optimizing cattle production in pastures would be the focus of Alternative D. Rather than increasing grasses with high wildlife value (as in Alternatives B, C and E), grasses with high forage production would be increased to benefit cattle. Forage would increase to support more cattle on the pastures, but there would be no change to the total acres of pasture. As in the other alternatives, the grazing period would increase by one month in the fall. Thus, cooperators would be less dependent upon other grazing areas off the Refuge. Grazing fees and mowing credits would be updated to account for inflation. Cooperators would benefit by being able to graze slightly more cattle and having better forage. The local economy would benefit by a slight increase of approximately $17,000 in economic output.

4.8.2.4. Timber Harvesting

Timber harvesting is one habitat management tool used on portions of the forest to support the Refuge's wildlife conservation purpose. In the past, the Refuge has sold pine and hardwood timber for a variety of products. The amount of revenue generated from timber sales has varied greatly from year to year. The average annual revenue for the years 1983 to 1998 was $17,600.

The Refuge would continue thinning treatments in pine stands under each alternative. Under Alternatives B and E, removal of the pine overstory would also occur in some cases. The amount of revenue from future timber sales is expected to be similar to that of the recent past. Refuge timber sales would continue to have a negligible effect on the local economy as a whole. Table 45 depicts the impacts of each alternative on timber harvests and pine and hardwood forest cover.

4.8.2.5. Industry

This section discusses the impacts of the alternatives on industry within the Refuge's boundaries. There would be minimal effect on munitions manufacturing operations, explosive storage areas, and other industrial facilities. Alternatives B, C, D and E would place more emphasis on building and grounds maintenance performed by the lessee. Because maintenance is already stated in the lease, we do not consider this change as an increase in costs to the tenant. As the buildings and infrastructure continue to age, the number of industrial leases will decrease in each of these alternatives. For example, structures would be eliminated as they become obsolete, and the tenant's lease would expire at such time. Alternatives C and D would not lease a structure to a new tenant if the current tenant does not renew the lease. We assume that Alternatives B and E would result in a 5 percent decrease annually in leased space, and Alternatives C and D would result in a 10 percent decrease annually. Besides these changes, the Refuge would continue to provide facilities for the existing tenants at fair market value rental rates. These changes are not expected to increase costs to industrial tenants on the Refuge. Furthermore, the local economy would not be negatively affected because companies would be expected to move to the industrial parks nearby. Impacts are shown in Table 46.

Table 45: Impacts of Each Alternative on Timber Harvesting and Pine and Hardwood Forest Cover

	Alternative A		Alternatives B and E		Alternative C		Alternative D	
	Forest Cover (acres)	Annual Harvest (tons)	Forest Cover (acres)	Annual Harvest (tons)	Forest Cover (acres)	Annual Harvest (tons	Forest Cover (acres)	Annual Harvest (tons)
Pine	2,497	1,803	-726	+524	-1,471	+1,062	-726	+524
Hardwood	832	123	726	107	1,471	217	726	107
Total Annual Impact	3,329	1,926	0	-417	0	-844	0	-417
Total Annual Value[1]		$6,641		-$1,657		-$3,355		-$1,657

1. *Total annual value is stated in year 2000 dollars. The price for pine and hardwood is averaged based upon past sales. The change in annual value is overestimated by about 18 percent.*

Table 46: Impacts of the Alternatives on Industry

		Change from Alternative A		
	Alt. A	**Alt. B and Alt. E**	**Alt. C**	**Alt. D**
Square Feet Leased	1.2 million	-0.06 million	-0.12 million	-0.06 million

4.9 Summary of Impacts of Alternatives

The previous sections described the consequences of management actions under the five alternatives. Table 47 on page 165 summarizes the effects for each alternative organized by the issues discussed in Chapter 1. The effects are summarized in short phrases to ease comparison among alternatives. The effects listed under Alternative B assume that a land exchange takes place and incorporate the combined effects of lands managed by the Service and former Refuge lands that would be managed by SIU. Thus, the effects for increased developed recreation reflect increases that would occur on SIU lands under Alternative B.

4.10 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are those that cannot be reversed. Irretrievable commitments can be reversed, given sufficient time and resources. There are no irreversible commitments of resources under any alternatives. Land use changes proposed under the alternatives would be irretrievable. Modifications would affect a maximum of 4,265 acres of net change in the preferred action alternative.

4.11 Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was signed by President Bill Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

None of the alternatives disproportionately place an adverse environmental, economic, social, or health impacts on minority or low-income populations.

4.12 Cumulative Impacts

Cumulative effects are effects on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Potential cumulative effects for the alternatives are described below. The discussion considers the interaction of activities at the Refuge with other actions occurring over a larger spatial and temporal frame of reference.

Forest habitat, Crab Orchard NWR. U.S. Fish & Wildlife Service

4.12.1 Cumulative Effects Resulting from Habitat Management Actions

4.12.1.1. Forest

In 1820 an estimated 38 percent of Illinois was wooded. During the 1800s forest land was converted to agriculture. By the early 1900s about 8 percent of the original forest remained; today less than 1 percent remains. As Illinois farmers switched from animal to row crop production in the mid-1900s, abandoned pastures reverted to woods. The Illinois forests are estimated to have increased 41 percent since 1926. The current Illinois forest is about 31 percent as large as the state's original wooded acreage, about 12 percent of the area of the state.

Although the amount of woods has increased in Illinois, the average size of wooded parcels is decreasing. An analysis of 13 counties in south central Illinois found that the vast majority of woods were smaller than one acre in size. The average forest ownership in Illinois is about 20 acres. The fragmentation of forest is of concern because smaller tracts do not support the same species and ecological processes associated with large tracts.

Acres of forest would increase and forest fragmentation would decrease, to varying degrees, under all alternatives. The increase in forest acreage would be larger in Alternatives B, D, and E than in Alternative C. The decrease in fragmentation would increase the quantity and quality of habitat available for area-sensitive forest species on the Refuge. The three counties – Williamson, Jackson, Union – that contain the Refuge are among the top 10 forested counties in Illinois. Because the Refuge is adjacent to other protected lands managed by the U.S. Forest Service and the State of Illinois, which also contain blocks of forest, the Refuge will contribute to a cumulatively large area of forest. This larger forest area would result in greater benefits for area-sensitive forest species.

4.12.1.2. Grassland

In 1820, at least 60 percent of Illinois was some type of grassland. Much of Illinois' original prairie was converted to agriculture during the 1800s. In 1978, the Illinois Natural Areas Inventory (White, 1978) found that only 0.01 percent of original prairie survived in a high-quality condition. For a time the conversion of some of the prairie to hay fields and pastures enhanced habitat for certain birds such as dickcissel and prairie chicken. But conversion to row crops has led to the decline of this type of grassland, as well. Today about 18 percent of Illinois is covered in rural grassland-pastures, fallow fields, and greenways.

Although Williamson County is in the top 10 Illinois counties ranked by percentage of area in grassland with 32.7 percent, the counties with the largest rural grassland acreages are in the northern and west-central part of Illinois. The Conservation Reserve Program has set aside more than 600,000 acres of highly erodible agricultural land in Illinois since 1985 and planted much of it to grassland habitat. Still, populations of many species of grassland birds have continued to decline. Research has shown that many species of grassland birds require large blocks of habitat to nest successfully and they do poorly in areas where habitat is broken into small, isolated blocks.

Prairie restoration in Illinois consists of preserving the isolated tracts and restoration of other tracts. The Natural Resources Conservation Service (NRCS) includes grasslands and prairie as pri-

ority habitat types in Illinois. The Illinois Department of Natural Resources Strategic Plan, 2003-2008 includes a goal for protecting and restoring wildlife habitat, but does not give target acres for any particular habitat.

None of the alternatives evaluated for the comprehensive conservation plan would measurably contribute to or detract from the cumulative number of acres of grasslands in Illinois. The core area acres of Refuge grasslands – the area free of an edge effect – remains the same or increases only slightly under any alternative. We plan to maintain the restored native grassland that exists on the Refuge, but we do not plan to increase the grasslands significantly in an area that was historically forest.

Over the next 100 years, habitat for grassland birds will decrease about 43 percent under all alternatives (Table 34 on page 151). This will be a result of succession of fallow areas that contain some grassland to habitats dominated by shrubs or trees with little, if any, grassland. Areas currently managed as grasslands (prairies, permanent hay fields, and clover fields) will continue to be managed as open habitats that will provide habitat for grassland birds. Under all alternatives, mowing in permanent hay and clover fields will be delayed until August 1 in order to protect nesting grassland birds and their nests. Additional measures meant to enhance habitat for grassland birds will be taken in the action alternatives. In Alternatives B, C, and E, grassland bird habitat will be improved by converting fescue pastures to native warm season grasses. In Alternative D and especially in Alternatives B, C, and E, habitat for most grassland bird species will be improved by removing fencerows and other linear woody habitat.

4.12.2 Cumulative Effects Resulting from Recreation Changes

Under Alternative B, Southern Illinois University would begin to manage existing facilities and develop new recreation facilities adjacent to the northwest portion of the Refuge. The increased development that SIU has proposed would contribute to an increased 'critical mass' of recreation opportunities in Southern Illinois. The new development, in conjunction with other developed recreation opportunities in the area, would lead to improved quality of opportunities and a greater attraction to tourists. By increasing the grouping of high-quality, developed recreational opportunities, more people would see Southern Illinois as an attractive destination for a recreational trip. The increased attractiveness of concentrated recreational opportunities would have an economic effect greater than that of a lone enterprise. The development envisioned under Alternative B would contribute to the expanding development along the Highway 13 corridor between Marion and Carbondale. The increased development would likely change the social and economic culture as more people visit and move into the community.

Crab Orchard NWR. U.S. Fish & Wildlife Service

Under Alternatives B, C and E, the Refuge would formally designate a horseback riding trail through the Crab Orchard Wilderness as part of the River-to-River Trail. By officially designating the Refuge portion, the entire trail would likely be more attractive to trail users and be used more.

4.12.3 Cumulative Effects Resulting from Agricultural Management

Under all alternatives the size of the agricultural program on the Refuge is largely unchanged. Agricultural areas outside the Refuge will likely face the pressure of land conversion to industrial and residential uses. By maintaining agricultural acreage on the Refuge, when combined with the agriculture in nearby areas, agriculture will likely persist in the economic and social culture of the area longer than if the Refuge did not have an agricultural program.

Table 47: Summary of Effects of Alternatives Described in Chapter 4

	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis With Land Exchange	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
Threatened and Endangered Species					
Bald Eagle	Minor increase in nesting habitat.	Minor increase in nesting habitat.	Minor increase in nesting habitat, alternative with highest habitat values.	Minor increase in nesting habitat.	Minor increase in nesting habitat.
Indiana bat	Minor increase in potential habitat.	Minor increase in potential habitat.	Minor increase in potential habitat, alternative with lowest habitat values.	Minor increase in potential habitat, alternative with highest habitat values.	Minor increase in potential habitat.
Resident Fish & Wildlife	Minimal impacts.	Minimal impacts.	Minimal Impacts	Minimal impacts	Minimal impacts
Canada Geese	Minor decrease in habitat, alternative with highest production of potential goose food.	Minor decrease in habitat, this and Alternative E have lowest production of potential goose food.	Minor decrease in habitat.	Minor decrease in habitat, higher production of potential goose food than Alternative C.	Minor decrease in habitat, this and Alternative B have lowest production of potential goose food.
Waterbirds	Minimal impacts.	Minor increase in habitat.	Minor increase in habitat.	Minimal impacts.	Minor increase in habitat.
Grassland Birds	Decrease in habitat (37%), improved nesting conditions.	Decrease in habitat (43%), much improved nesting conditions.	Decrease in habitat (36%), much improved nesting conditions.	Decrease in habitat (43%), improved nesting conditions.	Decrease in habitat (43%), much improved nesting conditions.
Area-sensitive Forest Birds	Increase in habitat (8%).	Increase in habitat (9%) improved nesting conditions.	Increase in habitat (7%).	Increase in habitat (9%), improved nesting conditions.	Increase in habitat (9%) improved nesting conditions.
Shrubland Birds	Decrease in habitat (26%).	Decrease in habitat (26%).	Decrease in habitat (26%).	Decrease in habitat (26%).	Decrease in habitat (26%).
Invasive Species	Most species increase.	Most species increase.	Most species increase.	Most species increase.	Most species increase.
Agricultural Uses	No acerage change, minor restriction in agricultural practices.	Minor acreage decrease, changes in some agricultural practices.	Minor acreage increase, changes in some agricultural practices, alternative with largest amount of agricultural land.	Minor acreage decrease, addition of practices beneficial to agriculture, alternative with least amount of agricultural land.	Minor acreage decrease, changes in some agricultural practices.

Table 47: Summary of Effects of Alternatives Described in Chapter 4 (Continued)

	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis With Land Exchange	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
Wilderness	Minor increase in Wilderness designation.	Minor increase in Wilderness designation.	Minor increase in Wilderness designation.	Minor increase in Wilderness designation.	Minor increase in Wilderness designation.
Industrial Uses	Minimal impacts.	Minimal impacts.	Minor decreases in facilities.	Minor decreases in facilities.	Minimal impacts.
Hunting	Minimal impacts.	Increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.
Fishing	Minimal impacts.	Increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.
Wildlife Viewing & Photography	Minimal impacts.	Increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.
Interpretation and Environmental Education	Minimal impacts.	Increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.	Minor increase in opportunities and quality.
Swimming	No change.	Increased opportunities provided by SIU.	Minimal impacts.	Minimal impacts.	Minimal impacts.
Camping	Minimal impacts; 14-day stay limit.	Improved facilities provided by SIU; 14-day stay limit on Refuge.	Fewer campsites, improved facilities, 14-day stay limit.	Fewer campsites, improved facilities, 14-day stay limit.	Fewer campsites, improved facilities, 14-day stay limit.
Picnicking	Minor improvements.	Increased opportunities provided by SIU.	Minor improvements.	Minor improvements.	Minor improvements.
Motor boating /Sailing	Minimal impacts.	Minor restrictions in use (zoning); restricted use on Devils Kitchen Lake.	Minor restrictions in use (zoning).	Minor restrictions in use (zoning); prohibited use on Devils Kitchen	Minor restrictions in use (zoning); restricted use on Devils Kitchen Lake.
Water-skiing	Minimal impacts.	Reduction in area open to skiing.	Reduction in area open to skiing.	Reduction in area open to skiing.	Reduction in area open to skiing.
Marinas	Minimal impacts.	Improved facilities provided by SIU.	Minimal impacts.	Minimal impacts.	Minimal impacts.

Table 47: Summary of Effects of Alternatives Described in Chapter 4 (Continued)

	Alternative A: Current Management (No Action)	Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis With Land Exchange	Alternative C: Open Land Management, Consolidate and Improve Recreation	Alternative D: Forest Land Management, Consolidate and Improve Recreation	Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative)
Group Camps	Minimal impacts.	Increased costs to camps, limits on expansion, increased environmental education.	Increases costs to camps, limits on expansion, increased environmental education.	Increased costs to camps, limits on expansion, increased environmental education.	Increased costs to camps, limits on expansion, increased environmental education.
Private Clubs	Minimal impacts.	SIU management.	Tradition of Boat & Yacht Club would end. After 2 years the opportunities at site would be available to wider segment of public.	Tradition of Boat & Yacht Club would end. After 2 years the opportunities at site would be available to wider segment of public.	Tradition of Boat & Yacht Club would end. After 2 years the opportunities at site would be available to wider segment of public.
Horseback Riding	Minimal impacts.	More restricted opportunities.	More restricted opportunities.	No horseback riding.	More restricted opportunities.
Water Quality	Minimal impacts.	Minor improvements.	Minor improvements.	Minimal impacts.	Minor improvements.
Communication with Community	Improved.	Improved.	Improved.	Improved.	Improved.
Volunteer Program	Minimal impacts.	Improved.	Improved.	Improved.	Improved.
Cultural Resources	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.
Economics	Minimal impacts.	Most positive impact.	Minimal positive impacts.	Minimal positive impacts.	Minimal positive impacts.
Fire	Minimal impacts.	Minimal impacts.	Minimal impacts.	Minimal impacts.	Minimal impacts.
Environmental Justice	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.	No disproportionate impacts on minority or low-income populations.
Climate Change	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.	Minimal mitigation of human-induced global climate changes.
Air Quality	Minimal impacts.	Minimal impacts.	Minimal impacts.	Minimal impacts.	Minimal impacts.

Chapter 5: List of Preparers

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James Neil Vincent, Park Ranger, FWS, Crab Orchard NWR

Richard Whitton, District Biologist, Illinois Department of Natural Resources

Chapter 6: Consultation and Coordination

This chapter summarizes the consultation and coordination that occurred and was used to identify issues, alternatives, proposed action, and the Comprehensive Conservation Plan. The public participation process is described in detail in Chapter One of the Final Environmental Impact Statement. Also included in the present chapter is a list of all organizations and persons who have been sent a copy of the Final Environmental Impact Statement and Comprehensive Plan or a Summary of the document.

6.1 Summary of Public Involvement

We began asking for public comments regarding the Draft Comprehensive Conservation Plan in October 2000. Three public, open house meetings were held. At the open houses, on the Service's Region 3 website, and via the media, we encouraged people to tell us in written comments how they wanted the Refuge to be managed. Hundreds of letters and comments were received. We invited approximately sixty stakeholders who had demonstrated a long-standing interest in the Refuge to three focus group meetings in January 2001. Thirty-nine people attended the focus group meetings. In September 2001, we described four alternative management concepts to the public in a project update, which we mailed to 1,400 persons on the Refuge's mailing list and posted on the Service's website. We invited people to comment on the concepts. We received 62 letters, 39 e-mail messages, and 527 form letters commenting on the alternatives. We also received a petition supporting gasoline motors on Devils Kitchen Lake.

The Crab Orchard National Wildlife Refuge Draft Environmental Impact Statement (DEIS) and Comprehensive Conservation Plan was made available to the public on October 17, 2005. The minimum 45-day comment period for a DEIS was extended to 90 days at the outset due to the interest in the Comprehensive Conservation Plan. The comment period ended January 17, 2006. Copies of the DEIS were distributed as hard copies and compact disk. The document was also available for viewing or downloading from the planning web site.

6.2 List of Agencies, Organizations and Individuals Receiving a Draft Document

Copies of the Final Environmental Impact Statement and/or Final Environmental Impact Statement Summary are being provided to Federal, state, and local agencies and elected officials, businesses, organizations, persons who requested a copy, and media.

The following sections list the persons who received a copy of the Draft EIS or its summary.

6.2.1 Elected Officials

Federal

Sen. Richard Durbin
Sen. Barack Obama
Rep. Jerry Costello
Rep. John Shimkus

State

Gov. Rod Blagojevich
Sen David Luechtefeld

Sen. Gary Forby
Rep. Mike Bost
Rep. John Bradley
Rep. Brandon Phelps
Rep. Dan Reitz

Local

Robert Butler, Mayor, City of Marion
Mark Clerk, Board of Trustees, Village of De Soto
Joe Eggemeyer, Mayor, City of Chester
Brad Cole, Mayor, City of Carbondale
Robert Barnett, Williamson County Board of Commissioners
Paul Gage, Mayor, City of Vienna
Ron Williams, Mayor, City of Murphysboro
Frank Jeters, Mayor, Village of Energy
Vernon Kee, Mayor, City of Johnston City
Dennis Stewart, Board of Trustees, Village of Dowell
Charles Mausey, Mayor, City of Carterville
Pam McGriff, Jackson County Board of Commissioners
Victor Ritter, Mayor, City of Herrin
Union County Commissioners
William Wiggs, Mayor, City of Crainville
Bob Ellis, Mayor, City of West Frankfort

6.2.2 Organizations

Federal

Federal Bureau of Investigation, Carbondale, Illinois
Shawnee National Forest, U.S. Forest Service, Harrisburg, Illinois
U.S. Environmental Protection Agency, Chicago, Illinois
U.S. Penitentiary, U.S. Department of Justice, Bureau of Prisons, Marion, Illinois
U.S. Fish and Wildlife Service, National Conservation Training Center Conservation Library

State

Director, Illinois Department of Natural Resources, Springfield, Illinois
Illinois Department of Natural Resources, Ferne Clyffe State Park, Goreville, Illinois
Illinois Department of Natural Resources, Division of Fisheries, Springfield, Illinois
Illinois Department of Natural Resources, Giant City State Park, Makanda, Illinois
Illinois Department of Natural Resources, Illinois State Water Survey, Champaign, Illinois
Illinois Department of Natural Resources, Little Grassy Fish Hatchery, Makanda, Illinois
Illinois Department of Natural Resources, Office of Resource Conservation, Springfield, Illinois
Illinois Department of Employment Security, Marion, Illinois
Illinois Department of Natural Resources, Benton, Illinois
Illinois Environmental Protection Agency, Springfield, Illinois
Illinois Forest Resource Center, Simpson, Illinois
Illinois Historic Preservation Agency, Springfield, Illinois

Agencies/Organizations

Animal Protection Institute, Sacramento, California
Boy Scouts Of America, Greater St. Louis Area Council, Saint Louis, Missouri
Camp Carew, Southeastern Illinois Presbytery, Cobden, Illinois
Carbondale Convention & Tourism Bureau, Carbondale, Illinois
Carterville Chamber of Commerce, Carterville, Illinois
Chief, Carterville Fire Department, Carterville, Illinois
Chief, Lake Egypt Fire Protection District, Marion, Illinois
Chief, Williamson County Fire Protection District, Energy, Illinois
Crab Orchard Boat & Yacht Club, Marion, Illinois
Crab Orchard Waterfowl Association, Marion, Illinois
Defenders of Wildlife, Washington, D.C.
Ducks Unlimited Inc., Washington, D.C.
Environmental Defense, New York, New York
Friends of Crab Orchard Refuge Inc., Marion, Illinois

Girl Scouts of Shagbark Council, Herrin, Illinois
Great Lakes Regional Office, Ducks Unlimited Inc., Ann Arbor, Michigan
Greater Egypt Regional Planning & Development Commission, Carbondale, Illinois
Greater Marion Area Chamber Of Commerce, Marion, Illinois
Heartwood Inc., Wood River, Illinois
Herrin Chamber of Commerce, Herrin, Illinois
Illinois Federation for Outdoor Resources, Marion, Illinois
Illinois Trappers Association, Modoc, Illinois
Little Grassy United Methodist Camp, Makanda, Illinois
Lower Kaskaskia Stakeholders, Inc., Red Bud, Illlinois
Midwest Regional Rep, Wildlife Management Institute, Pratt, Kansas
National Audubon Society, Washington, D.C.
National Rifle Association, Fairfax, Virgina
National Trappers Association, Inc., New Martinsville, West Virginia
National Wildlife Federation, Ann Arbor, Michigan
National Wildlife Refuge Association, Washington, D.C.
Natural Resources Defense Council, Washington, D.C.
PEER Refuge Keeper, Aurora, Nevada
Regional Association of Concerned Environmentalists, Brookport, Illinois
River to River Trail Society, Harrisburg, Illinois
Shawnee Resource Conservation & Development Area, Marion, Illinois
Sierra Club – Midwest Office, Madison, Wisconsin
Southern Illinois Hunting & Fishing Days Inc., Carterville, Illinois
Southern Illinois Power Cooperative, Marion, Illinois
Southern Illinois Tourism Council, Carterville, Illinois
Southern Illinois Tourism Development Office, Marion, Illinois
Southernmost Tourism Bureau, Ullin, Illinois
Take Pride In America Committee, Herrin, Illinois
The Conservation Fund, Arlington, Virginia
The Haven, Egyptian Past Commanders Club, Du Quoin, Illinois
The Wilderness Society, Washington, D.C.
Wilderness Watch, Missoula, Montana
Williamson County Emergency Management Agency, Marion, Illinois
Williamson County Farm Bureau, Marion, Illinois
Williamson County Tourism Bureau, Marion, Illinois

Libraries

Carbondale Public Library, Carbondale, Illinois
Carterville Public Library, Carterville, Illinois
Chester Public Library, Chester, Illinois
Du Quoin Public Library, Du Quoin, Illinois
Herrin City Library, Herrin, Illinois
Johnston City Public Library, Johnston City, Illinois
Jonesboro Public Library, Jonesboro, Illinois
Marion Carnegie Library, Marion, Illinois
Mitchell Carnegie Library, Harrisburg, Illinois
Sallie Logan Public Library, Murphysboro, Illinois
Stinson Memorial Library, Anna, Illinois
Vienna Public Library, Vienna, Illinois
West Frankfort Public Library, West Frankfort, Illinois

Businesses

Ameren CIPS, Marion, Illinois
Burns Goose Club, Carbondale, Illinois
Bush Hunting Club, Carbondale, Illinois
Cherokee Timber, Inc., Marion, Kentucky
Cooksey's Bait Shop, Marion, Illinois
Country Kitchen Hunting Club, Marion, Illinois
Crab Orchard Campground, Carbondale, Illinois
Crab Orchard Hunting Club, Evansville, Indiana
D & M Hunting Club; Crab Orchard Waterfowl Association, Marion, Illinois
Devils Kitchen Boat Dock and Campground, Carbondale, Illinois

Diagraph Corporation, Herrin, Illinois
Dooley Brothers Inc., Peoria, Illinois
Dyno Nobel Midwest Inc., Quincy, Illinois
Ensign-Bickford Co., Marion, Illinois
Ferrell's Hunting Club, Carterville, Illinois
General Dynamics, Ordnance and Tactical Systems, Marion, Illinois
Glenn's Goose Hunting Club, Henderson, Kentucky
Hanley Industries Inc., Alton, Illinois
Honkers Corner Goose Club, Carterville, Illinois
Honkers Corner Goose Club, Saint Peters, Missouri
Hospital & Physician Publishing Inc., Marion, Illinois
KRA Corporation/Fish and Wildlife Division, Bethesda, Maryland
Maytag Herrin Laundry Products, Herrin, Illinois
Mead-Westvaco Corporation, Wickliffe, Kentucky
Orpack-Stone Corporation, Herrin, Illinois
Pin Oak Motel, Carterville, Illinois
Propellex Corporation, Edwardsville, Illinois
Shell Oil Pipeline Co., Marion, Illinois
Silent Wings Hunting Club, Creal Springs, Illinois
Spectra Pyrotechnics Corporation, Carlyle, Illinois
Supergan's Hunting Club, Carterville, Illinois
Union Planters Bank, Carbondale, Illinois
Verizon, Marion, Illinois
Winn-Star Inc., Marion, Illinois

News Media

American News Service, Benton, Illinois
Marion Daily Republican, Marion, Illinois
Southern Illinoisan, Carbondale, Illinois

Individuals

All individuals on record as requesting a copy of the Draft EIS. All interested individuals not on record that request a copy of the EIS once its availability is announced and it is distributed to the above list.
All individuals on the project mailing list, who have not requested a EIS, will receive a Final EIS/CCP Summary.

Chapter 7: Response to Comments Received on the Draft Environmental Impact Statement and Comprehensive Conservation Plan

The Notice of Availability for the Crab Orchard National Wildlife Refuge Draft Environmental Impact Statement (DEIS) and Comprehensive Conservation Plan was published in the Federal Register on October 17, 2005. The minimum 45-day comment period for a DEIS was extended to 90 days at the outset due to the interest in the Comprehensive Conservation Plan. The comment period ended January 17, 2006. Copies of the DEIS were distributed as hard copies and compact disk. The document was also available for viewing or downloading from the planning web site. In response to the DEIS, a total of 1,983 comments were received via letters, emails, public meeting comment forms, petition, and oral comments. The total accounts for numerous repetitious comments included in form letters. The number of commentors on the DEIS totaled 642. Some commentors submitted comments on a number of topics and sometimes in multiple forms.

Submissions were examined for content and each commentor was entered into a log. The comments were extracted from the submission and grouped into topics, which provide the organization for this Response to Comments chapter. Within the topics some comments have been grouped into a theme representative of a common theme by more than one commentor. Some individual comments were unique enough in nature that they did not fit into a theme. These individual comments were responded to separately within a topic. Table 48 displays the number of comments that were received and that are represented in a topic. Table 49 functions as a table of contents for locating a topic's comment and response.

The names and addresses of those submitting comments, with the exception of names from petitions, were entered into our mailing list database. The full comments are available on the website, www.fws.gov/midwest/planning/craborchard. Comments received from agencies and organizations are reproduced in their entirety at the end of this chapter.

Changes have been made to the DEIS based on comments received. Changes made to the DEIS are referenced in the comment's response. The changes include modification to the alternatives, including the proposed action, and typographical and factual corrections.

Table 48: Comment Topics and Number of Comments Received for Each Topic on Crab Orchard NWR Draft Environmental Impact Statement and Comprehensive Conservation Plan

Comment Topic	Number of Comments
Wildlife/Habitat	
Forest fragmentation	57
Grassland fragmentation	55
Pine forest management/conversion	55
Reforestation	50
Prescribed burning	46
T&E species management	46
Waterfowl	24
Invasive plants	16
Wetland/moist-soil management	13
Clearing fencerows	7
Early successional habitat	6
Water quality	5
Grass field borders	4
Conservation easements	2
Fire management	2
Fisheries	2
Air quality	1
Agriculture	
Agricultural croplands	50
Pastures	17
Hay	9
Recreation	
Hunting	238
Trapping	206
Crab Orchard Boat & Yacht Club	202
14-day camping stay limit	132
Gas motor restriction Devils Kitchen Lake	89
Equestrian trails	88
Fishing	82
ATVs	57

Table 48: Comment Topics and Number of Comments Received for Each Topic on Crab Orchard NWR Draft Environmental Impact Statement and Comprehensive Conservation Plan (Continued)

Comment Topic	Number of Comments
Personal watercraft (jet skis)	43
Devils Kitchen Campground	38
Reducing recreational opportunities	34
No-wake zones Crab Orchard Lake	21
Recreation fees	13
The Haven	13
Hiking/biking trails	10
Waterskiing	10
Playport Marina	9
Law enforcement	5
Swimming	5
Picnicking	3
Sailboarding/windsurfing	3
Wildlife Observation and Photography	3
Environmental education	2
Fishing tournaments and fish-offs	2
Rockclimbing	2
Collecting wild plant foods	1
Scuba diving	1
Industry	
Industry	11
Wilderness	
Wilderness	67
Lands	
Land acquisition/boundary modification	54
Land exchange with SIU	54
Eliminate area designations	8

Table 49: Where to Find Topics and Service Responses

Table 49: Where to Find Topics and Service Responses

7.1 Response to Comments

7.1.1 Wildlife / Habitat

7.1.1.1. Waterfowl

Comment: The Refuge should maintain enough food resources through the cooperative farm program to support 6.4 million goose use-days; the document should add the amount of standing corn acreage unharvested in addition to the actual, but harvested corn acreage; the standing corn acreage is probably the most important food source for wintering populations of Canada Geese. Fields that are in weeds and not mowed should be planted to grain or hay that the geese would use. The Service should manage its agricultural resources in a manner that not only allows for maximum profit for farmers, but for effective wildlife management as well. This should include allowing enough food for wintering flocks of geese equal to the maximum population over the past five years.

Response: Our goal is to provide enough food to support 6.4 million goose-use-days using a variety of food resources. Although most of this food comes from the Refuge agricultural program, ultimately our goal is to provide the food—and whether we provide it with agricultural crops, managed moist-soil wetlands, or other habitats—is of secondary importance. Traditionally, 25% of the corn crop is left standing in the fields unharvested. In the future, we may vary the amount of corn left unharvested, as long as the 6.4 million goose-use-days goal is met. We manage the Refuge agricultural program to be a profitable venture of cooperative farmers, but not for maximum profit. We currently provide food well above the goose-use levels experienced over the last five years (Table 3, page 41 of the Draft EIS/CCP). The 5-year average for 2001-2005 is 1.6 million goose-use-days.

Comment: There is a flock of resident geese on the refuge. Prime nesting habitat on the refuge is disappearing due to erosion on the lake. We ask that you provide nesting structures for the resident geese.

Response: The Mississippi Flyway Giant Canada Goose Management Plan (Giant Canada Goose Committee, Mississippi Flyway Council Technical Section, 1996) describes the high reproductive potential and low mortality rates of giant Canada Geese in the Mississippi Flyway. The Plan also notes that agricultural and natural resource damage, including depredation of grain crops, overgrazed pastures and degraded water quality, have increased as resident Canada Goose populations have grown. Considering the negative effects of resident geese, the committee described its intention to not take any actions to specifically encourage increased nesting of resident Canada Geese. We agree with the findings and recommendations of the Plan and do not intend to provide nesting structures for resident geese. For further information on goose management see the Final Environmental Impact Statement: Resident Canada Goose Management, which is intended to guide and direct resident Canada Goose population growth and management activities in the conterminous United States, and is available at http://www.fws.gov/migratorybirds/issues/cangeese/finaleis.htm.

Comment: The Service should note the tragedy that occurs in the spring within sight of Rt. 148 Bridge concerning Canada Geese attempting to nest on the "island" just west of the bridge.

Response: We are aware of the Canada Geese nesting on this island. We note that cormorants roosting in the trees on this island impact goose nesting success.

Comment: There is no mention of the pounds of corn per acre that would be available on the acres of corn planted that are needed to feed 6.4 million goose days. No mention is provided of the pounds/bushels of corn that are produced/acre on the Refuge cropland. The size and numbers of ears observed by me indicates that the geese are going to get awfully hungry.

Response: We calculated the amounts of Canada Goose food produced on the Refuge in conjunction with Illinois Department of Natural Resources personnel using widely accepted techniques. Calculations are based on known calorie requirements of Canada Geese, the average production (weight and calories per acre) of different habitats (harvested corn, unharvested corn, wheat, clover, moist soil wetlands, etc.), and the amount of each habitat on the Refuge. There is some discussion of this in the Draft EIS/CCP (pages 89-91). The actual numbers used in the calculations are available at the Refuge.

Comment: The range of peak counts of Canada Geese would be informative along with the average peak count. There was a strong concern among biologists in the 1980's that there was not enough food to nourish the wintering geese.

Response: The peak count (highest number) of Canada Geese on the Refuge for each year is displayed in Figure 22 (page 90 in the Draft EIS/CCP). Overall goose use is better measured by the total number of goose-use-days on the Refuge for each year (Figure 23, page 90). Although there may have been concern regarding food quantity during the 1980s, this has not been an issue for 20 years. We have an abundance of food resources for Canada Geese (Table 3, page 41 of Draft EIS/CCP) that easily meet our goal of providing food to support 6.4 million goose-use-days.

Comment: The number of Canada Goose-use days needed on the refuge has been decreasing in the last decade, with fewer geese at the peak and with the geese coming later and leaving earlier. Hunters want to provide a safety net for geese in case northern lands experience a very cold winter. Providing feed for ten times the present number of goose-use days is excessive. The Refuge should reduce crop acreage to a level that reflects the most realistic projection of over-wintering waterfowl numbers. Maintaining unneeded crop acreage means that substantial amounts of land will be unavailable for conversion to additional forest or grassland habitat.

Respone: We agree that under normal circumstances, the Refuge will have more food available for Canada Geese than the numbers of geese that have been using the Refuge in recent years. We have opted to take a conservative approach when it comes to providing food for wintering Canada Geese. We would rather have some food left unused than risk not having an adequate amount if required. Agriculture is also one of the legislated purposes of the Refuge (Appendix G, page 281 of the Draft EIS/CCP), so we will set aside land for agriculture regardless of the needs of Canada Geese.

Comment: The Ducks, Shorebirds and other Waterbirds Goal specifies maintaining and enhancing populations of ducks, shorebirds and other waterbirds. However, the objective and strategy identified primarily benefits waterfowl. Either the goal should be revised or additional objectives/strategies should be added to provide benefits for shorebirds and other waterbirds (e.g., creation/management of mudflats, submergent wetlands and emergent wetlands, maintaining water levels conducive to shorebirds, etc.).

Response: The objective and strategy for the Ducks, Shorebirds and other Waterbirds Goal are general and do not outline actions specific to waterfowl or shorebirds and other waterbirds. More detailed descriptions of management actions will be outlined in the step-down Habitat Management Plan (Appendix A, Table 48, page 185 in the Draft EIS/CCP), which will be completed after the Final EIS/CCP is published.

7.1.1.2. Protection of Non-Game Wildlife

Comment: With declining populations for many wildlife species, it is important for the Refuge to focus on the protection of non-game wildlife, and make that a priority at least equal to the propagation of game animals, such as ducks, geese and deer.

Response: We agree that public lands are important to the existence of many species of plants and game and non-game animal species. We think that our plan increases management for non-game wildlife, especially our plans for forest and grassland management.

Comment: We believe the current survey activities could be enhanced by including monitoring events for certain types of birds. In particular, surveys of area-sensitive forest birds and grassland and shrubland species would contribute valuable information to Refuge and national goals. We recommend the Service add this component to existing survey work.

Response: We have done some surveys of forest, grassland and shrubland birds. More detailed descriptions of future surveys will be outlined in the Monitoring and Inventory step-down plan (Appendix A, Table 48, page 186 in the Draft EIS/CCP), which will be completed after the Final EIS/CCP is published. We will keep your comment in mind when the step-down plan is developed.

7.1.1.3. Threatened & Endangered Species

Comment: The Refuge should give any Illinois state endangered or threatened species the same proactive considerations and protections that they would afford any federally listed species that

occurs on the Refuge. The Refuge should always consult with the IDNR Division of Natural Heritage regarding any action that may impact any state-listed species that occur at or near Crab Orchard National Wildlife Refuge. We would like to see the Service and the Illinois DNR enter into a formal agreement that the Refuge managers will consult with IDNR biologists every time a management action could possibly involve a state T & E species.

Response: We will be proactive regarding the management of state-listed species, but because federally-listed species often face more widespread threats, they may be higher priorities. We are happy to continue to work with IDNR and we will consult with the Division of Natural Heritage.

Comment: We do have some concerns that illegal ATV riding, jet skis, power boats and other commotion will disturb the nesting of the bald eagles, and even discourage some eagles from nesting on the refuge, especially if the nesting population continues to increase. We would support closing off more fingers of Crab Orchard Lake and the other lakes to motor boats. We also strongly advocate strict policing of illegal ATV riding to protect these species.

Response: We will continue to use the guidelines set forth in the Northern States Bald Eagle Recovery Plan (USFWS 1983). We also have concerns about disturbance of bald eagle nests, but have seen no evidence of negative impacts caused by human disturbance. Nests that have been built close to a road or a busy part of Crab Orchard Lake appear to produce young at rates similar to other nests on the Refuge. If human activities, legal or illegal, appear to be negatively impacting nesting bald eagles, we will take action to address the issue.

7.1.1.4. Fisheries

Comment: The bluegill fishing on Devils Kitchen Lake hasn't been as productive as in the past. The number of bluegill beds has greatly declined. The shoreline is almost completely taken over by moss or some other type of water vegetation. The decline in bluegill beds has gotten worse as the moss has gotten thicker. Perhaps you could look into this and see if something can be done about it. Either by spraying or some other type of vegetation control.

Response: We have been discussing the amount of aquatic vegetation present in Devils Kitchen Lake with Illinois DNR fisheries personnel. The vegetation that you refer to as a problem is Eurasian watermilfoil (*Myriophyllum spicatum)*. Vegetation control is being considered, but must be weighed against other concerns such as water quality and impacts on other species.

7.1.1.5. Wetlands/Moist-soil Management

Comment: Alternative E states 50 -70 acres of moist-soil wetlands will be developed during the 15 year period of the CCP. The Refuge should increase the amount of wetlands developed over this planning period. This total seems to underachieve the opportunities currently on Refuge. All available locations based on topography and soil type should be assessed and developed as moist-soil management areas whenever possible. Even areas without suitable sources for critical water control manipulations should be considered because spring drawdowns may provide adequate food resources for wetland wildlife species. In situations where undesirable plants (cocklebur) infest these wetlands, appropriate management and seeding could provide necessary food resources and microhabitat for macroinvertebrates. Protection of isolated wetlands and small ponds are important for amphibian populations.

Response: We agree that there may be more opportunities for wetland development and plan to target 150-200 acres. Wetland development on the Refuge is constrained by topography. The largest, most suitable wetland development sites on the Refuge have already been developed. We would be happy to work with Illinois DNR in the identification of additional wetland sites. We are currently working on surveying additional sites for development as wetlands.

Comment: The Refuge should place a higher priority on developing wetlands than on planting trees.

Response: We plan to develop new wetlands (150-200 acres) and plant trees (490 acres). The area of suitable sites that can be practically developed as wetlands, however, is limited by the terrain. The largest, most suitable wetland development sites on the Refuge have already been developed. It is unlikely that we could find the same number of acres as will be planted in trees (490 acres). We are currently working on surveying additional sites for development as wetlands.

Comment: I suggest creating a wetland out of the pond behind the visitor center. This make much more sense than spending 2.5 million to reinforce a dam that is less than 500 yards away from a 7000 acre lake.

Response: A cost-benefits analysis will be conducted before work on the dam behind the visitor center is undertaken.

7.1.1.6. Forest Fragmentation

Comment: We support the consolidation of closed canopy hardwood forest in order to provide habitat for forest interior birds, whose populations have been decreasing at an alarming rate.

Response: We appreciate the support of our proposed action.

Comment: Where are the priority wildlife species identified? The effort should be to enhance and/or improve habitat for those species. Some species will be adversely affected by reducing habitat fragmentation. The establishment and expansion of hardwood forest will not be good for grassland and border species.

Response: Resource conservation priority species are listed in Table 33 (page 130 of the Draft EIS/CCP). The effects of each alternative are discussed in Section 4.1.1 Quantifying Effects of Alternatives on Wildlife Species (page 128) and displayed in Table 34 (page 131). The U.S. Fish and Wildlife Service Region 3 conservation priority species that inhabit the general area of the Refuge are listed in Appendix N of the Draft EIS. This list of species is a subset of the region-wide list found in *Fish & Wildlife Conservation Priorities Region 3*. This document is available for viewing at: http://www.fws.gov/midwest/News/documents/priority.pdf Our proposed management actions would enhance grassland habitat. An abundance of edge habitat will remain on the Refuge.

Comment: I fully agree that emphasis should be placed on maximizing unfragmented forest and applaud the intention of the Refuge to do so. I am surprised, however, at the conclusion that the small changes that you cite will make a significant difference, particularly in brood parasitization by cowbirds.

Response: Our forest management program should provide tangible benefits for many forest-nesting bird species, including some reduction in cowbird parasitism. We have adopted many of the forest tract management guidelines recommended in the scientific literature, such as those published by Illinois DNR (IDNR. 1993. *Habitat establishment, enhancement and management for forest and grassland birds in Illinois*.). Management actions taken to increase the amount of forest, and especially to increase the amount of core area forest (more than 100 meters from non-forest habitat), should result in decreased nest parasitism. Most of the increase in the amount of forest on the Refuge will be the result of the maturation of existing forest and the succession of fallow fields and shrublands into forest (2,200 out of 2,700 acres of additional forest by year 2100). We project the amount of core area forest will increase by over 40% in 15 years and 180% in 100 years (Page 136 of Draft EIS).

Comment: Owing to the pre-historical importance of forest over grassland in this area, I favor emphasis on forest.

Response: We agree. About 25,000 acres of the Refuge is forest; grasslands cover around 2,000 acres. In 100 years we estimate that about 28,000 acres of the Refuge will be forested with around 2,000 acres in grassland.

Comment: Plans to reduce forest and grassland fragmentation benefit certain birds, but it will adversely affect food and habitat for geese, deer, turkey, and many small animals.

Response: We have an abundance of food resources for Canada Geese (Table 3, page 41 of Draft EIS/CCP) that easily meet our goal of providing food to support 6.4 million goose-use-days. Food and habitat for deer, turkey and small mammals may be slightly reduced, but our focus is largely on resource conservation priority species that are migratory birds and an endangered mammal (Table 33, page 130 of the Draft EIS/CCP).

7.1.1.7. Forest Management

Comment: We believe that it is crucial to establish and maintain the Refuge's forests as being composed primarily of oak-hickory forest types. Oaks are keystone species that are critically important for sustaining the forest ecosystem including many wildlife species. We recognize that active management is required to maintain the oak-hickory component of the forest. With a lack of disturbance, maple trees increase in numbers and

oak-hickory trees steadily decrease. The forest floor becomes intensely shaded and understory species begin to disappear. In areas where disturbances such as tree harvest have occurred, new oak-hickory forests are more likely to develop and predominate. Professional foresters know that an oak-hickory forest cannot be sustained and regenerated without vegetative disturbance.

We are concerned, however, that the disturbance regime proposed for forested lands is essentially insignificant, especially for hardwood stands. The Refuge should harvest its hardwood stands at a rate sufficient to maintain the oak-hickory ecosystem and prevent conversion to maple-beech. Fire should be introduced to oak-hickory forests as well as pine stands. Prescribed fire language should be broad enough to allow growing season fire as well as dormant season; managers may need higher mortalities than those produced during the dormant season. Prescribed fire should continue to be allowed in those pine stands converting to hardwoods to enable managers to manipulate the mix of species toward a higher percentage of oak-hickory. Without silvicultural data, we are unable to recommend an appropriate disturbance regime. Suffice it to say that significant disturbance in the form of harvest, fire, and other methods must occur within the historic range of variability for the oak-hickory species present if they are to flourish.

Little data is presented to support or explain the silvicultural program and, indeed, one is led to the conclusion that upland forest composition is of little importance to the refuge. The EIS and Plan must articulate, and support by appropriate management, a desired future condition for all of the Refuge's forested lands.

Response: We agree that our general forest management program needs to be described in more detail. Thank you for pointing out this oversight. Accordingly, we have modified the Features Common to All Alternatives section to include a goal, an objective and strategies to address general hardwood forest management. Much greater detail regarding this program will be presented in the Refuge's *Habitat Management Plan*, which is a step-down plan scheduled to be completed after the CCP is approved.

\# **Comment:** The draft CCP does not describe practical or effective management of the land acquired from SIU in 1979 along the southern Refuge border on Rocky Comfort Road. The 1979 land appears to be in worse shape now than in 1979.

Response: The projected conditions for this land are represented in Figures 9 and 10 of the Draft EIS. The specific techniques and timing for strategies to achieve this land cover will be described more specifically in a step-down *Habitat Management Plan* that will be initiated and completed after the CCP is approved. Most of the tract acquired from SIU in 1979 had been cleared of trees. Since that time, the Refuge has allowed natural succession to occur in these old fields resulting in the slow recovery of the forest. It should be noted that all stages in this decades-long process provide important habitats for wildlife.

7.1.1.8. Pine Forest Management/Conversion

\# **Comment:** The Illinois DNR and others support the conversion of non-native pines to native hardwoods through timber harvest (thinning), prescribed burning, and either by natural regeneration or augment with plantings when necessary.

Response: We intend to apply silvicultural treatments that encourage advance regeneration of desirable hardwoods; plantings should rarely, if ever, be needed. Treatments may include thinnings, final removal cuttings, and prescribed burning.

\# **Comment:** We do not support the use of commercial logging to convert stands of non-native pines to hardwoods. We have witnessed previous "clear cutting" of pines on the refuge by commercial contract loggers. Soil disturbance, compaction of soil by large machinery, and uprooting of hardwood saplings caused by the commercial logging can all cause setbacks to the conversion of pines to hardwoods. A plan to thin non-native pine stands without the use of heavy, industrial equipment could be implemented.

Response: Commercial timber sales are the most efficient and cost effective means to accomplish removal of trees. Timber sale contracts have appropriate special conditions to minimize disturbance and protect resources. Refuge personnel inspect the timber cutting operations daily or as often as necessary to ensure compliance with

the contract. Harvest operations do cause short-term disturbance on the site, but recovery occurs within one to three years.

Comment: In the past when stands of pine trees were completely cut down on the Refuge, people who used those areas of the refuge were horrified. No explanations were given to the public as to the reasons. I would hate to see the same thing happen again and urge that adequate public notification and even involvement in the process occur before change is made.

Response: We intend to notify the public and solicit comments as required by NEPA before any timber harvest operations.

Comment: We have observed in some areas of Shawnee National Forest where there were clearcuts that pines were regenerating and growing just as fast as the oaks and other hardwoods. For one thing, deer eat small oaks, but not pines. To keep this from happening would take close management.

Response: Pines can regenerate on a site whenever there is a seed source overhead or nearby. Deer feed on or otherwise physically damage both hardwoods and pines. Follow-up treatments to remove unwanted pine seedlings or saplings would be desirable, especially if they are determined to be hindering the hardwood regeneration.

Comment: We object to the proposal to remove all pines. What reason is there other than that these particular species are not native to this exact area? They are not non-native; all being native North American trees that were planted during the 1930's mainly by the CCC. These are 70 years old and provide habitat for a large number of birds and other wildlife. To remove pines so that native hardwoods could be planted would reduce forest diversity for at least 50 years. Various hardwoods are now becoming established in the pine groves. The few remaining living CCC veterans would be most disappointed to know that their efforts were being destroyed for some idealistic notion.

Response: We classify all the pine species planted on the Refuge as non-native because none occurred here naturally. We feel that focusing on restoring plants native to the local area is more appropriate than perpetuating plants beyond their natural range. We also feel that species-rich hardwood forests are much more diverse than monocultural pine stands. The pines were originally planted under the direction of the Soil Conservation Service primarily to quickly establish vegetative cover to control soil erosion. The long-term objectives for the pine plantations were to provide wood products and hasten restoration of native hardwoods.

Comment: A tremendous benefit of pine is that it early successional habitat and winter cover are created for wildlife" (W.K Clatterbuck, associate professor of forestry, wildlife and fisheries at the University of Tennessee} With this in mind and then observing it on my own for more then thirty years I feel strongly that there should not be a large reduction of them. We planted, they adapted and it would be wrong to remove them.

Response: Pines on the Refuge provide a negligible amount of early successional habitat because the stands are mature (40 to 70 years old). The Refuge has a substantial amount of native, eastern red-cedar forest which provides winter cover for wildlife. We intend to convert non-native pine plantations to native hardwoods as proposed because, generally, hardwood forests provide much better habitat than pine.

Comment: Oppose radical methods of thinning pine stands, such as final shelterwood cuts, which can damage the existing hardwoods in a mixed stand and can set back the recovery of hardwoods.

Response: The final cutting under the shelterwood silvicultural system is a removal cutting not a thinning. The final removal cutting is necessary to release the advance reproduction of hardwoods from the shade of the pine overstory to allow vigorous growth. Another reason it is desirable to remove all pines from a given site is to prevent them from regenerating from seed and competing with the young hardwoods. Damaging the young, hardwood advance reproduction is unavoidable during harvest operations and not necessarily undesirable. Following disturbance by cutting (or burning), the hardwoods will sprout vigorously from the rootstock and grow more rapidly than a seedling of the same age.

Comment: Support removal of pines, but over an extended period of time, not during the breeding season and not in its entirety.

Response: We intend to convert pine stands to native hardwoods through a process which mimics natural succession. We will primarily use the shelterwood silvicultural system to accelerate the process of removing pines and promoting establishment and growth of desirable hardwoods. We will schedule cuttings to minimize harmful effects on wildlife. We intend to favor the oak-hickory forest type on sites that are suitable because they provide high quality wildlife habitat.

Comment: It would be desirable to keep pine stands in recreational areas, especially the Harmony Trail area, but also in and around campgrounds, fishing and picnic sites, etc. Pines supply diversity, aesthetic qualities. There are places, such as along the Devil's Kitchen shoreline, where the pine stands are narrow, where the pines are older, and where regeneration of hardwoods is already occurring naturally. To remove pines in those areas makes no sense and could be damaging to bird populations that use the trees as food sources and shelter in winter (such as irruptive red-breasted nuthatches and pine warblers that have overwintered for decades at Crab Orchard and that also breed regularly in the refuge) and as breeding sites for species such as Cooper's hawks and owls.

Response: We agree that there may be some locations where removing pines may not make sense. We also agree that pine trees do provide habitat for some species of birds, but our focus is largely on the resource conservation priority species identified in the Draft EIS/CCP (Table 33, page 130). The forest species on this list generally prefer hardwood forest.

Comment: In those areas where pine stands are thick and wide, and where hardwood regeneration is not occurring, we urge the refuge to adopt pine-removal policies that will be as unintrusive or disruptive as possible. Pine removal in those areas should be planned over a long as period of time to allow for bird species to adapt to the habitat changes.

Response: We intend to proceed with accelerating succession in all pine stands to encourage native hardwoods while minimizing any harmful effects on Refuge resources. Since we would focus management on larger stands, some small, remote patches will probably remain for several decades.

Comment: Support the removal of the large pine "plantations" to support and improve hardwood regeneration, I feel it would be beneficial to Pine Warblers and some migratory species such as Pine Siskens, Yellow-rumped Warblers, Purple Finches, and Red-breasted Nuthatches to leave a few of the scattered pines, including some of the small pine rows. Ribbons of pines and small scattered pine stands do provide essential shelter, food, and habitat to a number of bird species and should not negatively impact hardwood forest management. In the large pine stand/plantations, I urge the refuge to adopt pine-removal policies that will be as unintrusive or disruptive as possible. Pine removal in those areas should be planned over a long period of time to allow for bird species to adapt to the habitat changes. I urge you to plan any habitat changes, including tree removal, during times other than the prime breeding season of mid-March through August.

Response: We agree that pine trees provide habitat for some bird species, but the focus of our plan is largely on resource conservation priority species that are listed in the Draft EIS/CCP (Table 33, page 130). The forest birds on this list generally prefer hardwood forest. Refuge-wide pine removal will likely take many years and be a gradual process. Breeding season for wildlife, especially migratory birds and the endangered Indiana bat, will be a major factor in scheduling vegetation management activities.

Comment: No thinning of pines should take place within 50 yards of the shoreline. Crab Orchard Lake is beautiful because of its shaded shorelines. The pines will naturally die and be overtaken by oak and hickory, so there is no reason to destroy the shadiness of the shorelines in the short-term.

Response: Pines border a small fraction of the 125-mile shoreline of Crab Orchard Lake. A good deal of shade will remain elsewhere along the shore following cuttings in pine stands. Without silvicultural treatments tailored specifically toward promoting oak and hickory, less desirable forest types could capture the site in many cases.

Comment: I oppose logging. Logging drives out wildlife and birds making them homeless and subject to death and injury. Logging also causes erosion, creates heat islands, and changes the composition of the trees that grow. Given the

many, substantial objections to logging, it is interesting that the lure of money and greed seems to override all of them.

Response: Logging does cause short-term disturbance, but recovery occurs within one to three years. Commercial timber sales are strictly a means to accomplish habitat management treatments; the timber harvested is a by-product of management and the proceeds we collect are deposited in the National Wildlife Refuge fund.

7.1.1.9. Reforestation

Comment: Illinois DNR and others support reforestation of 490 acres to reduce forest fragmentation. Reforestation efforts should focus south of Grassy Road to improve forest habitats for neotropical birds and other forest wildlife species; recent literature suggests that forest portions within Crab Orchard NWR may not provide critical breeding habitats because of insufficient acreage and may actually be a poor source of recruitment due to heavy predation; therefore, management goals for neotropical birds might emphasize migratory stopover habitats rather than breeding habitats; the document should also indicate the number of acres which have already been converted from cropland and other fields to forest.

Response: We agree that the amount of forest on the Refuge may not be large enough to provide high-quality habitat for the most area-sensitive forest-nesting birds. Our forest management plans should provide benefits for many forest-nesting bird species, including some reduction in cowbird parasitism. Our forest management plans follow many of the forest tract management guidelines recommended by Illinois DNR (IDNR. 1993. *Habitat establishment, enhancement and management for forest and grassland birds in Illinois.*). Since 1990, about 881 acres have been reforested on the Refuge; 254 acres of cropland, 397 acres of grassland, and 230 acres of brushland.

Comment: There are currently more acres of forest in Illinois than at any time since at least 1924 (Herkert, J.R. ed 1992.) Despite this increase in forest acreage, populations of many species of forest birds continue to decline. In Illinois, nest predators may destroy as many as 80% of all nests for some species of woodland birds (Robinson, S. K 1988.) Clearly the problem is more than just the acreage of habitat available. The Draft EIS/CCP supports reforestation of approximately 500 acres of forest. The estimated cost for the necessary reforestation would be $ 500.00 per acre (Final Restoration Plan July, 1997.) for a total cost of $ 250,000.00. The proposed acreage suggested for tree planting will have a miniscule effect (in view of the hundreds of thousands of acres of timber that exists within this state) on attracting the Neotropical song birds. Reforestation will be detrimental to our waterfowl populations After weighing the pros and cons should your decision be to add more acres of reforestation, we would suggest that the same number of acreage be planned for wetland development, conservation, and management for Ducks, Geese and Shore Birds. Every attempt should be made to avoid reforestation in goose use areas.

Response: The area of forest in Illinois reached its lowest point around 1924, as shown in the table below. Since that time the area of forest in the state has increased somewhat. Unfortunately, much of this old-field or successional forest does not provide suitable or adequate habitat for many species of forest birds, especially area-sensitive species. The size, arrangement, and species composition of forest tracts and the age/size of the trees growing there are important factors in determining suitability as wildlife habitat. We intend to develop several moist-soil management areas on suitable sites. The area of suitable sites that can be practically developed, however, is limited by the terrain. Therefore, the area we propose to reforest will exceed that of new moist-soil units. The sites we have identified for reforestation typically receive little to no goose use.

These data compiled by Iverson *et al.* (1989) show historical amounts of forestland in Illinois.

The sites proposed to be reforested were strategically selected based on their location and capacity to create large blocks of forest, thereby reducing habitat fragmentation. None of these sites currently receive a significant amount of goose use. We have not observed any detrimental effects on waterfowl caused by past reforestation projects, nor do we expect any from those proposed. We plan to construct several new moist-soil management units. The table above shows that the area of forest in Illinois in 1985 was only 31 percent of the area in 1820, which is around the time of European settlement. Likewise, Williamson County had only 33 percent of its original

Table 50: Area of Forest in Illinois and Williamson County in 1820, 1924, and 1985 (acres)[1]

Year	1820	1924	1985
Illinois	13,804,600	3,021,700	4,263,100
Williamson County	257,500	39,900	85,300

1. *[Iverson, L.R., R.L. Oliver, D.P. Tucker, P.G. Riser, C.D. Burnett, and R.G. Rayburn. 1989. The forest resources of Illinois: an atlas and analysis of spatial and temporal trends. Illinois Natural History Survey Special Publication 11. 181 p.]*

forest area by 1985. While Illinois had 4.2 million acres of forest in 1985, the individual tract size has decreased along with the quality of the habitat provided. Most forest tracts in the state have become severely fragmented, which is thought to be the primary reason for declining breeding success of some forest birds.

Comment: There are more than plenty of trees and wooded areas within the "closed" portion of the refuge. We suggest any and all reforestation be conducted outside of the "closed" portion of the refuge to minimize the impact felt by migratory waterfowl and surrounding property owners. By planting trees you or the service have no idea which private landowner on the refuge perimeter you will be affecting by changing the flight pattern of the geese leaving the refuge.

Response: About 270 acres of the 490 acres of proposed reforestation sites are located in the restricted use area. None of these 18 sites currently receive a significant amount of goose use. We do not expect any change in flight patterns of geese as a result of our reforestation projects.

Comment: Reforestation for neotropical songbird habitat will only bring bird flu to the area.

Response: Our proposed reforestation projects are designed to consolidate forested areas by converting open land to forest. This will benefit a number of area-sensitive bird species that require large blocks of closed canopy forest. Forest birds are not likely to introduce avian influenza to this area. In the wild, waterfowl are the principal carriers of avian influenza.

Comment: A cooperative farmer would like to keep bottomland fields that he farms in crop production instead of planted in trees.

Response: The subject fields are located along the west side of Grassy Creek south of Westgate Road. These two fields are within one of the large forest blocks we have identified in which openings will be minimized or eliminated to reduce forest habitat fragmentation. We have weighed the wildlife conservation purpose against the agricultural purposes for this land and feel the wildlife benefits justify the conversion. When we take farm fields out of production as proposed, we will make adjustments to equitably allocate the remaining farm fields among all our cooperative farmers.

Comment: Portions of the Refuge cropland have been replanted with trees within the last 15 years. Have these areas been identified in the land cover descriptions as developing forests?

Response: See Figure 21: Land Cover of Crab Orchard NWR, 2000, on page 85 of DEIS, and Table 6: Area and Percent cover of Habitats on Crab Orchard NWR, 1807 and 2000 on page 86. The sites that have been reforested are identified as “Fallow Herbaceous Field” or “Early Successional Oak Forest (reforested).” Note that the “Fallow Herbaceous Field” cover type includes some sites that have not been reforested.

Comment: Oak and hickory may not thrive in bottomland fields bordering Little Grassy Creek. It would take many decades to reach the desired goal. The usual growth of low-value softwoods grows quickly and tends to crowd out the hardwoods making it less likely to achieve the desired reduction of fragmentation. The reforestation will greatly affect a cooperative farming operation that has made large investments and are concerned about loss of income.

Response: We intend to select appropriate oak, hickory, and other desirable species to match the site conditions. Bottomlands typically develop a profuse growth of volunteer trees, shrubs, and vines. In most cases, the longer-lived species will eventually grow through and express dominance after two or three decades. At this age trees start

mast (acorn or nut) production, which continues for many more decades. Bottomland hardwood forests are some of the most biologically diverse and productive habitats of this area. Restoring forest along Little Grassy Creek would benefit this riparian zone almost immediately by protecting water quality (reduce water temperature, reduce sediment load, reduce pesticide runoff). In the longer term, the forest would provide high quality habitat and reduce forest fragmentation as part of a large forest block. Reduction of forest fragmentation would result independent of the composition of the forest. When we take farm fields out of production as proposed, we will make adjustments to equitably allocate the remaining farm fields among all our cooperative farmers.

Comment: The final concern is about the plan to reforest the area I commonly refer to as Grassy Bottoms. This is the area in the SW 1/4, SW 1/4 of Section 4; the NE 1/4, NE 1/4 of Section 8 and the W 1/2 of the NW 1/4 of Section 9, Township 9 South, Range 1 East of the 3rd PM. This cropland area is surrounded on the north, northeast and west by flooded timber areas which provide excellent areas for large numbers of waterfowl to not only winter, but also nesting for many woodducks. The close proximity of the corn or beans of this agricultural area provides a definite asset to these waterfowl. This area is one of my favorite areas to observe the wildlife and I feel that reforesting this area would serve no wildlife, but rather create a potential harm to many.

Response: If feasible, our tentative plan for this area is to construct a moist-soil management unit. If we determine that constructing a moist-soil management unit is not feasible here, we would probably reforest the site because it is located within one of the large forest blocks where we intend to minimize openings. In either case, we expect the wildlife benefits to increase under the conversion.

7.1.1.10. Grassland Fragmentation

Comment: Support consolidation of grasslands on the refuge and the conversion of fescue and cool season grasses to native warm season grasses.

Response: We appreciate the support for this portion of the proposed alternative.

Comment: Plans to reduce grassland fragmentation are to benefit certain birds, but it seems to me it will adversely affect food and habitat for geese, deer, turkey, and many small mammals.

Response: The Refuge has an abundance of food resources for Canada Geese (Table 3, page 41 of Draft EIS/CCP) that easily meet our goal of providing food to support 6.4 million goose-use-days. Food and habitat for deer, turkey and small mammals may be slightly reduced, but our focus is largely on resource conservation priority species that are migratory birds and an endangered mammal (Table 33, page 130 of the Draft EIS/CCP).

7.1.1.11. Grass Field Borders

Comment: Establish 60-foot field borders of native warm season grass adjacent to select cropfields beginning in the public hunting area; this will improve wintering and brood habitats for bobwhite quail, rabbits, turkey, other wildlife species and increase hunting opportunities.

Response: We plan to add about 100 acres of 30-foot-wide borders of native warm-season grasses in row crop fields in the open portion of the Refuge (page 44 of the Draft EIS/CCP). We will be happy to work with Illinois DNR to identify fields where 60-foot borders are possible. However, Refuge agricultural fields tend to be small and 60-foot borders may be too large.

7.1.1.12. Early Successional Habitat

Comment: The CCP should direct the maintenance of a number of areas (acreage) of early successional habitats that are crucial to certain resident and migratory species.

Response: We plan to maintain 300 acres of early succession habitat (page 44 of Draft EIS/CCP) by using prescribed fire or mechanical treatment (mowing, disking) to disturb about 200 acres every 3 to 5 years and adding about 100 acres of 30-foot-wide borders of native warm-season grasses in row crop fields in the open portion of the Refuge.

7.1.1.13. Clearing Fencerows

Comment: The clearing of 8 miles of linear fence rows to improve nearby grasslands may not result in accomplishing the goal to improve habitats for grassland birds; the acreage of grasslands on the refuge and in the county most likely

will not contribute significantly to increase breeding populations of grassland birds; destroying fence rows may actually hurt resident wildlife without providing measurable benefits to grassland birds.

Response: Our goal for grassland birds (page 11 of the Draft EIS/CCP) was meant to place emphasis on priority species (Table 33, page 130 of the Draft EIS/CCP). Removal of linear forest habitat and hedgerows adjacent to agricultural fields would benefit Canada Geese and grassland nesting birds. Clearing fencerows will remove some habitat for some resident species, but only a small proportion of the fencerow habitat on the Refuge will be removed. The benefits to grassland birds from reducing or removing woody vegetation in grassland areas is supported in the scientific literature (Herkert *et al.*, 1996. *Management of Midwestern grassland landscapes for the conservation of migratory birds.* U.S. Forest Service, General Technical Report NC-187.)

Comment: Resident wildlife and some birds will be adversely affected by the removal of 124 acres of linear forest habitat and 8 miles of hedge row. This may be a small part of the Refuge but it is an adverse effect that has not been adequately discussed in the document.

Response: Clearing fencerows will remove some habitat for some resident species, but only a small proportion of the fencerow habitat on the Refuge will be removed. The effects on wildlife are discussed in Section 4.1.1 Quantifying Effects of Alternatives on Wildlife Species (page 128 in the Draft EIS/CCP). The vast majority of negative impacts on shrubland species will be the result of habitat succession, the natural process of shrub-dominated habitat converting to tree-dominated habitat.

Comment: What wildlife would be adversely affected by the removal of 15 acres of lineal forest and 2 miles of hedge rows? Would archeological and historical resources be adversely affected by such actions? Earth moving is anticipated.

Response: Some shrubland species are listed in the Draft EIS/CCP (page 84) and effects on wildlife are discussed in Section 4.1.1 Quantifying Effects of Alternatives on Wildlife Species (page 128 in the Draft EIS/CCP). Fencerow clearing will require the same protection of archeological resources as any other Refuge activity. The archeological objective is outlined in the Draft EIS/CCP (page 24).

Comment: Have you considered delaying the removal of fencerows, which might provide temporary bobwhite habitat, until more extensive habitat has been established?

Response: We will consider delaying the removal of fencerows until more extensive habitat has been established, but we feel that northern bobwhites are more limited by nesting habitat (grassland) than by other cover.

Comment: We wish to reiterate our concerns regarding the proposal for removal of linear forest habitat and hedgerows. The purported purpose of the action is to benefit grassland birds. However, such an activity would impact some species of grassland birds, such as loggerhead shrikes (a species of interest). Loggerhead shrikes nest in hedgerows and linear forested areas. In addition, these habitats provide perch sites for foraging and singing activities. The removal of these important habitats would make some areas completely unsuitable for loggerhead shrike use. Other grassland birds may be impacted in a similar manner. Additionally, woody fence rows and hedge rows provide critical wintering habitat for many species of songbirds that are more susceptible to predation when seeking shelter at the edge of large forested tracts.

Response: Fencerow removal is an action intended to help the Refuge meet a goal for grassland bird management (page 11 of the Draft EIS/CCP) which places emphasis on resource conservation priority species (Table 33, page 130 of the Draft EIS/CCP). The loggerhead shrike is one of 29 priority species for which we are managing. Clearing fencerows will remove some habitat for some species, but only a small proportion of the fencerow habitat on the Refuge will be removed. The benefits to grassland birds from reducing or removing woody vegetation in grassland areas is supported in the scientific literature (Herkert et al. 1996. Management of Midwestern grassland landscapes for the conservation of migratory birds. U.S. Forest Service, General Technical Report NC-187.)

7.1.1.14. Fire Management

Comment: What and where do "wildlands" occur on the Refuge? No maps depict that habitat type. Would burning affect bald eagle nest trees or potential nest trees?

Response: "Wildland" is a fairly new term often used by fire management professionals when referring to undeveloped land, which could be forest, brushland, grassland, etc. The term is not meant to describe a habitat type. Bald eagle nest trees are typically located in bottomland forests, which we do not intend to burn.

7.1.1.15. Prescribed Burning

Comment: Illinois DNR and others support the use of prescribed fire in forest and grasslands to increase their productivity to wildlife. The Refuge should implement a program of prescribed burning in existing hardwood stands to encourage oak regeneration, eliminate woody and non-woody exotics in the understory, and discourage the establishment of shade tolerant tree species in the overstory. Prescribed fire language should be broad enough to allow growing season fire as well as dormant season; managers may need higher mortalities than those produced during the dormant season. Prescribed fire should continue to be allowed in those pine stands converting to hardwoods to enable managers to manipulate the mix of species toward a higher percentage of oak-hickory. Without silvicultural data, we are unable to recommend an appropriate disturbance regime. Suffice it to say that significant disturbance in the form of harvest, fire, and other methods must occur within the historic range of variability for the oak-hickory species present if they are to flourish.

Maintaining grasslands via cyclic controlled burning will go far in controlling unwanted non-native, invasive shrub and vine species and those trees, like honeylocust and autumn-olive, that opportunistically sprout or sucker up in grassland areas.

Response: We concur.

Comment: Pages 132-134, Section 4.2.7, Prescribed Fire - A section on faunal effects should be added.

Response: We agree. We have inserted a section describing the effects of prescribed fire on fauna.

Comment: Prescribed fire is a form of manipulation that should be avoided within wilderness except if and when it is necessary to protect survival of a T & E species, or absolutely necessary to protect adjoining private properties. Wilderness Watch supports a let-burn policy for naturally occurring fires, with actions taken outside the wilderness boundary such as fuel removal and fireproof wraps to protect adjoining property. If greater suppression efforts still seem necessary in a particular circumstance to protect survival of a T & E species, or to protect human health and safety or property, then a second-tier effort can consider air drops of water (first) and retardant (second) if water drops are not adequate in controlling the intensity and direction of the fire. The potential impacts of fire retardant on birds and wildlife should be assessed in the CCP.

Response: Our rationale for the need to reintroduce fire in the natural system is to simulate the documented, historical fire regime in the oak-hickory forests by utilizing the natural tool of fire. The goal is to preserve the natural conditions and primeval character of the Wilderness by restoring the essential element of fire. The lack of natural disturbance, such as fire, in the oak-hickory forests has often resulted in fire-intolerant species such as sugar maple replacing fire-tolerant tree species, as well as aiding encroachment of non-native and invasive species. Major changes in land use over the landscape surrounding the Wilderness have greatly reduced the capacity for natural fire to reach the Wilderness. Our approach is consistent with the Service's policy and guidelines.

The Service's *Refuge Manual* (6 RM 8.8 D.) addresses prescribed burning in wilderness as follows: "When consistent with refuge objectives and contingent upon the existence of a current, approved fire management plan for the wilderness area, prescribed burning is permitted. Burning may even be desirable within wilderness, especially when fire is a natural force that has historically affected the area or when fire is necessary to restore, maintain, protect, or preserve the wilderness resources and values of the area, or when controlled burning can reduce fire hazards to the refuge or wilderness. Using mechanically-created firebreaks and motorized equipment for prescribed burning is generally

not permitted on a wilderness area. However, firebreaks may be constructed contiguous to the wilderness area."

The Service's *Draft Wilderness Stewardship Policy Pursuant to the Wilderness Act of 1964* states: "We may use prescribed fire to maintain or restore ecological integrity that has been degraded by human influence or is necessary to protect or recover threatened or endangered species." (66 FR 10)

We intend to revise the Refuge's *Fire Management Plan* to allow for wildland fire use in the Wilderness and elsewhere on the Refuge. We agree that precautionary measures must be taken when implementing prescribed fire operations in the Crab Orchard Wilderness. We intend to use only minimal impact techniques during implementation of prescribed fires and during management of natural ignitions within the Wilderness. We expect to use ground-based ignition, control, and suppression tactics only, and do not anticipate the need for aerial techniques or chemical retardants.

7.1.1.16. Invasive Plants

Comment: Non-native and exotic plant populations invading the refuge should be controlled. Autumn-olive and multiflora rose are strongly invasive and are detrimental to achieving national wildlife refuge objectives and should be controlled. There is particular concern for protecting the Rocky Bluff area from invasive plants, especially garlic mustard that has not been found there yet but is spreading greatly in Southern Illinois. Use herbicides only after other methods have not worked. A number of volunteers could be recruited for control of plants such as garlic mustard and winter creeper. Since horses tend to spread invasive species, horse trails should be monitored.

Response: We agree that control of invasive species should receive high priority. We will use available resources to help control autumn-olive and multiflora rose, but these species are especially problematic because they are extremely prolific and have become entrenched over much of the Refuge and surrounding lands. We have made and will continue to make concerted efforts to detect, monitor, and control invasives and we welcome any assistance from volunteers. We typically use an integrated pest management approach to managing invasive species.

Comment: Presently, Refuge's designated wilderness areas suffer from invasive species such as autumn-olive, multiflora rose and Japanese honeysuckle, all of which endanger native flora. The CCP recognizes that these plants are all are common throughout the Refuge's wilderness and are likely to become even more problematic in the near future. Exterminating these species and restoring native habitat is a critically important responsibility of the Service. In the words of Aldo Leopold, wilderness is a laboratory, a base datum or normality, a picture of how healthy land maintains itself'. The Service should consider the extermination of invasive species a top priority in the final CCP.

Response: We agree that control of invasive species should receive high priority. We have made and will continue to make concerted efforts to detect, monitor, and control invasive species throughout the Refuge.

Comment: The Refuge should monitor the environmental impacts caused by new invasive species.

Response: We would like to monitor the environmental impacts of invasive species, but with our limited resources, we think we must devote our resources to the monitoring and control of known populations. We will rely on reports in the professional literature and research scientists to provide information about the environmental impacts.

7.1.1.17. Water Quality

Comment: Incentives and education for landowners in the watershed(s) of the Refuge will help minimize erosion on their land, thus reducing sedimentation in the three lakes. The "no wake" zones will help minimize erosion and disturbance of wildlife.

Response: We appreciate your recognition and support for the proposed strategies. Although shoreline erosion caused by boat wakes is relatively minor compared to that caused by natural wave action, designating additional no wake zones will contribute to reducing erosion.

Comment: The Refuge has taken a "good neighbor policy" with respect to addressing soil disturbance activities that occur around the Refuge. Even though the activities cause significant soil erosion that cause sediments to enter Crab

Orchard Lake, little effort and no known actions have been taken to protect the Refuge or the lakes. What specific efforts will occur in the future under the implementation of Alternative E? Just talking to landowners is not enough.

Response: The strategies we intend to implement are listed on page 45 of the Draft EIS/CCP under Water Quality Goal in Section 2.6.3.2 Wildlife Conservation Goals. These strategies go beyond just talking to landowners about improving water quality. However, since we have no enforcement authority, our approach is one of encouraging voluntary cooperation in the stewardship of the watershed.

Comment: We recommend the Final EIS include a discussion of possible partnerships designed to reduce non-point pollution and sedimentation to improve water quality on the Refuge. Developing opportunities for volunteers and user groups to work cooperatively with neighboring businesses, industry, and local governments would not only develop a sense of ownership and foster good community relations, but also result in improved habitat quality and recreational activities on the Refuge. Discussions could include opportunities for environmental education and drafting and enacting ordinances designed to protect water quality.

Response: The strategies we intend to implement are listed on page 45 of the Draft EIS/CCP under Water Quality Goal in Section 2.6.3.2 Wildlife Conservation Goals. They include working with Illinois EPA, landowners, municipalities, developers and cooperative farmers to improve water quality. We would certainly welcome any assistance from volunteers and user groups in this endeavor. A possible framework for this cooperative effort is the Big Muddy River Ecosystem Partnership under the Illinois DNR Conservation 2000 program, which was in its initial stage of formation a few years ago. We expressed our desire to join this partnership at the time, but apparently little further progress has been made to date.

Comment: Two-cycle motors should be banned on all lakes due to pollution. As a long-range goal, the use of 2-cycle outboard motors should be phased out in favor of less-polluting 4-cycle motors. This could be done over a period of years.

Response: We appreciate the concern. Fortunately, newer motors that are less polluting should gradually replace 2-cycle models. We do not intend to restrict the use of 2-cycle boat motors.

7.1.1.18. Air Quality

Comment: Prescribed burns release smoke, which is visible. Prescribed burns release stored up mercury, extremely harmful to people/children/elderly. Prescribed burns also release fine particulate matter, which drifts for thousands of miles causing lung cancer, heart attacks, strokes, pneumonia, allergies and asthma, all of which cause billions in health care for Americans with no health insurance. Why are you causing these negative health effects? Don't tell me about smoke which you can see. Fine particulate matter is invisible to the eye. And you are causing health issues with all of this burning and loading the air with pollutants like this. Who is the regional fire management coordinator and how much does this person know about fine particulate matter? In prescribed burning, are any medical doctors consulted? Are the clean air people brought in? Do they sign off? Is the local lung cancer group advised of this assault on their air, as well as the asthma affected?

Response: In general, air quality of the area is good. No significant local concerns regarding air quality exist. Our prescribed burning activities comply with federal and state air pollution regulations. We obtain open burning permits from the Illinois EPA prior to every burn. Smoke is managed through scheduling and using appropriate surface wind and atmospheric conditions to direct and disperse smoke. Management of smoke is incorporated into the planning of all prescribed fires. Sensitive areas such as populated areas and roads are identified and precautions taken to safeguard visitors and neighbors. A guiding principle of the National Fire Plan is hazardous fuels reduction. The NFP directs us to incorporate public health and environmental quality considerations in fire management activities undertaken for the hazardous fuels management program. Our fire management program is administered by professionals at the local, regional, and national levels.

7.1.1.19. Conservation Easements

Comment: Section 3.7.3: Someone in the Service, other than the Refuge, should be held accountable for the lack of proper administering the conservation easements. The lack of monitoring and enforcement of the easements is a flagrant nonperformance issue that is not a fault of the Refuge staff. Congress, the Bureau of the Budget and the U.S. Attorney should be made aware of this. Page 111, Section 3.7.3, Conservation Easements - This section discusses how conservation easements fit into the NWRS. However, none of the alternatives address the needs of Conservation Easements or how they will be managed over the next 15 years.

Response: We intend to manage the conservation easements according to established policy. We have added an objective under the protection goal in *Features Common to all Alternatives* to describe our proposed outcomes and strategies. The omission of the objective was an oversight in the Draft EIS. Thank you for pointing out the omission.

7.1.1.20. Right-of-way Management

Comment: Although not mentioned in your draft plan, power company right-of-way land should be written in as part of your 10-year plan. Specifically, we ask you to have a policy in place for power companies to follow regarding breeding birds. Power companies should not be allowed to cut, burn, spray, or otherwise disturb the habitat for breeding birds from mid-March through August.

Response: We customarily coordinate with electric utility and road right-of-way managers to minimize possible negative effects on wildlife caused by their operations. We restrict the timing and extent of treatments and restrict the products used for chemical treatments.

7.1.2 Agriculture

7.1.2.1. Agricultural Croplands

Comment: Just as industry compromises the purpose of the Refuge and the mission of the Refuge system, agriculture is also entirely inappropriate on refuge lands. Presently, 10% of the Refuge is covered by cropland that requires herbicide and fertilizer. According to the CCP, the original justification for establishing agricultural plots was to provide food for wintering Canada Geese and to "fulfill the agricultural purpose of the Refuge". The Service is incorrect to implement such sweeping habitat modifications for the benefit of a single species. The Service should be interested in the best overall plan for maintaining the wild state of the land, rather than constructing artificial habitat. In addition, farming limits the biodiversity of the Refuge's native ecosystem communities by managing for a few select species such as wheat and corn.

Farming on Refuge lands is addressed in *Fulfilling the Promise*: "Rather than farming intensively to provide food for migratory birds, moist soil units could provide abundant natural foods" (p.13). The document also asserts: "In order to maintain or restore biodiversity, management should mimic, where possible, natural systems" (p.21). Therefore, in order to comply with the Service's vision document and the Refuge's mission, cropland must be eliminated from the Refuge in order to allow for restoration of native habitat.

Response: We disagree that agriculture is entirely inappropriate on refuge lands. Agriculture can be used to meet National Refuge System mission objectives. In addition, agriculture is a legislated purpose of Crab Orchard Refuge (Appendix G, page 281 in the Draft EIS/CCP). The National Wildlife Refuge System Improvement Act of 1997 states that "…if a conflict exists between the purposes of a refuge and the mission of the System, the conflict shall be resolved in a manner that first protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission of the System;"

Comment: Agriculture creates a mosaic of natural lands and artificially crafted lands, allowing no observable tract to witness long term natural processes. While it is encouraging that the smallest slivers of farm land (those less than 5 acres) would be discontinued, the patchwork nature of the agriculture land as a whole causes problems, leading to serious habitat fragmentation.

Response: We agree that managing non-agricultural habitats in a mosaic of agricultural lands can limit natural processes. However, agriculture is a legislated purpose of the Refuge. Recognizing the negative aspects of the patchwork nature of the agriculture land, we are proposing to manage two areas of the Refuge as large forest

blocks. Our proposal seeks a balance among the many mandates that we are obligated to follow and environmental factors.

Comment: The use of pesticides on farmland is dangerous and potentially lethal to native organisms. The CCP states that "pollutants from agriculture include sediment, nutrients and pesticides (CCP, p.126). This practice will compromise the conservation of wildlife and therefore negate the primary purpose of the Refuge. Spraying of poisonous herbicides and pesticides should be banned at Crab Orchard NWR.

Response: Refuge staff and cooperative farmers will most likely continue using herbicides on the Refuge following national policy. Pesticide use on National Wildlife Refuge System lands is governed by U.S. Department of the Interior Pesticide Use Policy (U.S. Department of the Interior, Departmental Manual, Part 517, Chapter 1), and the Fish and Wildlife Service's Refuge Manual (7 RM 14). The use of insecticides is generally not allowed, except in rare circumstances. The use of herbicides is reviewed at the Regional and National levels. Further, a pesticide use proposal (PUP) must be prepared for each chemical used in pest control programs on refuge lands (7 RM 14). PUPs are used to evaluate the specifics of proposed chemicals, treatment sites, application methods, and sensitive aspects of use.

Comment: Convert small crop fields not used by Canada Geese to native warm season grass. Consider reduction in agricultural uses, perhaps eliminating small acreage sites.

Response: We agree. We have edited the strategy for Objective 1 in the agricultural goal in our proposed action to include reviewing small fields (less than 5 acres) and dropping those that are not profitable from the row cropping program and converting them to other cover (about 15 fields totaling 52 acres)

Comment: Sierra Club supports cutting back on the amount of refuge land used for row crops from the proposed 4,400 acres down to 2,200 acres or less. Although agricultural use is one of the four "purposes" of the land for Crab Orchard Refuge, there is nothing that says how much of the land has to be used for agriculture. Sierra Club supports cutting back the amount of Crab Orchard Refuge land in agriculture to one half or less of the land proposed for agriculture in preferred Alternative E, in order to provide more room for natural lands instead of farm land. We are especially concerned with the amount of row crops on the refuge. With such a large portion of Illinois taken over by row crops, we really do not need our refuges to devote much land to row crops.

Response: We chose to focus more on the conservation effects of agricultural practices (mowing dates, fescue conversion, etc.) than on the number of acres farmed. The amount of agricultural land on the Refuge has been greatly reduced over the years (Figures 36 and 37 on page 114 of the Draft EIS/CCP). Reducing the amount of agricultural land to 2,200 acres would have a considerable negative economic impact on farmers and the local agricultural economy. We also believe that, for the time being, the Refuge agricultural program provides an important safety net for wintering Canada Geese. It is also unlikely that the Refuge would have the resources to manage the conversion of 2,200 acres of agricultural land to more natural habitat.

Comment: You should consider whether or not row crops are really necessary for supporting the geese on the refuge. Can't land in its natural state, such as more moist soil units, support the geese? Has this alternative been considered?

Response: This approach has been considered, but the majority of Canada Goose food is produced on agricultural lands and it is unlikely we could meet our present goal without agriculture (Table 2, page 41 in the Draft EIS/CCP). The area suitable for sites that can be practically developed as moist soil units is limited by the terrain. The largest, most suitable wetland development sites on the Refuge have already been developed.

Comment: If we are to encourage neo-tropical migrant interior forest birds, then we should make sure row crops are not grown adjacent to the forested area, since that increases the number of bird predators to the forested area, according to studies done by Scott Robinson and Jeff Hoover (IDNR - Natural Heritage Division studies).

Response: We agree that some agricultural lands grown adjacent to forested areas increase the number of bird predators in the forest. This is a large part of the reason we plan to manage two large forest blocks on the Refuge (page 41 of the Draft EIS/CCP).

Comment: Limiting mowing of fields until after nesting of grassland birds is good. Land and resource management initiatives such as tweaking agricultural practices to provide more efficient and proper land usage are well thought out.

Response: We appreciate the support for our proposed actions.

Comment: Atrazine used on row crop fields could be very beneficial in helping to control exotic and invasive plant species. Atrazine has cleared every question proposed if used properly and in moderation. It should be allowed to be used in moderation on this Refuge. The decisions made for crop protection chemicals are not based on the local Refuge needs. Also the area soil types, cropping practices, timing of application, and rainfall are not addressed in making the list of products that can be used on our local Refuge—they are made by someone sitting in an office in Minnesota. The reason products are important is because the Refuge in its plan "proposes" a mowing date of August 1. First let me state the Refuge has already imposed the August 1 mowing date much to the objection of its tenant farmers. Most of the species on page 87 have already produced viable seed to reproduce by August 1. So without some type of control—chemical or mechanical—these species will continue to be a growing threat to habitat. I feel the plan should allow for mowing of first ear clover before August 1 to prevent weed seed from multiplying. This would still leave one-half the fields for ground nesting birds. In all my years of mowing these fields I have seen very few nesting birds. In fact when you are mowing it usually attracts many birds to feed on the disturbed bugs. There has been no study shown to document that shows that mowing prior to August 1 has damaged the nesting population.

Response: Pesticide use on National Wildlife Refuge System lands is governed by U.S. Department of the Interior Pesticide Use Policy (U.S. Department of the Interior, Departmental Manual, Part 517, Chapter 1), and the Fish and Wildlife Service's Refuge Manual (7 RM 14). The use of insecticides is generally not allowed, except in rare circumstances. The use of herbicides is reviewed at the Regional and National levels. Further, a pesticide use proposal (PUP) must be prepared for each chemical used in pest control programs on refuge lands (7 RM 14). PUPs are used to evaluate the specifics of proposed chemicals, treatment sites, application methods, and sensitive aspects of use. Atrazine is not an approved herbicide for use on National Wildlife Refuge System lands and is very unlikely to be approved for regular use in the Refuge agriculture program. We agree that the limited availability of herbicides for Refuge use and the August 1 mowing date will make the control of some weeds challenging. Although there have been no studies on the Refuge examining the effects of mowing on nesting birds, many studies of the issue have indicated that mowing does negatively impact nesting grassland birds. For example, Frawley (1989) found that, in Iowa alfalfa fields, all active above ground nests and 50% of active ground nests were destroyed by hay mowing. Grassland bird nests destroyed as a result of mowing have been observed on the Refuge.

[Frawley, B.J. 1989. The dynamics of non-game bird breeding ecology in Iowa alfalfa fields. M.S. thesis. Iowa State Univ., Ames. 94p.]

Comment: The bottomland fields should be kept in agricultural production. They should not be planted in trees. Bottomland fields get a lot of wildlife use.

Response: We agree that bottomland agricultural fields do provide useful habitat for some wildlife. Our focus is largely on the resource conservation priority species listed in Table 33 (page 130 of the Draft EIS/CCP), which mostly do not use agricultural fields.

7.1.2.2. Pastures/Grazing

Comment: Replacing fescue with native grasses is an excellent idea that will benefit a variety of wildlife, particularly quail. Healthy grasslands will benefit migratory species as well as resident species.

Response: We appreciate the support for our proposed action.

Comment: Convert all fescue pastures to a 50 percent combination of native warm season grass and cool season grass mixtures (timothy, clover, redtop, orchard grass)

Response: This is very similar to what would occur under our preferred alternative. We would convert fescue pastures to other cool-season grasses and native, warm season grasses with higher wildlife value.

Comment: Conversion of fescue pastures to native, warm-season grasses and more cool-season grasses will only benefit forest and grassland birds. We do not agree with this plan because again you are taking away waterfowl habitat and grazing pastures. Should you do this we recommend that the same number of acres used for this conversion be replaced with wetland development and management for waterfowl. Many of these pastures are used for both feeding areas and loafing, resting areas for the Canada Goose, probably mostly loafing and resting areas around ponds with some food value. These grasses for the most part will be mowed "tall" and will not be suitable habitat for the Canada Goose. We oppose this act just as strongly and much the same as Reforestation. As we set down and discuss these issues we have a hard time understanding why the USFWS would destroy much of our goose habitat at CONWR.

Response: Much of the pasture that is converted from fescue to other grass will still be used as loafing areas for geese, especially around ponds. In addition, there will be thousands of other acres of potential loafing areas available: corn fields, wheat fields, clover fields, hay fields, and other open habitats. The Refuge has an abundance of food resources for Canada Geese (Table 3, page 41 of Draft EIS/CCP) that easily meet our goal of providing food to support 6.4 million goose-use-days. While we plan to develop 150-200 acres of new moist soil wetlands, the area of suitable sites that can be practically developed is limited by the terrain. The largest, most suitable wetland development sites on the Refuge have already been developed. It is very unlikely that we could find the number of acres equal to the acres of fescue converted (1,000 acres). We are currently working on surveying additional sites for development as wetlands.

Comment: The grazing program in Alternative E proposes to reseed pastures with native warm-season grasses. The study claims on page 159 higher forage production. That may be beneficial if the fields were used for hay production. The assumptions made on page 159 that all the cattle grazing were yearlings and sold at the end of the grazing period. Most of the cattle on the Refuge are cow-calf breeding herds.

Response: The increase in forage production mentioned on page 159 relates to Alternative D, which would focus on adding better forage species. In our preferred alternative (Alternative E), our goal in converting fescue pastures is to find replacement forage species that are not invasive, provide good wildlife habitat, and provide good grazing forage. We may use native and/or non-native species to reach this goal. Pastures may not be more productive for grazing under the preferred alternative. We agree that most cattle on the Refuge are cow-calf breeding herds. We think the economic effects are similar to those depicted with the yearling assumption.

Comment: Alternative D is a better choice than Alternative E for the grazing program because it adds legumes to pastures, subdivides larger pastures, and includes rotational grazing. There are currently very few pastures in southern Illinois that are warm-season grasses that are successful for grazing.

Response: We agree that, based on cattle production, Alternative D would be the best alternative. In our preferred alternative (Alternative E), we are attempting to balance our goals and find replacement forage species that are not invasive, provide good wildlife habitat, and provide good grazing forage. We agree that there is limited grazing of warm-season grasses in southern Illinois.

Comment: An additional suggestion concerning the grazing pastures and paddocks would be to look into the possibility of replacing cattle with native bison.

Response: There are some good reasons for replacing cattle with native bison, but we are unlikely to do so at this time because: 1) grasslands are scattered throughout the Refuge without any one area large enough to be a good area for bison, 2) fencing and other management costs for bison could be quite high, and 3) it is unclear whether there are any strong conservation-based reasons for managing a captive population of bison.

Comment: In the past, grazing activity has been ended by October 1. This year, cattle grazed in parts of the closed areas well after that date. The posted September 30 deadline should be re-established and enforced.

Response: We moved the grazing date to mid-November in 2004 and plan to keep it there as long as conditions allow. Currently our pastures are dominated by fescue, which grows quite well

in the fall and provides good forage in October and November. The cattle are removed in mid-November because of the November deer season and the desire to remove cattle before pasture soils become water saturated during winter conditions.

Comment: The Refuge currently allocates approximately 1,000 acres of grazing land to support 375 head of cattle. Typically, grazing on a refuge is inappropriate and against the intent of the Refuge Improvement Act, unless it can be demonstrated essential to meet the refuge purpose. Allowing even controlled, prescribed grazing poses numerous adverse environmental impacts to sensitive habitat areas, including the compacting of soils, sedimentation, and the degradation of water quality. The CCP does not sufficiently demonstrate that grazing is a necessary management tool essential to the Refuge's purposes. Therefore, grazing should be prohibited.

Response: We disagree that grazing should be prohibited on the Refuge. Grazing is a standard agricultural practice in the area that is a part of how we meet our agricultural purpose. We feel we can use grazing practices that protect soils and water quality.

7.1.2.3. Hay Fields

Comment: There is support to limit mowing of fields until after nesting of grassland birds. This policy should be a permanent part of refuge management in the future. There should also be a date set in spring which delineates the start of the "no mowing during nesting" season. For example, there will be no mowing from the first day of spring (March 21) or the first day ground nesting birds start building nests.

Response: The Refuge has a mowing plan that designates mowing seasons for different habitats. Most mowing takes place August through November with exceptions for developed recreation sites, administrative areas, road intersections, etc.

Comment: I encourage conversion to native grasslands and prairies and the consolidation of grassland habitats. All effort should be made to remove fescue and other non-native grasses as they provide little to no support for Northern Bobwhite and other grassland bird species. Healthy grasslands will benefit migratory species as well as resident species.

Response: This is very similar to what would occur under our preferred alternative. We would convert fescue pastures to other cool-season grasses and native, warm season grasses with higher wildlife value.

7.1.3 Recreation (General)

Comment: There is a need to recognize the recreation need and demands of the public. There has been little effort in this document to recognize how the Refuge fits into the entire recreation that is available in southern Illinois. The issues of budget constraints and Refuge mission are mentioned, but there is little discussion in the following text on these issues.

Response: We agree that a thorough analysis of the recreation need and demands for Southern Illinois similar to the analyses prepared for a Statewide Comprehensive Outdoor Recreation Plan (SCORP) is desirable. Our recreational concerns, however, are far more basic for the immediate future. We think we need to improve our minimal, basic facilities to accepted standards as a first priority. We heard from enough people during scoping to know that we have challenges in the management of recreation as it now exists. Given our budget and budget prospects, we think it is realistic to address our most immediate needs before more completely analyzing how we fit into the recreational landscape of Southern Illinois. Data from the Illinois SCORP published in 2004 will be used as a reference

Comment: The Refuge's recreation focus should be on wildlife-dependent recreation.

Response: Our challenge is to meet our responsibilities related to the purposes of the Refuge, which includes non-wildlife-dependent recreation, and recognize the values and mission of the National Wildlife Refuge System. We think at Crab Orchard our responsibility is to provide opportunities for both wildlife- and non-wildlife dependent recreation. Part of the CCP planning process has been to explore the alternatives and balance between the various forms of recreation. See the last section of the comment and responses for a further discussion on the precedence of refuge purposes over System Mission.

7.1.3.1. Hunting

Comment: Illinois DNR recognizes that greater hunting opportunities exist on the Refuge and suggests opening greater portions of the restricted area on a limited time zone to increase refuge hunting programs (dove, turkey, limited entry (weekly draw) archery 4 point/side or antlerless and quail/rabbit) including youth hunting opportunities emphasizing high quality experiences. Others, also, would like to see more hunting opportunities in the restricted use area of the refuge.

Response: Our plans include creating additional hunting opportunities within the restricted use area of the Refuge. These hunting opportunities will target the non-traditional hunting segment of the public such as youth, persons with disabilities and women.

Comment: Hunting should continue on the Refuge.

Response: Hunting was identified in the Refuge Improvement Act as a priority public use and will continue at Crab Orchard Refuge.

Comment: Hunting on the Refuge should end.

Response: Hunting is one of the six wildlife-dependent public uses of national wildlife refuges specifically encouraged by the National Wildlife Refuge System Improvement Act of 1997. Whenever a particular type of hunting is compatible with the Refuge's purposes, goals and objectives, and can be conducted in a sustainable manner, it may be permitted. Wildlife populations are monitored, and where a population is below target levels, hunting is suspended or reduced until the population recovers. Limited trapping is conducted at Crab Orchard of furbearers that damage infrastructure, like muskrat and beavers, and other mammalian predators and carnivores. The trapping is conducted by permittees and on a sustainable, relatively small scale. As with hunting, trapping is suspended when the populations of target species appear to be low.

Comment: Fox hunting and dog trials should be prohibited on the Refuge, because it disturbs wildlife and destroys vegetation.

Response: If the comment is referring to traditional foxhunting meets, we agree. A compatibility determination was conducted on this activity and it was found not compatible. The compatibility determination on foxhunting was published as part of Appendix J in the Draft EIS/CCP. Dog trials are not conducted on the Refuge. Individuals wishing to train hunting dogs for their personal use may obtain a special use permit to conduct this activity.

Comment: Controlled waterfowl hunt should be more developed with pits and flooded fields.

Response: It would be difficult to establish pits in the areas where the controlled waterfowl hunt is conducted. These areas are a part of our agriculture program and the fields are on a crop rotation system. Under the rotation system the fields are fallow in some years, which would not attract waterfowl. One of the reasons for the controlled hunt is to provide a hunting opportunity that results in a reasonable harvest opportunity.

Comment: Need more food plots for small game.

Response: The Refuge has a large agriculture program with over 2,500 acres of corn and soybeans planted annually. We feel the crop fields provide more food than we would ever be capable of providing with food plots.

Comment: The Refuge provides wildlife habitat management for one of the main waterfowl stops along the Mississippi Flyway. In order for that to continue we feel all deer hunting on the refuge should be done prior to waterfowl hunting season or after waterfowl season. Deer hunting in the closed areas of the refuge during the month of December is having a devastating effect on the early migrating geese that are stopping here in November and December each year. The practice of deer hunting in the closed area of the refuge alters the "normal" migration of Canada Geese, many ducks, and shorebirds. In order to protect the migrating waterfowl there should be no activities in the restrictive (closed) areas of the refuge during the waterfowl season. We propose that all the now restrictive (closed) areas remain closed to protect the fall migration of waterfowl. This problem has an easy fix and we feel the FWS should look at this problem in length and come up with a solution immediately.

Response: The Refuge deer population is maintained just below carrying capacity through a carefully managed deer hunting program. Harvesting of deer is necessary to prevent excessive competition between deer and other species, minimize crop depredation on surrounding farms, reduce deer related traffic accidents and to maintain a healthy deer population. The current deer

seasons in the restricted area (closed portions) are in November and the first week of December. These are statewide seasons and it would be difficult for us to move these seasons. However, we do appreciate the concern and plan to prohibit deer hunting in areas with heavy waterfowl concentrations in order to reduce disturbance to migrating waterfowl.

7.1.3.2. Fishing

Comment: The gates at Carterville Beach and Lookout Point Beach should be removed to allow easier access to bank fishing. These areas were open to vehicles at one time. Ponds on the refuge need better management. They are beginning to get a lot of growth on the bank making it difficult to bank fish.

Response: There are numerous high quality bank fishing areas available on the refuge, including several newly renovated areas on Wolf Creek road that provide fishing docks and fish attractors, as well as areas accessible to people with disabilities. The limited and declining use of the two refuge beaches did not justify the high maintenance cost and liability associated with operating them. The city of Carterville was approached and offered an opportunity to operate the Carterville beach, but declined due to cost and liability concerns. The areas remain open to walk-in fishing.

Comment: There are several places to fish on the Refuge the Visitor Center Pond should be converted into wetland area instead of spending $2.5 million to re-do the dam when you have a large lake within one mile of the area.

Response: Local newspaper reports that indicated $2.5 million would be spent to rehabilitate the dam at the Visitor Center pond were incorrect. Our division of engineering is currently evaluating the project, and much of the work will be done with refuge staff and equipment – saving the taxpayers hundreds of thousands of dollars. The Visitor Center pond is one of our most heavily used public fishing ponds, and it is a priority for us to maintain this area for quality bank fishing.

7.1.3.3. Fishing Tournaments and Fish-offs

Comment: All fish-offs departing from the same boat ramp is not necessary.

Response: Requiring all fish-offs on Crab Orchard Lake to use the Take Pride in America boat ramp reduces congestion on other ramps for non-fish-off lake users. It also allows law enforcement officers to determine that any weigh-ins taking place at the other boat ramps are by individuals who do not possess a valid Fish-off Use Permit.

Comment: Why are Fish-offs not allowed to give out prize money, but the big tournaments can give out prize money?

Response: In 1992, we defined a fishing tournament as any fishing event that has more than 20 boats or has prizes or money in excess of $100.00. Organizers of these events solicit participants by the use of fliers, advertisements or public service announcements, and conduct post-event activities which bring publicity to the tournament or winners. We decided to allow five authorized tournaments annually on the Refuge by special use permit. In our decision we weighed the recreational and charitable value of tournaments against the possible detrimental effects to other users and the fishery resource.

One purpose of these tournaments is to raise money for non-profit, charitable organizations. In addition, the number of participants (sometimes exceeding 400 individual anglers) involves large overhead expenses and administrative burdens. In order to meet the purpose of fund-raising as well as offset overhead and administrative costs, organizers of these designated tournaments are allowed to offer prize money to attract enough participants to meet their goal of charitable giving.

Fish-offs are considered competitive fishing events for relatively small, local clubs, and because of the smaller character (20 boats or fewer) and much lower overhead and administrative costs, significant entry fees and prize money are not necessary to offset overhead or administrative expenses. Therefore, our policy of not allowing the distribution of prize money for fish-offs will continue in order to limit the number and scope of fund-raising events on the Refuge.

Comment: How are fishing tournaments decided on, as to who gets to have a tournament?

Response: The Refuge has five (5) Special Use Permits issued each year for sanction fishing tournaments on Refuge waters. They are: Take

Pride in America on Little Grassy Lake, the Little Egypt Bass Tournament on Devils Kitchen Lake, the Bill Harkins Tournament, Boy Scouts Tournament, and Mid-West Bass Classic all on Crab Orchard Lake. The organizers of these tournaments have conducted these tournaments on the Refuge for many years.

The current policy is that as long as the organizers of the above tournaments meet the special conditions of their Special User Permit they can continue to hold the tournament on Refuge waters. If for some reason the tournament organizer decides to discontinue their event, the tournament will not be replaced by another event.

Comment: Entry fee towards tournaments should not go to charity but should be used towards stocking the lakes, improving fish habitat, etc.

Response: Currently $10.00 of every entry fee is committed to the improvement of the fisheries on Crab Orchard Lake.

Comment: What are the procedures in determining when and who gets to have a fish-off?

Response: Fish-offs are club events that have 20 boats or fewer with a scheduled date, time, and ramp on either Crab Orchard, Devils Kitchen or Little Grassy Lakes. Fish-offs are regulated by a fish-off-permit. Any organization may have one fish-off per lake, per year, for a total of three Refuge fish-offs. We allow one fish-off per lake per day and do not allow any to take place on holiday weekends, i.e., Memorial Day, Fourth of July, Labor Day. Fish-off permits are issued on a first-come, first-served basis.

7.1.3.4. Trapping

Comment: Trapping should not occur on the Refuge. It is not a priority use; it poses a serious hazard to non-target wildlife; it is not compatible. The animals are part of the ecology of the area.

Response: A compatibility determination we prepared found that carefully controlled trapping contributes to the habitat and wildlife management goals of the Refuge. We consider trapping to be a management tool that, in some cases, is the only means by which nuisance animals can be removed. This activity will be limited to areas of the Refuge that are designated by the Refuge wildlife biologist, and carefully regulated through the issuance of special use permits.

Comment: Trapping should continue to be part of the overall management program.

Response: Limited trapping will be allowed in designated areas of the Refuge through special use permits.

7.1.3.5. Wildlife Observation and Photography

Comment: Wildlife observation should be given emphasis over hunting. Wildlife observation is the most popular activity and most economically productive for the area. Hunter numbers are diminishing each year, which means the time and money devoted to support the activity should be reduced.

Response: Wildlife observation and hunting are both important recreational activities on the refuge and each were identified as priority wildlife-dependant public uses in the Refuge Improvement Act. Both uses are considered compatible with the refuge purposes. We have not observed a reduction of hunter numbers on the Refuge.

Comment: Relocate the observation deck on Route148 closer to the water.

Response: The location of the observation deck was chosen to provide adequate wildlife viewing opportunities without disturbing the wildlife. Moving the deck closer to the water is likely to preclude the use of a portion of the wetlands by wildlife.

7.1.3.6. Environmental Education

Comment: Educational focuses are a welcome initiative. I suggest supplementary lesson plans, wildlife projects for science fairs, and educator training for the outdoor classroom, as areas of focus for encouragement of local educators K1-K12 to participate with the wildlife classroom.

Response: Thank you for your support and ideas. We will consider your ideas as we develop our education program more fully.

7.1.3.7. No-wake Zones on Crab Orchard Lake

Comment: The no-wake zones on Crab Orchard Lake are a good idea. The zones improve safety and overall fishing experience; reduce noise disturbance to wildlife, especially nesting birds; decrease erosion of the lake shore; enhance boating; provide alternate options for people who

want to canoe with reduced noise level; reduce likelihood that nesting bald eagles will be disturbed.

More no-wake zones should be added to the plan.

Response: We appreciate the support for the no-wake zones. Additional no wake zones would result in an overall reduction of areas available for waterskiing. We have modified our original proposal and reduced the extent of the no-wake zone based on comments that we received from waterskiers. (See the following comment and response.)

Comment: All the coves should not be included in the no-wake zone. The proposed plan will limit good waterskiing opportunities and lead to congestion in the center of the lake.

Response: We recognize that areas of the lake that are protected from prevailing winds are valuable for waterskiing. We have reduced the size of the no-wake zones in the lake in our proposal to better accommodate waterskiing in these areas.

Comment: The no wake zones should be removed during waterfowl season. Rule-abiding hunters will lose the best hunting spots to hunters who violate the zoning rules and speed.

Response: Waterfowl hunters are expected to obey no-wake zones along with all other users. Additional enforcement may be appropriate during the waterfowl season if no wake zones are routinely violated.

7.1.3.8. Restriction of Gas Motors on Devils Kitchen Lake

Comment: Limiting the use of gas motors on Devils Kitchen Lake will be good for wildlife and people using the lake; reduce the noise levels in the adjacent Crab Orchard Wilderness and enhance the wilderness experience there; and may be needed in order to comply with the Wilderness Act (wilderness values) and Refuge Improvement Act of 1997 (biological integrity).

Response: We appreciate the support for this portion of our proposal. We feel that reducing noise levels on the lake would be good for some users, but needs to be balanced with the desire of other users to use gas motors. (See the following comment and our response.) We have found no evidence that noise from 10-hp gas motors has a negative impact on wildlife. We agree that reducing noise levels on Devils Kitchen Lake could enhance the wilderness experience in the adjacent Crab Orchard Wilderness.

We do not agree that limitations on gas motors are required to comply with the Wilderness and Refuge System Improvement Acts. While the Crab Orchard Wilderness borders much of the southern part of Devils Kitchen Lake, the lake is not in the Wilderness, therefore motors may be allowed without violating the Wilderness Act. We have found no evidence that noise from 10-hp gas motors has a negative impact on biological integrity.

Comment: There should be no gas motor use on any of Devils Kitchen Lake as in Alternative D.

Response: We feel that the use of gas motors on Devils Kitchen Lake is a compatible and appropriate use enjoyed by many Refuge visitors.

Comment: Limiting the use of gas motors on Devils Kitchen Lake will limit access to the best fishing areas on the lake and the Panthers Den Wilderness, which will reduce hunting, fishing and other recreation opportunities; be unsafe, especially during windy or rough water conditions; boats can get stuck on top of a submerged standing tree and an electric motor or paddling provide insufficient power for getting a boat off; electric motors would be too slow and have too limited battery life to be useful on the lake; noise is not an issue and the Service has not demonstrated that gas motors create a nuisance; an additional limit to public access that will make the lake less attractive to the public and reduce tourism in the area; the area should be a no wake zone.

Response: Based on these comments and a site visit, we have modified our proposal. The modification will prohibit the use of gas motors on Devils Kitchen Lake in Grassy Creek and the eastern arm of Devils Kitchen Lake from the mouth of Grassy Creek south to the Refuge boundary. The portion of the lake south of Line Road #6 boat ramp will be designated a no-wake zone. The modification will allow continued access to the majority (85 percent) of the lake by boats using gas motors and provide the power that some feel is required for safe navigation. Boats equipped with gas motors would be able to use the entire

lake, but would be required to use only an electric motor or paddles for propulsion on 107 acres (15 percent) of the lake.

Access to fishing areas and Panther Den Wilderness will be only slightly limited. Although the current motor limit was established to provide for recreation purposes and not safety and access, we agree that under certain conditions, using an electric motor or paddles could be less safe than using a gas motor. This may require some additional judgment by boaters regarding weather and water conditions. We would not ticket a boater for using a motor if it was required for safety purposes. Some Refuge users do feel that the noise created by gas motors is a nuisance. The purpose of our modification is to offer an area on one of the large Refuge lakes that would provide a different boating experience for the public and also address the concerns of gas motor users. We feel that offering a different boating experience on a portion of the Refuge may make Devils Kitchen Lake more attractive to some users and actually increase recreational use. Our modification of the original proposal has made the majority of the area in question a no wake zone.

\# **Comment:** The restriction on gas motors favors a minority user group (canoes and kayaks) at the expense of a majority group (boats with gas motors).

Response: When possible, we try to accommodate appropriate, compatible uses. With approximately 8720 acres of Refuge lakes open to boating, we feel restricting the use of gas motors on about 100 acres is not overly restrictive

7.1.3.9. Closure of Devils Kitchen Campground

\# **Comment:** Illinois DNR recommends, as a compromise to closing the Devils Kitchen campground, converting it to primitive camping which might be popular to some constituents who use non-motorized watercraft. Income from this campground might also help sustain the Devils Kitchen Marina vendor.

Response: We agree. We have modified our proposed strategy in response to comments on the Draft EIS/CCP. Under our final proposed action, the concession at Devils Kitchen Campground will provide limited primitive camping, boat rental, and picnicking opportunities.

\# **Comment:** We advocate the reduction of commercial uses and recreation not compatible with wildlife on Crab Orchard Refuge, including the proposal to close the Devil's Kitchen Campground. We think that uses of refuge land for camping and related activities, such as high speed motor boats, water skiing, etc., should be minimized. To lessen the impact of these activities that are not compatible with wildlife, we support concentrating them at Crab Orchard Lake, and remove them from Devil's Kitchen Lake and Little Grassy Lake.

Response: We have modified our proposed strategy in response to comments on the Draft EIS/CCP. Under our final proposed action, the concession at Devils Kitchen Campground will provide limited primitive camping, boat rental, and picnicking opportunities. We feel that these low-impact activities are compatible with wildlife and support the recreation purpose of the Refuge.

\# **Comment:** If the Devils Kitchen concession people would have been given the help they had asked for from the different Refuge managers this campground could have been a prime site. It still could be if a portion of money from the user fee, boat sticker and Playport/Image boat-slip programs were spent to improve this area. Without a commitment such as this, it does need to close.

Response: Our plan is to consolidate and improve the camping facilities on Crab Orchard Refuge. Based on comments on our draft proposal, we have modified our preferred alternative to provide a limited number of semi-developed, tent camping sites at Devils Kitchen Campground rather than close the entire campground. The current campground was designed in the 1960s for the small recreational vehicles prevalent at that time. Because of the location of the campground and its ageing infrastructure, much work would be required before the campground would meet the needs of today's larger recreational vehicles. We feel that we can better provide camping opportunities for larger RVs at Little Grassy and Crab Orchard Campgrounds, while providing a more primitive experience at Devils Kitchen Campground.

\# **Comment:** Devil's Kitchen campground should be closed. The boat dock should remain open.

Response: We have modified our draft proposal to now allow some camping and the boat dock. See the first comment and response in this section.

Comment: The FWS indicates that the campground at Devils Kitchen is too steep to maintain; however, the campground appears to be in adequate shape, and it has been maintained for many years.

Response: The current campground was designed in the 1960s for the small recreational vehicles prevalent at that time. Because of the location of the campground and its ageing infrastructure, much work would be required before the campground would meet the needs of today's larger recreational vehicles. We have modified our preferred alternative to provide a limited number of semi-developed, tent camping sites at Devils Kitchen Campground rather than close the entire campground. We feel it is appropriate to provide a more primitive camping experience at Devils Kitchen Campground, while providing full-service, recreational vehicle camping at Little Grassy and Crab Orchard Campgrounds.

Comment: Devils Kitchen Campground receives much use. Closing it will be a waste of tax dollars spent in the past to develop it. Since you plan to close this campground, where are we to camp in November of each year when we come down from Belleville 2 ½ hours away to hunt? What is the alternative for us? You want people to use Devils Kitchen Lake and surrounding area, but you take away a place to stay right on the lake. Makes sense only to you. Keep the little place open or give us a better alternative.

Response: Based on comments on our draft proposal, we have modified our preferred alternative to provide a limited number of semi-developed, tent camping sites at Devils Kitchen Campground rather than close the entire campground. Under the current concessionaire these campsites would be available during the deer hunting season.

Comment: If this plan goes through, 15 years from now, I doubt if there will be any camping or boats with motors on any of the lakes. Surely something can be done to meet a happy medium between U.S. Fish & Wildlife and Tourism to secure a future for all.

Response: We do not share your outlook. We think the plan will lead to higher quality recreation, including camping and motorboating, and the economic benefit from tourism will continue.

7.1.3.10. 14-day Camping Stay Limit

The 14-day stay limit should be implemented. The limit is fairer and will open up more and better spots for weekend campers; improve the look of campsites; prevent the feeling of being an "outsider" on land that should be available to all; be consistent with DNR and COE (federal regulations). Many other options exist in Southern Illinois for those who want a longer camping or even permanent living environment.

Response: We appreciate the support for the proposed policy. The proposed 14-day limit is the length of stay that most Federal and State campgrounds in the area, as well as nation-wide, provide.

Comment: The campground facilities need to be improved. Money is needed in the near future to improve and expand the campgrounds. Careful monitoring of concession operations is important. Long-term campers should maintain a neat and orderly campsite.

Response: We agree that the campgrounds need to be improved. However, we do not think it is realistic to anticipate a budget that would allow an expansion of the campgrounds. We think our approach to consolidate the campgrounds and improve the reduced number of sites is a realistic approach to anticipated budgets and revenues. Our intent is to offer a higher quality camping experience through improvement of facilities. We expect to be more diligent in monitoring the concession operations and campsite appearance on the Refuge.

Comment: The consolidation of the camping areas is a good idea, because it will provide more space for wildlife.

Response: We are proposing the consolidation as a way to improve camping on the Refuge. We anticipate only a slight increase in wildlife habitat as a result of the consolidation.

Comment: Camping should not be allowed except in campgrounds.

Response: Your comment restates the current regulations: camping is only permitted in designated campgrounds on the Refuge.

Comment: The 14-day stay limit should not be implemented. Campsites are never full except on holiday weekends. The stay limit reduces stability for foster children who camp regularly at Crab Orchard Campground; causes hardship to senior citizens and campers who are not physically able to move their RV every two weeks. They may need to sell the RVs, which will result in lost revenue to local businesses. Long-term camping is an established practice; provides more time to experience fishing and hunting and other activities; is not available at a public site at many campgrounds in southern Illinois; provides a unique type of camping experience. Those who work full-time and can only camp on the weekends would not be able to make arrangements on a regular basis to move the camping units every 14 days. Gasoline prices prohibit moving a camper numerous times during the summer. Many who camp on the Refuge are locals who can not afford to travel and enjoy staying in one campground for the season.

Response: Our intent is not to create hardship, but rather to offer a higher quality camping experience through consolidation and improvements at the facilities. By limiting the length of stay, more people will have the opportunity to use the prime campsites. We think the occupancy rate will increase with improved facilities and visitor numbers will increase. There are private campgrounds in Southern Illinois that provide extended stay opportunities for people who desire that arrangement and its advantages to them. We acknowledge that people accustomed to staying for long periods at Refuge campgrounds will be required to change their routine. We think, in balance, that the fairness and other benefits of the proposed limits out weigh the disruption to the long-term campers' experience. Even with stay limits, a camper could move among the multiple campgrounds on the Refuge without an interruption in consecutive camping days.

Comment: The 14-day stay limit should not be applied to Little Grassy Campground. The Crab Orchard Campground is large and can accommodate short-term campers. Little Grassy Campground should be left alone.

Response: Our reasoning of fairness and providing a higher quality camping experience applies to all Refuge campgrounds. We think we should standardize camping regulations throughout the Refuge.

Comment: The Refuge seems to be discouraging most recreational use, which will completely eliminate tourism; cause some to not purchase recreational use stickers and not visit the Refuge at all. It gives the impression that most recreationists aren't welcome, and it will reduce revenue and the local economy. The strategy seems to be designed to fail and justify to the public an eventual land exchange with SIU.

Response: Our intent is quite the opposite from discouraging use. Upon implementation of the Final CCP, we plan to consolidate, improve, and encourage camping through use of a national reservation system with the idea of generating more tourism. We think that improved facilities and better service will increase visitation and revenue. We plan to continue to support both the traditional non-wildlife dependent, as well as wildlife-dependent recreational uses on the Refuge. The Final CCP is the document we intend to follow for the next fifteen years. The land exchange is not a part of our plans.

Comment: If the "land campers" are required to move every 14 days, then the houseboats should also be required to leave the premises before returning for another camping stay.

Response: We do not see the campers and houseboats as equivalent. Camping units are designed to be mobile and are generally driven, or pulled, by the owner. Houseboats are meant to remain on the water and in the event of a need to be transported, generally require a special vehicle, trailer, and are often "Wide Loads".

Comment: The concessionaire will have a difficult time making a profit if the revenue from long-term stays is taken away. The money it takes to operate the campground is much greater than the revenue generated by a 14-day stay. Other campgrounds operated by the state and federal government utilize tax payer dollars and do not have to make money to pay labor and insurance as a concession does. The monthly people keep steady money coming in and help provide safety for each

other. Limiting the campground stay and taking reservations are not cost effective, ask the Corps of Engineers.

Response: Consolidating and improving facilities allows the Refuge to concentrate both staff and resources to improve facilities and make them more marketable, safe, efficient, and accessible to a broader portion of the general public. With improvements and implementation of a reservation system, we think more people will visit. Increased visitor numbers will enhance the opportunity for a concessionaire to make a profit.

Comment: If the long-term, exclusive use of campsites is the concern, put limits on that. There is no need or rationale to require campers to leave the entire campground. Equity is understandable, but "greater opportunity" would not occur as some campers may discontinue going to Crab Orchard Campground. A reasonable compromise would be to designate a few campsites as 14-day limit. Limit the use of individual camp sites and allow campers to remain in the campground but on a different site after the initial 14 days. Other options include designating zones within the campground. Designating Loop A in the Crab Orchard Campground for long-term camping would leave prime spots for the short-term campers. Or, designate Loop E and F as long-term camping, A and B as short-term, and D as primitive. Senior citizens and disabled campers should be exempted from the 14-day stay limit. Perhaps 30, 45, and 60 day lengths of stay could be considered.

Response: We have modified our initial proposal to phase in the 14-day length of stay that incorporates ideas expressed in the comments. Part of our modification is to designate areas of the Crab Orchard and Little Grassy Campgrounds as long-term camping for the first two years. In the following two years we plan to limit lengths of stay to 28 days in the long-term area. We think that in a consolidated campground with fewer sites, the general practice of limiting the length of stay in the campground is still likely to be the fairest to all users. We think that if we allowed visitors to move from site to site without leaving the campground that they would have an advantage in selecting sites over short-term visitors who are coming from a distance.

Our modified proposal for the implementation of a length of stay limit of 14 nights, which is comparable with other Federal and State campgrounds, will be phased in. For the first two years, approximately one-half of the campsites would remain available for long-term camping and the other half for stays up to 14 days maximum. The second two year period would permit up to one-third of campsites be available for 28-day stays and the remaining two-thirds would be limited to 14-day maximum stays. Finally, beginning in the fifth year camping would be exclusively 14-day maximum stays. We would require campers to remove all equipment from the campground for 48 hours at the end of any consecutive 14-day stay. Storage of equipment such as recreational vehicles and trailers would be prohibited. In addition, a reservation system will be phased in for Refuge campgrounds.

7.1.3.11. Horseback Riding/Equestrian Trails

Comment: The restrictions on horseback riding are needed. There is a need for a designated trail to be mapped and signed, a closure during wet conditions, and a prohibition of access from private lands. The trail should avoid Research Natural Areas because they threaten the natural integrity of these sites.

Response: The needs are addressed in our proposed action. We have modified our proposed route to avoid the Research Natural Areas. The River To River Trail Society publishes a trail guidebook with maps. We will provide a free trail brochure that includes user information and a map of the portion of the trail on the Refuge. The trail will be adequately marked on the ground and signs will be posted at trailheads. The trail will only be accessible from designated trailheads. The trail route as originally proposed does enter both parcels of the Devils Kitchen Lake RNA. A slight realignment of the trail at both locations will resolve this conflict.

Comment: The Refuge section of the River to River Trail provides a good connection because riding on pavement is unsafe.

Response: We recognize the safety concerns. However, we intend to close the trail during the wet conditions to protect the trail from erosion, and if equestrians want to ride through on the River to River Trail, they will have to bypass the Refuge on public roads during the time of the closure.

Comment: The proposal for horseback riding is too restrictive. There should be: more trails; use of some or all of the existing user-created trails; a trail loop; year-round use of the trails.

Response: We are responsible for the stewardship and preservation of the Crab Orchard Wilderness. Since the vast majority (4.5 miles of 5.1 miles) of the proposed hiking/equestrian trail would be within the Wilderness, we must ensure that the construction, maintenance, and use of the trail does not conflict with the spirit and intent of the Wilderness Act. The Act does not prohibit such trails or horseback riding, but establishes limits on what activities are allowed in a wilderness. Our proposal is designed to provide a compatible and sustainable section of off-road trail that links other sections of the River to River Trail. We feel this is the most extensive project that we could undertake and accomplish given the resources likely to be available. Managing and maintaining the extensive network of existing user-created trails would surely exceed our capabilities. We feel the seasonal closure to horse traffic during times when the soil is wet and soft is necessary to prevent damage to the trail tread and the surrounding area.

Comment: Equestrians should be allowed the enjoyment of their solitude and primitive experiences.

Response: Our proposal offers equestrians and hikers the opportunity to ride or walk more than five miles through the most primitive, scenic and remote area of the Refuge.

Comment: The proposal for horseback riding is not good because it restricts access to the Refuge from adjacent private land. Access is needed to retrieve hounds that stray onto the Refuge. With restricted access the value of property adjacent to the Refuge would decline and the local economy would suffer.

Response: In order to fulfill our role as land stewards, we feel we must restrict horseback riding to the designated trail to control the environmental impacts. Land adjacent to the Refuge may be viewed as less desirable to equestrians, but we do not feel that restricting access from private property will negatively impact land values or the local economy as a whole. Several studies have found that property values are increased as a result of being adjacent to open or park land.

Comment: Alternative A (No Action) is the best alternative for equestrians because it provides more opportunities to ride with few restrictions.

Response: We think supporters of Alternative A overlooked that under this alternative horseback riding in the Wilderness would remain an unauthorized use and would be stopped with increased enforcement.

Comment: The Service has presented no scientific evidence of resource damage caused by horses; in the past 42 years there has been no erosion of any type on the existing trails.

Response: We have observed soil disturbance and erosion ranging from slight to severe caused by horse traffic on much of the proposed trail route and elsewhere on user-created trails. We disagree that no erosion has occurred on existing trails. We plan to fully assess the existing condition of the trail during the design phase of this project.

Comment: Horse riding raises concerns about impacts on soil, water, plants, nesting birds and other wildlife. Seasonal closures may not be effective; serious erosion on trails was observed in nearby Giant City State Park even though they are seasonally closed. Horses are major carriers of invasive species seed. A single trail would concentrate horseback riding and its impacts. A better alternative would be more trails to spread out the impacts.

Response: If the trail is designed, constructed, and maintained properly, the impacts associated with horseback riding should be tolerable. We intend to design, construct, and manage use of the trail so that no soil erosion will occur. We intend to regularly inspect the area and take any necessary actions to repair or correct problems, such as erosion, trail braiding, etc. We intend to monitor the area to detect the presence of invasive plants and take the necessary actions to control them. We intend to revise the *Wilderness Management Plan* and conduct a thorough environmental analysis prior to officially authorizing this use. If horses stay on the designated trail, the associated impacts on wildlife should be comparable to those of hikers walking on the trail. We think concentrating the use is the best way to monitor and control the impacts associated with the use.

Comment: Horseback riding: degrades the Wilderness; may not be an appropriate use in the Wilderness; as a previously unauthorized use in the Wilderness, should not now be allowed; may open the area to and encourage illegal ATV use.

Response: The Wilderness Act does not prohibit horse trails or horseback riding. We must ensure that the construction, maintenance, and use of the trail does not conflict with the spirit and intent of the Act. If the trail is designed, constructed, and maintained properly, the impacts associated with horseback riding should be within acceptable limits. We think that by authorizing the use under specified conditions we will be able to better protect the area than we can now. We plan to patrol and enforce regulations to prevent vehicle trespass and protect resources.

Comment: Monitoring and enforcement of horse trail regulations would be difficult, especially with limited staff; horseback riders often leave horse trails to ride on hiker-only trails in Giant City State Park; horses and hikers often widen or braid trails in areas that have been rutted by horses.

Response: We plan to monitor the condition of the trail and take any necessary corrective actions. We intend to post informational and regulatory signs at trailheads and other access points. We plan to patrol and enforce regulations to protect resources. We recognize this will be a particular challenge until visitors become familiar with the regulations. With time and education, we think horseback riders will comply with the regulations and the burden of enforcement will be lessened.

Comment: Horseback riding could conflict with hunters and impact hikers through trail damage.

Response: We intend to seasonally close the trail to horses, which would coincide with most of the hunting seasons. Horse traffic certainly has the potential to damage the trail. We intend to harden the tread so that it will withstand the impact of horse hooves under most conditions. To prevent damage, we intend to close the trail to horses during times when the ground is wet and soft. We plan to enforce regulations to protect resources and minimize conflicts between users.

Comment: The Refuge may not be able to adequately maintain the trail if it becomes popular and results in increased horse traffic. Horse trails require more trail management to prevent impacts.

Response: We agree that horse traffic will likely increase in the future and result in increased challenges of trail maintenance. We intend to harden the tread so that it will withstand the impact of horse hooves under most conditions. To prevent damage, we intend to close the trail to horses during times when the ground is wet and soft. Trail maintenance will be an ongoing, cooperative effort by the Refuge, U.S. Forest Service, and River to River Trail Society. We plan to monitor the condition of the trail and take any necessary corrective actions. We plan to patrol and enforce regulations to protect resources.

Comment: A trail fee should only be imposed if the proceeds are shared with all trail landowners and the fee covers use of the entire trail.

Response: We have no control over other landowners granting or denying use of the River To River Trail or charging a fee. The Refuge's recreational fee would apply to those who drive a vehicle onto the Refuge, park, and ride or walk the trail.

Comment: The Service does not have the authority to selectively abandon a portion of the River To River Trail.

Response: We are not seeking to abandon a portion of the Trail. We are seeking just the opposite—to authorize the Trail on the Refuge. Currently, The River to River Trail has no official designation on the Refuge. Horseback riding was prohibited in the Wilderness when it was established and our current regulations do not permit horseback riding off of roads. Our proposal is to explicitly recognize an approved route through the Refuge and then manage and enforce our regulations in a manner that fulfills our legal obligations.

Comment: Horseback riders are a deterrent to poachers and illegal drug activity.

Response: We feel that the presence of horseback riders would have a negligible effect in deterring illegal activities.

Comment: Commercial horse camps have no right to treat the Refuge as a cash cow.

Response: Currently there are no commercial horse camps adjacent to the Refuge. Giant City State Park has a public horse camp whose patrons can access the River to River Trail and ride to the Refuge.

Comment: The Refuge can do more to protect against degradation caused by illegal horse use. There is a need to close user-made trails and write tickets for violators without delay.

Response: Our current regulations do not address horseback riding, thus this use is technically prohibited. However, we have not actively enforced this prohibition in recent years. On the other hand, we would not hesitate prosecuting someone responsible for creating a new trail by cutting vegetation, marking the route, etc. We intend to close all trails to horses except the designated River to River Trail section following approval of the CCP. Our proposal is designed to provide a sustainable trail for horseback riding and prohibit this use on all other user-created trails.

Comment: Brown-colored hill gravel rather than light-colored limestone should be used for trail work because it would blend better with the natural soil color and because limestone gravel is sharp on the foot and provides calcium for brown-headed cowbirds. The trail through the Wilderness should be cleared no more than a maximum width of 4 feet.

Response: We agree with you. Another undesirable effect of placing crushed limestone on the naturally acidic soils is that it tends to increase the pH of the soil, which may cause changes in the plant community on the site.

Comment: Who will pay for trail maintenance?

Response: The Refuge will be largely responsible for trail construction and maintenance. The funds needed for this project have not yet been estimated or requested. We intend to enter into a cooperative agreement with the River to River Trail Society and the U.S. Forest Service by which the official designation as the River to River Trail will be made. This agreement will also specify each partner's responsibilities, including trail maintenance. The River To River Trail Society is a volunteer organization formed to establish, promote, and maintain the 146–mile RTR Trail. Any of the partners would be free to apply for grants or organize volunteer workers to perform trail maintenance.

7.1.3.12. Hiking/Biking Trails

Comment: The Refuge has been a partner in planning for the Williamson County, Marion-to-Carterville/Carbondale Trail. A preliminary alignment for the Trail through the Refuge was proposed in the 2003 Greenways and Trails Plan for Williamson County. Refuge managers have identified a potential trail corridor through the Refuge, using old roadbeds and possibly an old railroad bed. Further identification of a more definite alignment would significantly support the development of the trail. The Refuge is strategically located between the communities and will be important in providing the central portion of the trail, connecting the communities, and making a recreation and alternative transportation facility available to the County's residents and visitors.

Response: The Refuge supports this proposal and intends to cooperate with local interests to develop this Marion-to-Carbondale bicycle trail. A proposed alignment of the trail has been identified by Refuge staff, however support from local interests and funding will ultimately determine the location and scope of this project.

Comment: As a cyclist, I like the idea of including a bicycle trail on the northern boundary of the refuge, but only if it protects those areas that are needed for wildlife habitat. A logical location would be adjacent to or close to Old 13 Rt. on the east side of 148 perhaps connecting with the easterly extension of Post Oak Road and then leading onto regular refuge roads. Fencing along the south side of the trail might be necessary to protect adjacent wildlife habitat.

Response: Goal 12, Objective 12.1, Strategy 2 includes exploring the potential for a bicycle route within the restricted use area of the refuge, along old railroad beds and refuge roads. Impacts to wildlife will be considered and mitigated in the planning process for this trail.

7.1.3.13. Swimming

Comment: In the past there were more swimming areas. The swimming areas have long been inaccessible to the public.

Response: Swimming is allowed on Little Grassy and Crab Orchard Lakes. There are several beaches and swimming areas on Little Grassy Lake located at the various group camps and the Little Grassy Campground. The Crab Orchard Campground maintains a public beach on Crab Orchard Lake. Other public beaches on Crab Orchard Lake were closed because of declining use, liability concerns, and increased maintenance and operation costs. The current beach at the Crab Orchard Campground is under-utilized, but will continue to be available to the public along with the areas on Little Grassy Lake.

7.1.3.14. Picnicking

Comment: In the past there were many picnic areas. Today most of those areas are closed.

Response: When the Refuge experienced a budget cut in non-program uses in 1973, several picnic areas were closed. Although there has been a reduction in picnic areas on the Refuge, rarely do we see the existing facilities used to capacity. We feel it is unlikely that we could support high quality facilities at all of the former locations; therefore we intend to consolidate and improve picnic facilities at the Greenbriar, Wolf Creek, Harmony Trail, Cambria Neck, Playport Marina and the former Images Marina site.

7.1.3.15. Crab Orchard Boat & Yacht Club (COBYC)

Comment: The Crab Orchard Boat and Yacht Club should be converted to a public facility. This is public land for public use and should not be used for exclusive-use purposes. The Refuge should draft a policy that would result in eventual return of this property to public use or to closure for wildlife conservation purposes.

Response: Our plan is to support both the traditional, non-wildlife-dependent as well as wildlife-dependent recreational uses on the Refuge, and by converting the COBYC to a concession, this area will be available to the general public for use. The public use benefits from the area help fulfill the recreation purpose of the Refuge and are not out-weighed by the wildlife conservation benefits that would be obtained through conversion of the site.

Comment: The Crab Orchard Boat and Yacht Club should be granted the concession permit.

Response: The plan calls for the COBYC to remain for two years after the CCP is approved. After two years, all interested parties will have an equal opportunity to bid on the concession contract. Giving preference to the Club organization in awarding the concession contract is not within the federal regulations that we must follow.

Comment: According to the text in Section 2.5, the Crab Orchard Boat and Yacht Club would not be closed immediately, but in two years, to allow the members to amortize their recent investments. Is two years an adequate amount of time? Members have worked hard and spent a lot of money to maintain the facility that is to be taken away by the government.

Response: According to the lease, "…the COBYC agrees to amortize, to a "No Value" status any additional improvements to COBYC area sites, .and, structures, facilities, equipment, construction modifications or alterations, regardless of cost to COBYC or of installation date. The additional improvements will automatically become properties of the U.S. Government at the termination or expiration date of the current contract period or extension thereof." Legally, we could require the Club to leave at the end of their current lease. However, we feel it is fair to allow the COBYC to remain an additional two years following the finalization of the CCP to further amortize their investment.

Comment: The Crab Orchard Boat and Yacht Club should continue as it has in the past. The Club's alcohol ban, caretaker, and safe, family atmosphere is appreciated and seems to cater to senior citizens and children. The Club has provided a place for reunions, birthdays, church events and other activities. Non-members feel welcome. During the past year, the clubhouse was used over 150 times for functions other than club activities. The cost of joining the Club is low.

Response: We plan to retain the alcohol ban and safe, family atmosphere when the COBYC is made into a concession. The concession contract could include retention of a caretaker. By opening the area to the general public, it is our intention that all Refuge users have an opportunity for the same type of experience at the facility. The cost to use the area will remain comparable to other camping and boat slip rental rates on the Refuge. Also, the area will be available to every-

one when converted to a concession, as opposed to being limited in the form of a club membership offered to a set number of people.

Comment: The Fish & Wildlife Service lease limits the Club to 400 members and does not allow merchandise or services to be offered. There are no restrictions to membership except those imposed by the Refuge.

Response: The current lease, originating in 1985, does not specify a maximum number of members for the Club.

Comment: Appreciate that it is the only place to go to enjoy Crab Orchard Lake without paying an entrance fee or purchasing a special decal.

Response: In lieu of paying a membership fee, when the facility becomes a concession, the cost to utilize the area, as well as camping and boat slip rental rates, will remain comparable to that of other Refuge concessions.

Comment: It is safer to fish from COBYC docks than Rt. 13 or Wolf Creek Causeway.

Response: While we strive for all Refuge facilities to be safe for visitors, we appreciate your comment.

Comment: The revenue to the Refuge will be less if the Club is converted to a concession.

Response: It is our opinion that by opening the area to the general public, an opportunity exists for more visitors to use the facility, thus generating more revenue for a concession.

Comment: A fixed income would force me to give up my boat and dock if the Club is turned into a concession.

Response: There should not be a substantial increase in your rate. Rates for dock rentals on the Refuge are kept at similar levels to alleviate competition among the facilities on-site.

Comment: To single out the Club is unacceptable and discriminating.

Response: In a review of the Crab Orchard National Wildlife Refuge activities in 1971, the Office of Survey and Review Audit Operations of the United States Department of Interior found that "continued sponsorship of the Crab Orchard Boat and Yacht Club …. is not compatible with established public policy as it grants a privileged position on public recreational facilities to a private membership club." The auditors recommended that the Club's permit be terminated and the facilities be placed under a concession agreement. In a 1985 review of a proposed lease with the Club, the Office of Solicitor, United States Department of Interior, commented that exclusive use by the Club still continued.

Given the doctrine of fairness and its interpretation by other federal land management agencies, the Service intends to implement the auditors' recommendation to convert the site of the Crab Orchard Boat and Yacht Club to a concession. The Service has tried to satisfy the intent of fairness in the past through a variety of conditions and agreements with the Club, but recognizes now that the 1971 recommendation should be implemented to more fully provide the most benefit to the most people.

Comment: The public has an opportunity to apply for membership with no restrictions.

Response: By eliminating the "membership" aspect and converting to a concession, no applications or waiting period would be necessary to use the area.

Comment: If the Club is made public, the grounds and facilities will run the risk of becoming too populated and less cared for.

Response: Just as compliance of the agreement with the COBYC is currently enforced, so will the terms of the concession contract, ensuring the grounds and facilities are maintained. It is not our intent to increase the number of campsites or docks that will be available to the general public and it is assumed that if people who want to use the area for other activities feel it is too crowded on a given day, there are other opportunities available on the Refuge.

Comment: The people who govern the Refuge are not in tune with the people who use it. Visitors see a need for more places like this

Response: As administrators of government land and facilities, it is our responsibility to consider the broad range of views of the public, to comply with regulations, and use the best information and judgement possible. We think we understand the views of the current users of the Refuge. We know that we can not satisfy everyone as we have heard opposite viewpoints on nearly every topic addressed in our planning. We are trying to meet

our responsibilities in an open and fair manner. It is our responsibility to provide quality recreational opportunities to benefit a broad portion of the public who will have an equal opportunity to use them.

Comment: Why not open the gates to the marina? The plan for the sailboat marina seems like exclusive use for the SIU boat club.

Response: Playport Marina, as well as the Crab Orchard and Little Grassy Campgrounds, are seasonal use areas. The gates are closed in the off-season (November through March) because the areas themselves are closed to business at that time. From April through October these areas are open until 10:00 p.m. when, as is the case at the COBYC, the gates are closed until 6:00 a.m. the following day. There is no plan for a "sailboat marina" for the SIU boat club as you reference.

Comment: The name and activities descriptions should be changed to more accurately define the "club" as it truly functions. Elimination of a maximum membership cap and changing the Club's name would alleviate the "exclusive use" perception. This area is open to the public in the same manner as other docks and related facilities on the lake—first come, first served. Anyone can get on the list to rent a dock or join.

Response: We agree that a name change is in order. We think the changes that must be made are more fundamental than changing names, descriptions, and perceptions, however. We think the basic relationship between the operator of the area and the Refuge needs to change. A concession contract will clarify the facilities and uses that will be made available to the general public. The current "Club" organization will have a chance to bid on the opportunity to continue operation of the area under a new contract. While we agree that dock space is limited and is rented on a first come-first served basis, a concession operation would allow all visitors, not just club members, an equal opportunity to use the area.

Comment: The proposed change to the Crab Orchard Boat and Yacht Club violates the good faith agreement that has been used for many years. The Club should be given another 100 year lease.

Response: The Club currently operates under a lease contract, the most recent of which was written in 1985 and has been amended and renewed, as appropriate. The lease and its amendments specify the terms and conditions the Club has adhered to for these past twenty years. We realize that some members are under the impression that an extended lease exists, but neither the Club nor the Refuge has been able to find documentation of a 100-year lease.

7.1.3.16. The Haven

Comment: The Haven is technically in the same category as the Crab Orchard Boat & Yacht Club. However, the facility is making a positive contribution to the well being of disabled veterans; others can access the facility with an appropriate contact; and it requires little Refuge money and staff time. The Haven should be treated differently than the Boat & Yacht Club and remain.

Response: Our plan is for the Haven to remain on the Refuge. The Refuge does plan to assess a nominal fee to the Haven in order to help recover our administrative expenses. We also plan to work collaboratively with Haven personnel to provide more wildlife-dependent recreation to a broader portion of the public to more fully realize the broader purposes of the Refuge and the mission of the National Wildlife Refuge System.

Comment: With the exception of established church and scout camps, which are based on refuge land, we would like to see stronger language and policies regarding other exclusive-use sites in the refuge: the boat and yacht club and The Haven. A member-only boat and yacht club at a national wildlife refuge has always struck us as a great anomaly. This is public land, for public use and U.S. Fish and Wildlife regulation, and should not be used for exclusive-use purposes. We encourage you to draft a policy that would result in eventual return of this property to public use or to closure for wildlife conservation purposes.

Response: Our plan is to convert the Crab Orchard Boat & Yacht Club to a public concession. See the previous section for a fuller discussion of comments and response regarding the Club. We view The Haven slightly differently than the Club. As other comments have noted, the Haven's primary focus is to serve veterans. Because of their past service and sacrifice, we think that this group deserves special consider-

ation at a federal facility. See the first comment and response in this section for our expectations related to the Haven.

7.1.3.17. Youth Camps

Comment: We recognize the tradition of private church and scout camps which are established on refuge land and the difficulties, at this late date, of disturbing those camping and educational facilities. We recognize the long term good that can come from children's experiences in nature. We are pleased that Crab Orchard will allow the camps to remain, but we also endorse your proposal to begin charging fees for programs to help recover some of the costs that the refuge incurs in the private camp areas.

Response: We appreciate the support for our proposed action.

7.1.3.18. Playport Marina

Comment: The efforts of the Refuge in rebuilding the former Playport Marina are appreciated. It is a beautiful area. Glad the area is included in the draft plan.

Response: We appreciate the support for our past efforts and the proposed plan.

7.1.3.19. Waterskiing

Comment: I support the reduction of water skiing areas.

Response: We appreciate the support of the proposed action. However, after hearing comments from other visitors, we have modified our proposed action and excluded some areas from our original proposal. The areas that we have excluded are sheltered from the wind and are popular alternative with waterskiers when.

7.1.3.20. Collection of Wild Plant Foods

Comment: Collection of wild plant foods for personal use should be stopped. The native plants can be used for personal financial gain. The taxpayers who own this land believe this destroys the area. I don't think you should be able to take anything from this area. It is not compatible and, in fact, is destructive.

Response: We have determined this use to be compatible. Items collected are for personal use only; no commercial activities are allowed. We do not think this activity has significant harmful effects to these renewable resources or the ecosystem. We have seen no evidence of harm caused by collection of wild plant foods for personal use.

7.1.3.21. Recreation Fees

Comment: Sierra Club opposes the "Fee Demo" program being used on our national parks, forests and refuges. Instead, we support the adequate funding of the FWS and of the Refuge, and deplore the trend of Congress to cut the budgets for the FWS and other national land management agencies. We understand why land managers would latch onto user fees to make up for budget cuts. However, these user fees are another tool being used by commercial recreation interests to worm their way into using more and more of our public resources for their private profit. This can easily lead to high impact recreation pushing out the low impact, wildlife related recreation that is supposed to be the focus of recreation on wildlife refuges.

Response: Whether to collect fees from visitors on public lands is a persistent and ongoing national debate. You have correctly identified Congress as a key entity in this debate. The authority for the sale and disposition of recreation user fees is found in the Federal Lands Recreation Enhancement Act (From the 2005 Consolidated Appropriations Act (PL 108-447) signed into law by President Bush on December 8, 2004). The new authority limits recreation fee collection to the NWRS and this authority will expire December 2014. It the policy of the Service to collect recreation user fees on NWRS land wherever feasible, practical, and cost effective. Our fee collection at the Refuge meets these three criteria. The Service policy is to manage all recreation fees to help achieve the purposes of the National Wildlife Refuge System and the National Wilderness Preservation System; and provide revenue to support operation, maintenance, and expansion of wildlife-dependent recreational use opportunities (hunting, fishing, wildlife observation and photography, environmental education and interpretation) for visitors to the NWRS.

Comment: People who most need free, public recreation will be the people who are excluded because they cannot afford the fees. The Refuge should have one free day per week, when anyone, regardless of income, can use the public lands of

the refuge. When access is granted to the public, the access should not be determined by the ability to pay.

Response: The current entrance fees for Crab Orchard Refuge are $2.00 for a day pass, $5.00 for a week pass, and $15.00 for an annual pass. Fees are set based on comparisons with prices and services offered by other public agencies and private entities. We think the refuge fees exclude few people. Because most access to the Refuge is by car, the fee is a small part of the total cost of a visit when the cost of transportation is figured in. The Refuge currently offers nine (9) free days during the year. These days coincide with Earth Day, National Free Fishing Days, Public Lands Days, National Hunting and Fishing Day, and National Wildlife Refuge Week. All of the Refuge interpretive programs such as Eagles Days and Wildflower Walks are also free. Entrance fees are not charged to anyone visiting the visitor center or using the observation platform and the photo blind on Route 148.

Comment: A single entrance fee is discussed in several places in this document. Table 1 on page 29 shows twelve fees. What is meant by a single entrance fee - one for each type of visitor?

Response: The text that refers to a "single entrance fee" is wrong. We will edit the text in the Final EIS. The table on page 29 correctly reflects our proposal. Congress passed an act during our planning that changed how we propose to collect fees. The table was updated, but not the text. Entrance fees provide access into a recreation site and user fees authorize a visitor to use specific facilities, programs or resources sponsored by a recreation site. We collected fees in the past as user fees under authority of the Omnibus Consolidated Rescissions and Appropriations Act of 1996. The Service is now collecting fees under the authority of the Federal Lands Recreation Enhancement Act (REA), which was a part of the *2005 Consolidated Appropriations Act (PL 108-447)*. In the language of the REA a user fee is referred to as an expanded amenity recreation fee. To meet the direction of the REA, we are now going to collect an entrance fee and an expanded amenity recreation fee for boat launching facilities and quota hunts. The proposed fee schedule in Table 1 reflects the multiple categories and classifications for how the entrance fee can be paid and the user fees for boat launching. Our proposal is consistent with the standard schedule for most refuges.

Comment: As I understand it, the fee program is to generate funds for "improvements" on the refuge. While this sounds admirable, I question when the fee program will end and these improvements stop. Improvements often times become urban sprawl development type that ultimately detracts from the mission of a wildlife refuge. As we continue to collect user fees, we need to create more improvements to justify the user fee creating a never ending circle. Even something benign as improvements in the boat ramp parking areas create large light pollution from security lights that can be seen for miles. A careful planning program is needed to prevent an "urban sprawl city park type developmen" in the quest for tourism dollars.

Response: The Fish and Wildlife Service is currently drafting guidelines that will require each refuge collecting recreation fees to develop a five year business plan for the expenditure of recreation fees. The Federal Lands Recreation Enhancement Act specifies how refuges can expend funds from recreation fees. On the Refuge we envision better, not more, facilities. We plan to concentrate on repair, maintenance, and facility enhancement related directly to visitor enjoyment, visitor access, and health and safety during the life of the CCP. Our proposed consolidation of facilities is counter to the notion of sprawl.

Comment: Are the charges for the human activities sufficient to pay for the full costs of the facilities? If this area starts making itself into a public recreation park, then the wildlife and birds are negatively impacted. I thought this was a "wildlife refuge". Is there some change in mission?

Response: Recreation fees do not cover the full cost of facilities or services. The Refuge's operations and maintenance budget and volunteers also contribute to providing for visitor services. For a discussion of the purposes of the Refuge and mission of the System, see "Purposes of Refuge vs. Refuge System" section in the response to comments.

Comment: The proposed fees on page 29 seem extremely low. They should be ramped up by one thousand per cent. If hunting continues, I would

like to see a hunting license fee to be paid by anyone who steps into this refuge to cost $500.00 per year. You are running this refuge with a focus on hunting/killing so these gun wackos should start paying the freight.

Response: Our proposed fee schedule follows the standard schedule for most Refuges. We do not agree with your suggested fee for hunting. The National Wildlife Refuge System Improvement Act of 1997 directs us to consider hunting as a priority general public use and to give it priority consideration in planning and management. The Act encourages us to find ways to permit hunting, if it is compatible. We have found hunting to be compatible at Crab Orchard National Wildlife Refuge. The fee you suggest is inconsistent with our direction to facilitate this priority general public use.

7.1.3.22. Law enforcement

Comment: Law enforcement should be increased on the Refuge. There has been inadequate enforcement of fishing regulations on Refuge waters. Some anglers feel they can do anything since they will not be checked. The lack of law enforcement in the Wilderness and other areas has indicated to the public that the Refuge doesn't care. So, all types of unauthorized activities have been increasing that adversely affect the quality of experiences on the Refuge and the public perception of the Refuge and the Service. Law enforcement must be increased and emphasis on what efforts are conducted need to be changed. Drugs and indecent exposures are problems, but trespass, illegal sized fish and habitat destruction should not be allowed on the Refuge. More law enforcement needed to enforce no wake zones.

Response: We agree that more enforcement is needed. Our proposed action includes plans to increase law enforcement staffing above the current levels. Increased staffing, though, is dependent on increased budget allocations.

7.1.3.23. Sailboarding/windsurfing

Comment: There is a need for year round access and better places/facilities for windsurfing.

Response: The facilities for windsurfing and sailboarding are currently located at Playport Marina. Individuals docking boats at this facility have year-round access. At this time there are no plans to establish additional windsurfing facilities; however, this should not preclude launching at pubic boat ramps and the use of sailboards on waters open to their use.

7.1.3.24. ATVs

Comment: Thrill craft, such as ATVs, should not be used on the refuge. The inefficient two-stroke engines of ATVs spew out as much as 30 percent of their fuel unburned. The noise these machines make is incompatible with wildlife and also with all of the priority recreation uses of the refuge. The damage ATVs create on soils and vegetation can be extreme. ATV use may disturb the nesting of the bald eagles, and even discourage some eagles from nesting on the refuge, especially if the nesting population continues to increase. The nature of these machines encourages irresponsible, reckless and inconsiderate behavior in the riders. Refuge managers should put high fines ($1000 fines, as recommended by federal judge Gilbert) on the illegal use of ATVs on the refuge or to confiscate the ATVs of people riding illegally and causing damage on the refuge. It takes such extreme measures to discourage ATV riders. Swift action is needed, or the illegal ATV misuse and damage will continue to increase. Conservation Police Officers who patrol state owned Illinois DNR land have the authority to confiscate boats and other property of people who flout the state wildlife conservation laws. The FWS should do the same.

Response: ATV use, in general, is not permitted on the Refuge. We do not propose expanding the use of ATVs by the public on the Refuge. We currently issue a very limited number of special use permits to people with disabilities authorizing them to use specific roads in a limited area for specific activities. The Refuge policy on ATV use is much more restrictive than on adjacent Forest Service or Illinois DNR lands. Enforcement of unauthorized ATV use on the Refuge is ongoing. Refuge officers do not have the latitude to assess high fines for illegal ATV use. They are required to follow an established schedule of fines.

Comment: On page 323, the CCP/DEIS states: "The refuge issues several special use permits annually to disabled deer hunters authorizing them to use an ATV on designated routes for access." These special use permits raise a red flag. The U.S. Forest Service has a handicap ATV program on Shawnee National Forest, which has expanded to include over 1200 handicap permits.

These permits allow the riders to ride on any trail in the forest and allow the handicapped rider to be accompanied by another person on a second ATV. The reason there are so many handicap permits on SNF is because it is very easy to get a physician to write a letter saying the person has a handicap. In other words, the program is very much abused on SNF, because the Forest Service has made it too easy to get a handicap ATV permit. For that reason, we oppose any use of ATVs on the refuge, including use by handicapped hunters. It can prove to be a slippery slope. At the very least, the FWS should make sure there is a test that screens out all but the truly handicapped hunters to ride ATVs on the Refuge. The FWS should designate a strict route for the ATVs and limit the handicapped hunting on the Refuge to short time periods. Do the ATV riders use trails or roads on the refuge, or a combination of both? How many days are handicapped hunters allowed to hunt on the Refuge? Does another hunter accompany the handicapped hunter on another ATV? What are the criteria to qualify for the handicapped hunter special use ATV permit?

Response: The Refuge policy on ATV use allows riders who meet the Illinois DNR disability standard set forth in the State Hunting Digest to request a special use permit for use on approximately 3.5 miles of established service roads in the open area of the Refuge. Riders must stay on these established roads. Only disabled hunters who are not afforded a special disabled hunting area on the Refuge are eligible for permits. We do not allow another person to accompany the permittee on a separate ATV. Enforcement of unauthorized ATV use on the Refuge is ongoing. Fewer than 10 disabled ATV permits have been issued on the Refuge in each of the last 5 years.

\# **Comment:** An ATV trail should be established on or instead of the horse trail, because ATV's cause less erosion.

Response: There are currently no authorized horse trails on the Refuge. The equestrian trail that is proposed will go through the Crab Orchard Wilderness, where ATVs would not be allowed. Areas where we do allow limited ATV use by hunters with disabilities are established roads where erosion is not likely to occur.

7.1.3.25. Personal Watercraft (Jet Skis)

\# **Comment:** Personal watercraft should not be allowed on the refuge. The inefficient two-stroke engines of jet skis spew out as much as 30 percent of their fuel unburned. Research has shown that one jet-ski driven for 8 hours emits as much pollution as a car driven for 100,000 miles. The noise these machines make is incompatible with wildlife and also with all of the priority recreation uses of the refuge. Jet ski users greatly increase the danger of accidents on the lake, and interfere with priority uses of the Refuge, such as fishing and wildlife observation. They are incompatible with swimming, canoeing and other recreation that is allowed on the lake. In addition, the nature of these machines encourages irresponsible, reckless and inconsiderate behavior in the riders. Conservation Police Officers who patrol state owned IDNR land have the authority to confiscate boats and other property of people who flout the state wildlife conservation laws. We don't see any reason why the FWS shouldn't do the same. As the surrounding areas develop more residential and commercial properties, there will probably be increased pressure to allow more types of recreational use on the lakes. Limits need to be set NOW to preserve the objective of caring for wildlife. The need to confine the use of such craft to designated areas will put a strain on law enforcement staff.

Response: The portion of Crab Orchard Lake east of the Wolf Creek Road causeway is closed to all watercraft seasonally to protect migratory waterfowl. Additional no-wake zones are proposed east of the Route 148 causeway and in many fingers off of the main body of the lake. We do not expressly prohibit any kind of watercraft, although no-wake zones do preclude the use of fast-moving watercraft in portions of the lake. We think the proposed no-wake zoning will reduce the risk of accidents on the lake and conflicts with other visitors. We intend to enforce existing speed limits and rules governing the allowable noise levels that apply to all watercraft on the remainder of the lake.

7.1.3.26. Rock Climbing

\# **Comment:** Rock climbing should not be allowed on the Refuge because of lack of supervision and safety.

Response: We appreciate the support of our proposed action. We feel that better opportunities for this activity exist at nearby locations.

7.1.3.27. Scuba Diving

Comment: Scuba diving should be allowed on the refuge. Scuba diving is in tune with the mission of the refuge since it can lead to many more diverse areas like aquatic science. Also, law enforcement could utilize the lakes to develop their own search and rescue units. This would help the local economy.

Response: Swimming is prohibited in Devils Kitchen Lake because the submerged trees are a swimming hazard that can not be properly marked. The lack of water clarity in Crab Orchard Lake is not conducive to scuba diving. Little Grassy Lake is the only Refuge lake where scuba diving would be feasible and swimming is allowed. Because of potential conflicts with group camp users and recreational anglers, we do not think that recreational scuba diving would be appropriate on Little Grassy Lake. Scuba diving, as part of search and rescue training, has been and can be authorized on the Refuge with a special use permit issued by the refuge manager. We don't think that the numbers of people involved in scuba diving would contribute measurably to the local economy when compared to other recreational uses that can be promoted.

7.1.3.28. Reducing Recreational Opportunities

Comment: The October 2005 Project Update states that "Citizens were concerned about the loss of recreational opportunities and lack of support for recreation by the Refuge." This concern is highly exaggerated. The public is offered extensive recreational opportunities by the Refuge and takes full advantage of them. Many people consider the Refuge to be a public park rather than a wildlife refuge.

Response: We have heard from people throughout the planning process that recreational opportunities on the Refuge are fewer than they once were. Recreational facilities and sites have been reduced. The perception and challenge of providing for recreation arises, in our view, because recreation is one of the purposes of the Refuge. And, when the Refuge was established the Service recognized several non-wildlife-dependent recreation activities as appropriate. The Refuge has been challenged to provide for all recreation when competing for funds within an agency with a wildlife focus. The proposed action to consolidate and improve facilities is an attempt to recognize the desire for non-wildlife-dependent recreation and the realities of the agency's budget.

Comment: Over the years we have witnessed diminishing recreational opportunities on the Refuge. There are fewer picnicking and swimming opportunities. Parts of the refuge should remain open all year to recreational opportunities. The Image Marina and the gates at Cambrian Neck should be reopened to the public.

Response: Approximately 23,000 acres, or more than half of the total Refuge acreage, is open year-round to the public. In addition, portions of the restricted use area are open for special hunts, auto tours, and wildlife observation events. Our plan is to maintain and improve picnicking in the recreational areas at Greenbrier, Wolf Creek Road, Harmony Trail, Playport Marina, Devils Kitchen and the former Images Marina site. The former Carterville and Lookout Point Beach areas are still open to the general public, but are not maintained as recreation areas. These beaches were operated several years as a part of the Crab Orchard Campground concession contract. They were removed from the contract on request of the concessionaire because of liability concerns and increased maintenance and operating expenses. The Refuge did not have the personnel or funds to operate and maintain the facilities at a level where visitors would have an enjoyable experience. Images Marina and Cambria Neck are open to the public as day-use areas. Because of serious law enforcement issues in the past, Cambria Neck will be managed as a walk-in picnic area until such time that the picnic facilities can be re-located to a renovated day-use area at the former Images Marina site.

7.1.4 Industry

Comment: Although industry was located on part of the refuge land before Congress designated that land as part of Crab Orchard Refuge, industry is still inherently incompatible with preservation of wildlife. We are concerned with the impacts on the wildlife of air, water, noise and light pollution and truck traffic associated with the industry. We urge the FWS to steadily decrease the amount of industry on the refuge

through attrition. We agree with others that most of the industry on the Refuge would be better situated within one of the small cities in the area.

Response: Public Law 80-361 established the purposes of the Refuge, including industry. Our preferred alternative supports maintaining the existing industrial tenants, and as they depart, if buildings remain suitable, the Refuge would seek new tenants. Also, as buildings are deemed unsuitable, they will be removed. Our tenants are bound by either a Lease Contract or Special Use Permit, which dictate the terms and conditions they are to adhere to, including environmental compliance. In our approach we are seeking a balance among the purposes of the Refuge, responsible use of existing facilities with an awareness of environmental and social impacts.

Comment: Existing tenants are expected/required to upgrade and maintain leased facilities. This appears to be an unreasonable and unusual requirement as landlords usually provide proper facilities in order for prospective tenants to consider and be interested in leasing the facility.

Response: Our requirements are outlined in the individual Lease Contracts and/or Special Use Permits. If the tenant or prospective tenant feels the requirements are unreasonable, we are certain they would not agree to the terms and conditions and would not use Refuge property. Given our past and projected budget history, we think that it is unlikely that we will have the funds to upgrade industrial facilities. If we were to rely on our own funding, industrial sites would soon disappear from the Refuge. We are seeking to keep the options open for our current and potential industrial tenants by allowing them the opportunity to upgrade the existing facilities.

Comment: I urge that industrial buildings that have reached the end of their useful lifetimes be vacated and removed. While it may make sense to issue leases to new businesses that can use currently viable buildings, I can see little value to the Refuge in spending resources to bring poor-quality structures up to standard, or allowing the businesses, themselves, to do so. In my opinion, slowly discontinuing non-munitions industrial activity is a positive long-term goal.

Response: We agree with this assessment for the most part. However, we think that if a business wants to upgrade and use a structure then we should allow it to further meet our industrial purpose specified in Public Law 80-361. As buildings are deemed unsuitable, they will be removed as suggested.

Comment: Industrial sites should be consolidated and replacing tenants only if buildings are suitable for occupancy since industrial sites are part of the mission. Careful selection of tenants is important to assure that there are no more hazardous waste disposals. Industries must be required to conform to all health, safety and environmental standards. Continue cleanup of contaminated areas.

Response: Our proposed action is consistent with these points.

Comment: The old industrial area adjacent to Blue Heron Pond is a disgrace to the Refuge and should be taken care of NOW. This area is contaminated and requires costly remedies. Since it as built while under the control of the war department, why should the refuge be saddled the full reasonability of clean up? This is where all the federal, state and local officials should band together to hammer out a solution!

Response: We appreciate your opinion regarding appropriation of funds toward various Refuge endeavors. We have personnel at the Refuge committed strictly to environmental clean up activities under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as "Superfund." Through the CERCLA staff's efforts, sites are being remediated with funding from sources including Department of the Interior and "Potentially Responsible Parties" (PRPs).

Comment: In the past, the munitions industry operated in ignorance of their affect on the habitat and wildlife. PCBs were used as heat transfer agents. Prior to the discovery of their toxicity in 1976, and the subsequent ban, 1.5 billion pounds of PCBs were manufactured in the United States alone. We are almost guaranteed that additional discoveries of the harmful effects of industry to our public lands will happen in the future. A national wildlife refuge with the ecological values of Crab Orchard is no place for such a risky gamble with our natural resources. It is ludicrous to consider perpetuating this ill-considered use of refuge land, given all the new information about the effects of the munitions industry and their landfill waste on human health, wildlife and the

condition of the land. If the Service continues to promote the munitions industry, a dangerous precedent could be set that will weaken the spirit of the 1997 Refuge Improvement Act. If there is only one lesson to be learned from the allowance of industry on a refuge, it is that the effects cause severe environmental damage that is costly to clean up. The short-term benefits of industry are far outweighed by the incalculable long-term losses caused by soil and water contaminations.

Response: We appreciate your concern. The munitions manufacturer located on the Refuge, General Dynamics, follows strict environmental compliance guidelines. The company's Environmental, Health and Safety Policy, as well as its ISO 14000 certification demonstrate General Dynamics' commitment to protecting human health, the environment and our natural resources.

Comment: Clearly, when industry was included in Public Law 80-361, it was done so as a secondary aim, under the misguided belief that healthy wildlife and the munitions industry could co-exist on refuge lands. The harmful ramifications of that decision had not yet been observed. While we encourage the CCP's proposal to relocate non-munitions industry to industrial parks, as outlined in Alternative C, the exclusion of the munitions industry is an unacceptable omission.

Response: Public Law 80-361 established four *equal* purposes: wildlife conservation, agriculture, recreation and industry. The Refuge Improvement Act of 1997 states that: "…if a conflict exists between the purposes of a refuge and the mission of the System, the conflict shall be resolved in a manner that first protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission of the System." As stated on page viii of the Draft EIS/CCP, "We think that, overall, we are meeting the intent of the law…We determined that all existing activities are compatible." See also the previous comment and response related to environmental health.

Comment: We are alarmed and strongly disagree that the Service's preferred alternative (Alternative E) sanctions industry on the Refuge by allowing new tenants to move into vacated facilities and maintain practices that damage the Refuge (CCP, p.54). The language in Public Law 80-361 should be read to promote wildlife conservation first.

Response: We do not condone nor intend to allow tenants to "maintain practices that damage the Refuge" and will hold them to the strictest environmental standards. Public Law 80-361 established four *equal* purposes for the Crab Orchard National Wildlife Refuge: wildlife conservation, agriculture, recreation and industry.

Comment: The purpose of the Crab Orchard Refuge first and foremost states that the Refuge was established "for the conservation of wildlife" (Public Law 80-361). Although the purpose also includes the development of agricultural, recreation and industry, they are listed subsequent to wildlife conservation and can thus be understood as secondary purposes. The language in the purpose of the Refuge clearly delineates conservation as its own distinct value. By upholding industry, while failing its commitment to wildlife conservation, the Refuge is not within the bounds of the law. It can therefore be inferred that any other activity prohibiting wildlife conservation is illegal and inappropriate on Refuge land.

Response: We do not agree. Public Law 80-361 established four *equal* purposes for the Crab Orchard National Wildlife Refuge. The hearing record associated with the law does not support the claim that Congress considered the conservation of wildlife as a dominant purpose. Additionally, the four purposes are not always listed in the same order in Public Law 80-361. While the purposes of the Refuge might not seem compatible with the mission of the National Wildlife Refuge System (System), the purposes take precedence over the mission of the System. We feel that overall we are meeting the intent of the law.

Comment: The Service can not allow the operation of facilities that damage natural resources on the Refuge, while simultaneously honoring the Refuge's clear purpose to conserve wildlife. Industry detracts from the Refuge purpose by converting land away from wildlife habitat and emitting hazardous materials in ecologically sensitive lands. By supporting the munitions industry, the Refuge violates the overall mission of the Refuge system and its wildlife first mandate. The final CCP should eliminate all industry on the Refuge.

Response: We do not agree with this interpretation of Public Law 80-361. The four purposes were established as *equal* purposes. We do not intend to fail in our commitment to wildlife conservation while concurrently supporting the other three purposes. See the last section of the response and comments for a further discussion of refuge purposes and system mission.

Comment: Chapter 2.5 of the CCP lists alternatives that were considered but not analyzed in detail. Among these is the alternative to: "[h]ave the industrial purpose removed from refuge purposes." The CCP explains that the Service did not seriously analyze this alternative because of the potential economic impact such a transition would incur. Specifically, the draft states: "The removal of industry as a purpose would be seen as a threat to the local economy (CCP, p. 21)." We are baffled that the Service reached this sweeping conclusion without an appropriate economic study. National wildlife refuges are to protect and conserve wildlife and natural resources - not to uphold the local industrial economy. Two compelling reasons confound the argument that economic necessity prompts the retention of industry in the Refuge. First, an agreement to relocate industries to industrial parks would retain their presence within Williamson County and thus avoid any adverse effects to the economy (CCP, p. 160). As the CCP states, there are several nearby industrial parks that are suitable relocation sites for industrial manufacturing (CCP, p. 54). Secondly, the Refuge itself is a stimulant to the local economy. Freed of industry, visitation would most likely increase, as would profits to both the Refuge and to surrounding business.

Response: The effect on the local economy and jobs was one part of our consideration. Another part of our consideration that we noted was that "suitable infrastructure still exists on the Refuge to support the munitions industry." While most industries can relocate to industrial parks, the munitions industry is limited in its location due to safety and security concerns. It seems to us that the decision to not pursue this option is a basic and simple one, which does not require an economic study. Congressional action is required to change the purpose of the Refuge. Because of the economic effect and existing munitions industry infrastructure, we saw little likelihood of support from the community and Congress in removing the industrial purpose from the Refuge.

Comment: The Refuge should not be placed in competition with industry or the local economy. Crab Orchard Refuge is a dominant force in the community both because of its economic contribution and because it provides quality of life. In fact, Crab Orchard Refuge is among the most highly visited refuges in the nation. Furthermore, there are ways to compensate for any potential short-term, lost income to the Refuge. After all, in both the 2002 and 2004 Banking on Nature reports, the majority of visitors revealed they would have spent more money on their refuge trips. Banking on Nature indicates that the greatest stimulus to the local economy is generated by out-of-town visitors. An attractive tourism scheme could help bring additional revenue to the town.

Response: We agree that the Refuge contributes to the local economy and the community's quality of life and that tourism can bring additional revenue to the community. We do not agree, however, that the Refuge is a dominant force in the economy. Our economic analysis showed that the Refuge is a small part of the total economy of the community. Although it is difficult to quantify, we do think the Refuge's influence on the quality of life might more likely be characterized as significant or dominant.

Comment: The CCP highlights one additional reason for the munitions industry's presence on the Refuge: national defense. It is not the job of the Service to "contribute to and support national defense" as it claims in the CCP. Rather, it is the mission of the Service to work "with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people" (http://www.fws.gov/who/).

Response: We agree with your statement of the Service's mission. However, the Refuge has an industrial purpose and it is our responsibility to fulfill that purpose. We think that it makes sense for us as managers of a federal facility to fulfill the Refuge's industrial purpose by supporting national defense.

Comment: We are pleased that the USFWS maintains a commitment to the industries located within the refuge. While we recognize that it is sometimes difficult to balance the existence of

industry with the natural setting of the refuge, we feel that the continued existence of these employers is crucial to our regional economy.

Response: We appreciate the endorsement of our approach and the proposed action.

Comment: Industry should do no harm to the Refuge. The General Dynamics facility may or may not be doing harm-it's hard to tell but certainly the depleted uranium munitions production poses a possible and deadly threat to the environment and to Refuge staff, General Dynamics personnel, and volunteers and visitors should there be an accident.

Response: While we understand your concerns, the munitions manufacturer located on the Refuge, General Dynamics, follows strict environmental compliance guidelines. The company's Environmental, Health and Safety Policy, as well as its ISO 14000 certification demonstrate General Dynamics' commitment to protecting human health, the environment and our natural resources.

7.1.5 Wilderness

Comment: We urge the management of Crab Orchard Refuge to adhere to the FWS Draft Wilderness Stewardship Policy, as follows: "We will take action to prevent or minimize unnatural sounds that adversely affect wilderness resources or values or visitors' enjoyment of them."

I can be in the wilderness area and hear motorcycles, chainsaws, trucks beeping, dogs barking from Lake View Estates.

Response: Minimizing unnatural sounds in the Crab Orchard Wilderness is an ongoing challenge that becomes more difficult as development on adjacent private land increases. Under the preferred alternative, the authorized boundary of the Refuge would expand and adjacent lands would be acquired from willing sellers by fee title or easement. Additionally, restrictions on the use of outboard motors in the southern end of Devils Kitchen Lake are proposed under this alternative. The acquisition of lands adjacent to the Wilderness and re-zoning of the southern end of Devils Kitchen Lake should help diminish unnatural sounds in the Wilderness.

Comment: We whole heartedly support adding the two blocks of refuge land within the wilderness area as designated wilderness. Section 6 of the 1964 Wilderness Act states: "The Secretary of Agriculture may accept gifts or bequests of land within wilderness areas designated by the Act for preservation as wilderness." This would also apply to the Secretary of Interior. This section probably means that the 120 acres acquired by the FWS after designation of Crab Orchard Wilderness can automatically become wilderness, and needs no act of Congress to designate these acres as wilderness.

The Service is *obligated* to forward to Congress any suitable recommendations in a Wilderness Study Report that moves from the Refuge Director through the Secretary of Interior and the President (Fish and Wildlife Service Manual, chapter 7, part 610). Wilderness designation is an essential step in restoring and preserving the natural conditions of the Crab Orchard Refuge and strengthening the Wilderness Preservation System in its entirety. It is an absolute priority that the Service adheres to their objective to recommend wilderness designation within two years after the approval of the CCP.

Response: Our interpretation of the gifts or bequests clause is that it does not apply in this instance because neither a gift nor bequest is involved. We plan to recommend wilderness designation through the Secretary of the Interior Department, Congress, and the President.

Comment: The wilderness review identified a 558-acre tract of land contiguous with the southern boundary of the Crab Orchard Wilderness, which was acquired by a 1979 land exchange with Southern Illinois University. Although this tract does not currently qualify to be designated as a WSA because it does not meet the criteria for naturalness, it does have value as potential wilderness. It is of utmost precedence that the Service allows natural ecological succession to occur and restore the area's natural wilderness character for the eventual designation of the land as wilderness. This land should be able to be declared part of the wilderness area by the Secretary of Interior. The 1964 Wilderness Act (Section 6) states: "The Secretary of Agriculture may also accept gifts of bequests of land adjacent to wilderness areas designated by this Act for preservation as wilderness if he has given sixty days advance notice thereof to the President of the Senate and the Speaker of the House of Representatives."

Response: Additional removal of exotic plants and debris needs to take place in order to accomplish restoration of this tract prior to being considered for designation as wilderness. Currently this area does not meet the criteria for wilderness designation. We do not think this land can be accepted under the bequest clause. The land was not acquired as a bequest.

Comment: Benchmark conditions should have been established right after the wilderness area was designated in 1976. Management of an area should be guided by the principle that wilderness conditions should not be allowed to erode from the benchmark conditions. If there are no benchmark conditions that were established, then benchmark conditions should be established and recorded as soon as possible.

Any human manipulation within the wilderness should not be allowed until and unless a "minimum tool analysis" has been conducted. Thus, any horse trail within the Crab Orchard Wilderness should not be allowed until an analysis of appropriateness has been done, including a minimum tool analysis. Attached is a worksheet for the minimum tool analysis that we urge you to use before taking management action in the Wilderness Area.

Response: We intend to follow all applicable laws and policies in managing the Crab Orchard Wilderness.

Comment: The "Wilderness Management Plan" for the Crab Orchard Wilderness states: "Access to the interior of the Wilderness will continue to be permitted only to those on foot." We advocate that the FWS keep this policy and limit horse riding to the segment of the River to River Trail proposed for the Wilderness, unless the FWS decides that horse riding is an inappropriate use for the Crab Orchard Wilderness.

The "Wilderness Management Plan" also states: "An Enforcement Officer and vehicle are needed for patrol of the Wilderness...." Since mechanized vehicles are prohibited on wilderness by The Wilderness Act of 1964, it is illegal for an enforcement officer to be patrolling with a vehicle, unless he is patrolling the access points outside the wilderness. We do urge the refuge management to assign at least one enforcement officer to patrol the Wilderness Area, just not on any mechanized vehicle. If horses are to be allowed in the Wilderness Area, it would be expeditious to have a law enforcement officer on horse back to patrol the area, although patrol on foot would be adequate. Some Sierra Club members have noted a deer stand in a tree in the wilderness area, which is illegal.

Response: Our preferred alternative includes plans to increase law enforcement staffing above the current levels. We anticipate that Refuge officers will patrol the Wilderness primarily on foot as opposed to horseback. All Refuge personnel will abide by the general prohibition of wheeled vehicles. While deer stands are allowed in the open area of the Refuge, including the Wilderness, they must be removed at the end of each day.

Comment: We advocate that the revised management plan for the Wilderness include the following paragraph from the management plan written in 1979: "Once the restoration work is completed in the Wilderness, securing adequate personnel and funding on a continued basis will be absolutely essential for maintaining the Area in a wilderness condition. The Area is entirely too small and has too much access to be managed by a "hands-off' policy. With adequate funding the wilderness character can be preserved at the current level of public use. If this use becomes excessive, additional funds will be required to implement a program to control the numbers of people using the Area." It seems to us that a "hands-off" policy has taken over in recent years, and allowed user-made horse trails and ATV use to degrade the wilderness resource and character. We strongly urge the refuge management to devote more funds and resources to management of the Wilderness.

Response: We will keep the recommendation in mind as we revise the Wilderness Management Plan.

Comment: While it is imperative to be expeditious in taking management actions in the CO Wilderness, it is also imperative to use the "minimum tool analysis" procedure before taking action. Some in the management team at CONWR have expressed the desire to use bulldozers for trail work in the CO Wilderness. This is another slippery slope and blurs the "bright line" put forth by the 1964 Wilderness Act, which prohibits motors in wilderness areas. First might be a small bulldozer, then someone decides a large bulldozer

would do the job better, next someone will be taking a dump truck with stones down the trail. It's best not to start on that path!

Response: We intend to follow all applicable laws and policies in managing the Crab Orchard Wilderness. Benchmark conditions will be established and a minimum tool analysis will be conducted before any trail construction begins in the area. We do not intend to use any heavy equipment in the Wilderness.

Comment: Page x: Under Wilderness, no revision of the 1985 Wilderness Management Plan is needed until an accurate assessment of the anticipated adverse impacts are described and evaluated.

Response: We intend to thoroughly assess the impacts of constructing and maintaining a path in the Wilderness as part of the River to River Trail for use by equestrians and hikers prior to its official designation. We would also need to revise the 1985 *Wilderness Management Plan* to authorize horseback riding before designating the River to River Trail.

Comment: Updating the management plan will also fulfill the requirement by the National Wildlife Refuge System Improvement Act of 1997 that the Secretary of Interior must: "maintain the biological integrity, diversity, and environmental health of the National Wildlife Refuges" (16 U.S.C. § 668dd (a)(4)(B)). The Service has appropriately recognized that such values are best overall maintained by designating certain areas as wilderness. However, unmanaged horseback riding and gas motor usage should be banned within the Refuge's wilderness because they are detrimental to wilderness values and in direct violation of The Wilderness Act.

Response: The issue of unmanaged horseback riding will be addressed under the preferred alternative. Gas motors, either on boats or land vehicles, have never been allowed within the Wilderness.

Comment: Please let the 1985 Wilderness Management Plan remain unaltered.

Response: The Crab Orchard Wilderness Management Plan (1985) states: "No trail construction will be undertaken in the future." Horseback use and trails have developed inconsistent with the existing Wilderness Management Plan. In 1993, The River to River Trail Society sought permission to realign the River to River Trail from public, paved roads to a route through the Wilderness. Because the preferred alternative includes this new trail alignment, changes to the existing equestrian use regulations, and additional land to be included in the Wilderness, the Wilderness Management Plan will need to be revised.

Comment: Trail development in the wilderness should be kept to a minimum.

Response: Under the preferred alternative, only one trail – the River to River Trail – would be designated in the Wilderness.

Comment: Support the designation of the additional 120 acres of Wilderness, but only if you intend, and have the backbone, to protect it as Wilderness. The wilderness area is being degraded by horses, and I am opposed to what it will look like in the distant future if your proposed horse use becomes part of the plan.

While I think it's admirable to extend the wilderness area, I think putting a horse trail through it really goes against the original intent of this special designation. The horse trail at Giant City has become a huge gully due to use when the ground is wet, and it really splits the habitat and affects the scenic beauty. I realize the horse lobby is powerful in Illinois, but with the whole Shawnee to ride in, I don't think one group of users should be able to change the definition of what wilderness is.

Response: Under the preferred alternative, user-made horse trails would no longer be allowed. Horseback riding will be limited to the designated River to River Trail, and access will be from established trailheads only. The trail will be designed and constructed to minimize damage from equestrian traffic. Also, seasonal closures will be enforced during wet periods to further minimize the damage within the Wilderness.

Comment: I am not totally against having wilderness areas, but I do disagree with how they are maintained. I disagree with the concept of absolutely no motorized or wheeled vehicles. I believe that wildlife personal should be able to patrol these areas with ATVs. More importantly, they should be allowed to use equipment to establish food plots and nesting areas for wildlife. Since the early 1970s, I have spent a lot of time hunting and hiking in the areas now designated as wilderness.

I will admit that it is good for some species of wildlife, but it has been detrimental to others. The deer and turkey populations have thrived, though I do feel that the quality of deer has decreased. But where once there were many coveys of quail and countless rabbits, none now exist due to the change in the habitat. Being able to maintain food plots and grass fields for nesting instead of letting it grow up into a tangled mess of thickets would benefit all the wildlife.

Response: The Wilderness Act generally prohibits the use of motorized vehicles in the Wilderness. Maintaining artificial food plots and early successional habitat would not be appropriate in the Wilderness. Many other areas of the Refuge, including agricultural fields, pastures, prairie and young forests, are managed to provide habitat for deer, quail, rabbits, migratory birds and other wildlife. As natural succession takes place and forests mature, it is common for wildlife species that prefer early successional stages to decline while those that prefer later successional stages increase in abundance.

7.1.6 Research Natural Areas

Comment: Research Natural Areas (RNAs) should be protected from any activities that would threaten the native vegetation or features that distinguish these areas, including the closing the areas to the public, if necessary. These areas should be used to educate the public to appreciate and value the native plants, animals and other features of these areas, as long as the use would not damage their natural values. Outings with refuge interpreters should be conducted in order to learn more about the RNAs on the refuge.

Response: We see no need to close RNAs to public use at this time because no threats have been identified. Most of the RNAs are located in the restricted use area, thus public use is very low. Two RNAs that warrant close monitoring are Devils Kitchen Dam RNA and Devils Kitchen Lake RNA; the former because the popular Rocky Bluff Trail traverses the area and the latter because it currently receives a fair amount of horse traffic. We are open to the suggestion of conducting outings for environmental interpretation; in fact, many visitors enjoy the spring wildflower walks we conduct along Rocky Bluff Trail.

7.1.7 Land Exchange with SIU

Comment: The land swap (Alternative B) proposal would lead to excessive commercialization and increase the level of recreation that is not wildlife related. It could easily lead to unacceptable disturbance of wildlife and wildlife-related recreation. We also oppose any long-term lease that would lead to the excessive commercialization that has been proposed by people at SIU-C and others. We are concerned that, even though the land swap with SIU-C was found unfeasible, some people will continue the pursuit of the proposal to build commercial facilities such as a hotel, marina, restaurant, water park, par 3 golf course, etc. on Crab Orchard Lake by leasing the land from the FWS. Likewise, we are concerned that the FWS will find such an arrangement hard to resist, because it would provide more revenue for running the refuge. We are opposed to such commercialization and privatization of public land.

Response: We have noted your concern. The CCP, which does not include the land exchange or long-term lease proposal, is the document we intend to follow for the next fifteen years. If proposals were considered to build commercial facilities of the magnitude suggested, the CCP would need to be revised and public notice and involvement would be a part of the planning process.

Comment: The draft CCP does not describe practical or effective management of the lands to be acquired from SIU under Alternative B.

Response: We did not pursue more detailed habitat planning for the lands to be acquired in a potential land exchange when it became clear that an exchange was not feasible due to unequal land values.

Comment: It is unusual and bothersome that the Service thinks that Southern Illinois University (SIU) can construct, operate and maintain recreation facilities. That is totally inappropriate use of education funding, student tuition and fees and university staff. The exchange would result in "urban sprawl development." There is adequate infrastructure available in the surrounding communities for those needing such accommodations. The refuge should be seen as a refuge from urban sprawl and development for humans. Not considered, or at least not mentioned in the text, is the fragmenting of the Refuge by removing a sub-

stantial amount of land along the largest lake on the Refuge and allowing the major development of non-refuge recreation facilities. The DEIS does not address the significant adverse impacts that would be caused by such action.

Response: In considering the land exchange as a valid alternative, we considered the proposal by Southern Illinois University as a good faith proposal. We have no reason to doubt their sincerity or ability to carry out their proposal. In looking at the proposal we recognized the potential for considerable development in the northwest corner of the Refuge and recognized that this is not the traditional role of a national wildlife refuge. We saw positive aspects to the development in that it would better provide non-wildlife-dependent recreation than we have been able to provide. We thought with this general recreation provided by another entity we would be able to better concentrate on the System mission and wildlife-dependent recreation. We recognized that there would be trade-offs. We also recognized that we would be forfeiting some wildlife benefits in the exchange. We viewed the issue primarily of giving up acres of habitat, rather than as increasing fragmentation. The area already is considerably fragmented and the land that would be given up is essentially on a corner of the Refuge and therefore would not degrade an existing large block of forest or grassland. We think the Draft EIS presents an adequate analysis for the exchange as represented in Alternative B given that it is not the proposed action.

\# **Comment:** A positive aspect of a land exchange or long-term lease agreement with SIU would be that the purposes of the refuge could be better served by letting SIU handle the public uses on the 500 acres that would be transferred to SIU.

Response: We considered this point in evaluating the alternatives. Please see the response to the previous comment for a fuller discussion of the topic.

7.1.8 Land Acquisition/Boundary Modification

\# **Comment:** The proposal to purchase additional land from will sellers will consolidate the refuge lands and make it a more compact piece of land; lower the size of the refuge boundary exposed to possible incompatible uses; facilitate management; prevent property from being lost forever to housing and industrial development. Buying inholdings from willing sellers should be the top priority for land acquisition on the refuge.

Response: We appreciate the support for our proposed action.

\# **Comment:** The Rocky Bluff Trail and surrounding area is probably the most natural, pristine area on the refuge, evidenced by a profusion of native spring flowers. In addition, the area has other scenic features, such as a waterfall, interesting rock formations and a clear stream adjacent to the trail. Many of our members use the Rocky Bluff Trail, especially in the spring. Some members make weekly visits in April and May in order to see all of the species in bloom. Sometimes our group sponsors educational walks on the trail. For the above reasons, this area is of special concern to Sierra Club. One concern is that owners of the inholding adjacent to the Rocky Bluff area could negatively impact Rocky Bluff through incompatible development. We think it is important to safeguard against such development, and also to provide a protective buffer for Rocky Bluff. We advocate that the refuge management continue efforts to arrange a land swap or outright purchase of the private inholding adjacent to the Rocky Bluff area and trail. The trail has already been re-routed and shortened because part of the trail was on the property of the private adjacent land owners. We advocate that acquisition of this inholding be ranked as a top priority acquisition for the refuge, and that Refuge managers find a way to make this land swap work.

Response: We agree. This inholding has been identified as a high priority acquisition in the Refuge Boundary Modification and Land Protection Plan. Lands may be exchanged or acquired through fee title, lease or easement from willing sellers only.

\# **Comment:** Doesn't Congress have to act to change any refuge boundary? Considerable public interaction has occurred in other expansions of refuges when lands are removed from tax roles.

Response: Congressional action is not required to change any refuge boundary. Since the Refuge was established, the Service has acquired and divested several parcels of land (Appendix L, page 355 in the Draft EIS/CCP). The effects of Refuge expansion on taxes is discussed in the Draft EIS/CCP (page 144). Land acquired by the Refuge would be taken off the county tax rolls.

However, payments in lieu of taxes (revenue sharing) would be made to the respective counties. These payments are expected to be nearly equivalent to taxes.

Comment: Why would there be ".. increased challenges.." if the Refuge boundary is not changed? Without explanation, this is an unsupported attempt to disregard this alternative.

Response: Increased challenges are expected from pressures of more development and higher density use. Other refuges in similar circumstances have experienced encroachment and conflicting uses when development nears the boundary. The boundary modification would allow the acquisition of inholdings from willing sellers and moving segments of the boundary to roads would better define the limits of the Refuge. The boundary modification will increase the efficiency of management, reduce incompatible land uses, and enhance public use opportunities.

Comment: My main concern is expansion of the Crab Orchard National Wildlife Refuge under the terms explained. This is one way expansion in that land can be purchased but none sold as to widen a highway like Route 13 in Williamson County. I'm against any money being used for expansion unless this ongoing problem is changed.

Response: Since the Refuge was established, the Service has acquired and divested several parcels of land (Appendix L, page 355 in the Draft EIS/CCP). Highway projects that have occurred on the Refuge include: Interstate 57, the completion of Highway 148, and widening Route 13 from 2 lanes to 4 lanes.

Comment: The Service has put forward the idea of straightening their boundaries and also entering into conservation agreements with adjacent landowners. I would be interested in acquiring the 120 acres of land bordering on the east side of the Refuge at a fair price.

Response: At this time, no lands on the east side of the Refuge are for sale. The land is fulfilling the purpose of the Refuge and the mission of the Service in its present state.

Comment: Do not acquire the non-contiguous land west of Southern Illinois University's Touch Of Nature.

Response: The land west of Touch of Nature was part of the land exchange proposed in Alternative B. We have no plans to acquire these lands under our current proposal.

Comment: Do not acquire more land, maintain the land you have.

Response: We think the acquisition of lands from willing sellers has the long-term benefits cited in the Draft EIS and by supporters of the proposal in the first comment under this topic. We will continue to do the best we can to maintain our lands with the staff, resources, and partners available to us.

7.1.9 Eliminate Area Designations

Comment: We support the elimination of the area designations in order to allow flexibility of management on the refuge.

Response: We appreciate the endorsement of our proposed action.

Comment: The changing of the classification of areas will only change labels on maps. Management responsibilities would be identified with descriptions of activities and shown on maps within the CCP.

Response: We think the new classification will make management of the Refuge and its use clearer to visitors. We agree that descriptions and maps would make the details of management more clear. We expect to include more detail in step-down plans for habitat management and visitor services, which will follow the adoption of the CCP.

Comment: I see no harm in helping visitors feel welcome in the Refuge but do not understand the plan to do away with the former land classification that indicates... "where wildlife would be emphasized and where recreation would take place." Your intention is not clear. Stating... "We propose to...treat the entire Refuge as one unit..." sounds as if you plan to open all areas to recreation. If this is the case I am strongly opposed.

Response: Our intention is to balance our management responsibilities across all portions of the Refuge. Our draft plan states that wildlife management will be a major focus for all lands encompassed by the boundaries of the Refuge (page 28 of Draft EIS/CCP). Only the industrial area of the Refuge, formerly known as Ordill,

Area II or the Closed Area, would retain the designation of "restricted use area" because of safety and security concerns.

Comment: Your Draft Plan still does not abide by the agreements set forth by the Galitian Count settlement act, the Department of Defense (War Department), the Agriculture Dept, and others for continuing the Crab Orchard Creek Project.

Response: We assume the comment is referring to the Gallatin Farms Resettlement Project under which occupants of land bought by the government to construct Crab Orchard Lake could receive assistance in resettling elsewhere. We think the Service is fulfilling its obligations. We know of no obligation to "continue the Crab Orchard Creek Project." Our direction comes from the law that established the Refuge.

Comment: As stated in the supporting documents in 1946, Pro and Con for the passage of Public Law 361, it clearly states that if all the various departments agreed to the transfer of lands (Public Law 361) to the Dept. of The Interior, 2200 acres of the 44000 plus in the Crab Orchard Creek Project would be given to the Dept. of The Interior for specific purpose of a closed Refuge. This Refuge would provide for the protection and a nesting place for the migratory waterfowl traveling the Mississippi Flyway. The rest of these acres would continue as the Crab Orchard Creek Project. All of this land would be transferred to The Dept. of The Interior and managed by the U.S. Fish and Wildlife Service. These documents clearly state how you manage the Crab Orchard Creek Project. 22,000 acres on the east side of these lands if transferred (Public Law 361) will be a refuge. The remaining 22,000 plus acres will become the largest Recreation Facility in the State of Illinois.

Response: We do not agree with this analysis and interpretation of the hearing record for H.R. 3043 held by the Subcommittee on Conservation of Wildlife Resources of the Committee on Merchant Marine and Fisheries, House of Representatives, Eightieth Congress held May 21, June 4, 5, 13, 1947. Public Law 80-361, which was the outcome of the hearing, transferred the Crab Orchard Creek Project and Illinois Ordnance Plant lands to the Department of the Interior and directed the Secretary of the Interior to classify all of these lands to determine the most beneficial use for "wildlife conservation, agricultural, recreational, industrial, and related purposes" (Appendix G, page 281 of the Draft EIS/CCP).

Comment: You changed the management set forth by Public Law 361. Over the years since 1947 your Refuge signs were moved to include the areas (outside) of the Refuge so these areas became Refuge. By congressional Law this was illegal and still is. It takes an act of congress to change Public 361 to change these (inside) (outside) boundariess. Your Draft CCP Plan should not include the areas OUTSIDE of the Refuge.

Response: We disagree that the placement of Refuge signs is illegal. Public Law 80-361 transferred the Crab Orchard Creek Project and Illinois Ordnance Plant lands to the Department of the Interior and directed the Secretary of the Department of the Interior to classify all of these lands to determine the most beneficial use for "wildlife conservation, agricultural, recreational, industrial, and related purposes" (Appendix G, page 281 of the Draft EIS/CCP). The refuge signs mark the boundary of the lands administered by the Service. The refuge signs do not designate the purpose of the lands that they demarcate.

Comment: I remember when the lake was originally built and this is not what the government promised us. Not only was the lake supposed to be for wildlife, but there was to be a sense of balance with recreational access for all the southern Illinois residents. What happened to that promise?

Response: We believe that management of the Refuge does strike a balance among the four legislated purposes: wildlife conservation, recreation, agriculture, and industry.

7.1.10 Clean-up of Hazardous Waste on the Refuge

Comment: Clean-up on the refuge should continue, as long as it is done in an environmentally responsible way.

Response: We are continuing our efforts to remediate all known contaminated sites. Our methods are designed to be environmentally responsible.

Comment: Have the unexploded ordinance been removed in all areas? I expect that some parts of the Refuge will remain off limits to the public.

Response: The CERCLA personnel located at the Refuge are continually working to identify as well as remediate contaminant sites on the Refuge. There was a clean up and removal of unexploded ordnance between 1998 and 2000, and any new discoveries will be removed and remediated as well. There are some areas of concern that are off limits for the safety of the public.

7.1.11 Economics

Comment: There is no mention of the effect of hunting Canada Geese around the Refuge on the economies of the two counties. A section needs to be added that provides information on the economic benefits that are realized by the hunting of waterfowl, especially geese, in areas around the Refuge.

Response: We recognize that economic benefits are realized by the community from hunting near the Refuge. We did not estimate these effects because we are providing approximately the same habitat for waterfowl, especially geese, under all alternatives, and we do not expect any alternative to measurably change the economic benefit of hunting around the Refuge.

Comment: There is no mention of how user fees or funds from concessions or funds from industrial tenants affect the economy.

Response: The analyses, to the extent that the data allow, are presented in Section 3.12 of the EIS.

Comment: There is no mention of the removal of lands from tax roles in the discussion of the preferred alternative or in the socioeconomic discussion.

Response: The topic is discussed in Section 4.7.7 of the EIS and Section 5.4 of Appendix L: Land Protection Plan.

Comment: Rental receipts from industrial tenants are shown and discussed briefly. Are the total receipts returned to the Refuge or just part of the total? This reader did not find this subject or that of receipts from concessions in the discussions of economics.

Response: From 2001-2005, approximately 85% of industrial receipts were returned to the Refuge. Currently, 100% of fee payments from concessionaires are returned to the Refuge.

Comment: The preferred alternative contains strategies that will change the anticipated amounts of rental and concession receipts received. These are economic impacts that need to be addressed.

Response: If all industrial tenants other than defense-related industries chose to leave the Refuge, rental receipts would decline by about 12 percent. We expect concession receipts to remain about the same or increase somewhat because better quality facilities should attract more visitors and more frequent visits. In addition, the preferred alternative proposes operation of Playport Marina and a boat ramp at the former Images Marina site under concession contract. The economic effects related to camping are summarized in Section 4.8.1.7 and Table 41 on page 157 of the Draft EIS.

Comment: I find no discussion of "payment in lieu of taxes" that are paid to the counties in Section 3.12. This is an economic issue that needs discussion especially when additional lands are being considered for inclusion to the Refuge. What levels have been provided in recent years?

Response: This topic is discussed in Section 4.7.7 of the Draft EIS and mentioned in Section 5.4 of Appendix L: Land Protection Plan. The most recent payments made by the Service to the counties under the Refuge Revenue Sharing Act are shown in the Payments in Lieu of Taxes for Crab Orchard NWR table.

Table 51: Payments in Lieu of Taxes for Crab Orchard Refuge, Fiscal Years 2000 – 2004 (dollars)

Year	Williamson County	Jackson County	Union County
2000	138,000	10,195	3,295
2001	141,072	10,406	3,363
2002	131,831	9,721	3,142
2003	126,707	5,225	3,020
2004	233,846	10,740	4,674

Comment: We believe that part of the intent in the creation of the Crab Orchard National Wildlife Refuge was to bring rural economic development to Southern Illinois. The Refuge has great renewable resources that can provide a sustainable flow of wildlife and other products (timber, clean water, recreation, etc.), revenue to county governments, and jobs to Southern Illinois. We believe it is time for the Refuge to renew its commitment to be a leader in rural economic development.

Response: The economic analysis shows that the Refuge contributes to the local economy, but it does not have an impact that permits it to be a leader. We anticipate that we will continue to contribute to the economy though most programs of the Refuge – agriculture, industry, and recreation.

Comment: Recreation and tourism are important industries in our southern counties and the Refuge can and should make great strides in supplying those industries as well. The Refuge should showcase selected regionally significant natural features and tourist attractions with state-of-the-art facilities to attract and hold tourists in Southern Illinois. Because of the economic and social importance of horse riding, we fully support the provision of a well-designed, well-maintained trail in the Crab Orchard Wilderness.

Response: The economic analysis in Section 3.12 shows the Refuge's role in the economy. The intent of the plan is to improve Refuge facilities and make them more attractive. The amount of use, especially by non-residents, of the horse trail will determine its economic importance.

7.1.12 National Environmental Policy Act

Comment: As a retired Service employee that worked with federal actions that affected land and water for the last 16 years of my career, I am very disturbed and disappointed with the DEIS and CCP. A DEIS should be; 1, an accurate description of the environments that will be affected by the proposed federal action(s). 2. a description of the adverse environmental effects which can not be avoided. 3. an objective (rather than subjective) description and evaluation of the feasible and prudent alternatives.

The DEIS does not fit the items I have identified above. There are sections that have similar titles and the introductions speak to the subjects, but the texts and tables fall far short of the content that was sought by NEPA and the Council on Environmental Quality. Words like "minimal" and "small" in the texts and tables do not show amounts that are needed to fully and accurately describe what the author(s) are referring to. Most readers would not be able to understand what the effects of an action(s) will be or if they are beneficial or adverse. In my opinion, the DEIS would not be acceptable to the Division of Ecological Services.

Response: The DEIS has had review within the agency, by the State, the EPA and the public. We think the DEIS adequately depicts the effects of our proposal over 15 years.

Comment: The CCP attempts to inform the reader what is planned for the next 15 and 100 years. However, the date of 2015 is not 15 years in the future. Someone should have updated the document when the rewriting of the initial documents were assembled in 2002-2004; 2006 plus 15 is 2021. The CCP will guide management for supposedly 15 years, but the end of this period will be 2021 and NOT 2015 as stated many times.

Response: The dates in the document are a function of the length of the planning period. We think the analysis of the issues still applies within the sensitivity of our analysis. We will change the relevant dates when the stand-alone CCP is assembled after a Record of Decision is issued.

Comment: The Purpose of the DRAFT EIS is to identify anticipated environmental impacts that would occur with the implementation of feasible and prudent alternatives. The preferred CCP alternative should be the least damaging alternative. A DEIS DOES NOT SELECT a management direction! The CCP is the management direction!

Response: We have edited the text in Section 1.3 to clarify the purpose of the EIS.

Comment: Section 4.5 - Alternative C: This alternative is not compared with all alternatives. Therefore, this DEIS is inadequate in coverage. How can the least damaging alternative be identified?

Response: The comparison across all alternatives is presented in Table 47.

Comment: Section 4.7.7: "If acquired" is not an appropriate lead-in. Since this is a discussion of the preferred alternative, this section of the DEIS/CCP should be addressing the environmental impacts of such action. The text should not be a JUSTIFICATION of the proposed action. The last sentence in this section, "Eventually a larger . ." is a justification and is not appropriate for this section.

Response: "If acquired" emphasizes that acquisition is from willing sellers only and not totally under control of the Service. We think the last sentence does describe the effect of increased benefit to area-sensitive birds. We do not think it is a statement of justification.

Comment: Section 4.12: This is a poor discussion of cumulative impacts and provides no comparisons between all alternatives. The preferred alternative should be explained in depth.

Response: We think the two page discussion adequately describes the cumulative effects. The preferred alternative is described in detail in Chapter 2 and Appendix A.

Comment: Section 4.12.2: This narrative is TOTALLY INAPPROPRIATE for this document. The exchange with SIU has been removed from consideration per the Executive Summary narrative. This section should address what is anticipated to occur as a result of the implementation of each alternative and especially the preferred alternative. FRAGMENTATION OF THE REFUGE SHOULD BE UNACCEPTABLE TO THE SERVICE!

Response: We think a full discussion of the alternative is warranted and discloses the consideration that it was given in the planning process. The pattern of the Refuge's land ownership has to be weighed against many factors. Changing the pattern of ownership and possible fragmentation of habitat was considered during the evaluation of the alternative.

Comment: Table 47*:* No specifics are provided to accurately identify effects. Decisionmakers and readers need facts, like acres and numbers, to compare. The use of subjective words, like minor, minimal, reduction, fewer, increase and decrease, are only rough indicators and a reader does not know what is meant. The Service should not expect the public to accept this kind of an explanation of the effect of such a significant action as the CCP. This type of wording is considered as "justification terminology" by most reviewers of DEIS. This wording would not be acceptable if being reviewed by Ecological Services staff.

Response: Table 47 is a summary of effects. The details of effects are displayed in earlier text, tables, and maps.

The DEIS has had review within the agency, by the State, the EPA and the public.

Comment: The choice of alternatives offered by the alleged "experts" at this NWR is offensive. It is as if the administration is thrusting their plans down our throat. We want the right to make choices on EACH ELEMENT of this plan, and not to have to choose ones of the agency's choosing. That is the purpose of a free public education – to have citizens able to make choices – to read, to decide. This attempt to make the public fit into boxes of the agency's choosing is offensive and should be stopped as a practice by this agency.

Response: We think the evaluation is fair and meets the intent and requirements of NEPA. The elements of the plan are inter-related and are most effectively developed and considered as a set. We have considered the comments of the public in modifying the preferred alternative. The modifications have resulted in changes to selected elements of the plan.

Comment: Commenting on their wishes is not the hallmark of a free and independent citizenry - it is a boldfaced attempt to make people accede to what the agency wants. They have no right to make decisions for the public.

Response: In our role as administrators and stewards of the National Wildlife Refuge, we are given the responsibility of making decisions considering public input. Public involvement is the heart of the planning process.

Comment: Please take the word "conservation" out of the plan. The word "conservation" is a deceptive word, only used to hide the fact that hunting/killing, murder of wildlife and birds is taking place. It is a clever and deceptive word. I think the word protection is much more appropriate. The people are in favor of protection, and not conservation (secret code word for killing).

Response: Congress mandates that the document be called a "Comprehensive Conservation Plan." It is not within our authority to remove "conservation"

from the plan title and we think the word is used appropriately in the document consistent with the Wildlife Refuge System Improvement Act of 1997.

7.1.13 Purposes of Refuge vs. Refuge System

Comment: Although the enabling legislation that established CONWR specified the multiple purposes of agriculture, industry, recreation, and wildlife conservation, the National Wildlife Refuge System Improvement Act of 1997 established the primary mission of the National Wildlife Refuge System as wildlife conservation. In cases where there may be competition between this mission and other legislated uses (recreation, agriculture, and industry), wildlife conservation should be given preference. If the Service intends to genuinely follow the vision spelled out in the Improvement Act, then the purpose of the Refuge must be amended and all industry, grazing, and agriculture must be eliminated from the Refuge.

Response: We are given very clear direction on precedence when the purpose of a refuge conflicts with the mission of the System. The National Wildlife Refuge System Improvement Act of 1997 directs "…if a conflict exists between the purposes of a refuge and the mission of the System, the conflict shall be resolved in a manner that first protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission of the System". Our decisions are based on this direction to first protect the purposes of the refuge. Congressional action is required to amend or change the purposes of the Refuge.

Illinois Department of Natural Resources

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Illinois Department of Natural Resources

Illinois Department of Natural Resources

Illinois Department of Natural Resources

U.S. Department of Agriculture, Forest Service

U.S. Department of Agriculture, Forest Service

U.S. Department of the Army, Corps of Engineers

U.S. Environmental Protection Agency

U.S. Environmental Protection Agency

U.S. Environmental Protection Agency

U.S. Fish & Wildlife Service, Ecological Services

U.S. Fish & Wildlife Service, Ecological Services

U.S. Fish & Wildlife Service, Ecological Services

U.S. Fish & Wildlife Service, Ecological Services

U.S. Fish & Wildlife Service, Ecological Services

U.S. Fish & Wildlife Service, Ecological Services

City of Carterville

City of Carterville

U.S. Rep. John Shimkus

U.S. Rep. John Shimkus

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Animal Protection Institute

Audubon Council of Illinois

Back Country Horsemen of Illinois

California Wildlife Federation Inc.

Crab Orchard Boat & Yacht Club

Crab Orchard Boat and Yacht Club

Crab Orchard Boat and Yacht Club

Crab Orchard Waterfowl Association

Crab Orchard Waterfowl Association

Florida Airboat Association

Girl Scouts of Shagbark Council

Illinois Federation for Outdoor Resources

Illinois Trappers Association

National Wild Turkey Federation

National Wild Turkey Federation

River to River Trail Society

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Sierra Club

Shawnee Resource Conservation & Development Area, Inc.

Shawnee Resource Conservation & Development Area, Inc.

Shawnee Resource Conservation & Development Area, Inc.

Shawnee Trail Conservancy

Shawnee Trail Conservancy

Southern Illinois Audubon Society

Southern Illinois Audubon Society

Southern Illinois Audubon Society

Southern Illinois Audubon Society

Southern Illinois EDGE

Southern Illinois Quota Zone Waterfowl Association

Southern Illinois Quota Zone Waterfowl Association

Southern Illinois Quota Zone Waterfowl Association

Toluca Sportsman's Club

Toluca Sportsman's Club

Touch of Nature

Wilderness Society

Wilderness Society

Wilderness Society

Wilderness Society

Wilderness Society

Wilderness Society

Wilderness Society

Wilderness Society

Wilderness Society

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Wilderness Watch

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Appendix A: Goals, Objectives, Strategies and Implementation

Appendix A: Goals, Objectives Strategies and Implementation

The purpose of this appendix is to make it easier for the reader to understand the preferred alternative and what will be required to implement it. U.S. Fish and Wildlife Service policy directs that certain elements be included in a Comprehensive Conservation Plan. Most of those elements are included in the Final Comprehensive Conservation Plan/Environmental Impact Statement. Elements dealing with the implementation of the plan, not included in the Final CCP/EIS, are included in this appendix. Also included are the goals, objectives and strategies common to all alternatives and those specific to Alternative E that we plan to pursue over the next 15 years. If these are projects within the Refuge Operations Needs System (RONS) that contribute to an objective, they are listed as well. Appendix K contains a list of the priority RONS projects. Following publication of the Record of Decision for the Final EIS, a stand-alone CCP will be developed. The CCP will include sections from the EIS, including Chapter 1, the selected alternative from Chapter 2, Chapters 3, 5, 6 and the appendices.

1. Goals, Objectives and Strategies

1.1. Wildlife Conservation Goals

Goal 1. Canada Geese

Provide enough food for wintering Canada Geese to support 6.4 million goose-use-days annually, in support of the Mississippi Valley Population Canada Goose Management Plan.

1.1 Objective

Provide enough food for wintering Canada Geese to support 6.4 million goose-use-days.

Strategy:

Contributing RONS projects: 02006, 020007, 02008, 02009

1. Maintain 4,300 acres of cropland in agricultural production (see Figure 9 on page 44). Manage 450 acres of moist-soil units. Continue fall mowing around selected ponds. Maintain seasonal closure to boating on the east end of Crab Orchard Lake.

Goal 2. Forest, Early Successional and Grassland Birds

Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.

2.1 Objective

Manage two portions of the Refuge as large forest blocks to benefit area-sensitive forest birds. The first area (about 13,000 acres) extends from the southern end of Grassy Bay east to Caney Creek, and south including the wilderness area. The second area (about 1,700 acres) extends from the federal prison north and includes the Crab Orchard Creek bottomlands. This will include about 490 acres of reforestation of open habitat to consolidate large blocks of forest habitat.

Strategy:

Contributing RONS projects: 02001, 97001, 97009, 97008, 98027

1. Reforest about 290 acres of crop fields, 130 acres of fallow fields, and 90 acres of perennial grasslands. This may include site preparation, planting a cover crop, planting tree seedlings, and weed control treatments.

2.2 Objective

Accelerate succession of all (about 3,300 acres) pine plantations to native hardwood forest.

Strategies:

Contributing RONS projects: 97001, 97008, 02001, 98027

1. Thin pine plantations to promote establishment and growth of native hardwoods. In some cases, remove pine overstory to release young hardwoods. Most silvicultural treatments will be conducted under contract by commercial timber harvesting firms. Conduct prescribed burning during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration.

2.3 Objective

Manage forest land to favor oak-hickory forest types on suitable sites with all age classes from seedling stage to old-growth represented. Manage native, shade-tolerant tree species (such as sugar maple) to prevent wide-spread succession to climax forest cover types.

Strategies

1. Write and implement a *Habitat Management Plan* following policy in the Fish and Wildlife Service Manual (620 FW 1).
2. Apply appropriate silvicultural treatments to manage forest health, species composition, and age structure. Treatments may include non-commercial forest stand improvement treatments (girdling, cutting, and/or applying herbicide to individual stems), commercial timber cutting (thinnings, improvement cuttings, and regeneration cuttings) and prescribed burning. Forest stand improvement treatments may occur in any forest type (up to 25,000 acres). Commercial timber cutting may occur in any forest type outside the Crab Orchard Wilderness and research natural areas (up to 19,700 acres). Commercial harvest operations are not likely to take place on more than 400 acres annually on average, half of which would be considered regeneration cuttings. Our preferred regeneration technique is the shelterwood method. More specifically, the shelterwood method with reserves would be used in hardwood (and pine) stands where some hardwoods would be left standing following the final removal cutting. Prescribed fire may be applied in upland forest (up to 23,000 acres of hardwood and pine types), but not in bottomland forest.
3. Reforest available open sites located outside of the two large forest blocks (described in the Forest, Early Successional and Grassland Birds Goal section under Alternative B on page 41) by planting native hardwoods, with preference given to oaks and hickories, to reduce forest fragmentation. Examples of such sites would be small agricultural fields (or portions thereof) no longer being farmed, abandoned industrial areas, abandoned rights-of-way (roads, powerlines, and pipelines), and remediated contaminant areas.
4. Control exotic, invasive plants through integrated pest management practices.

2.4 Objective

Maintain about 300 acres in early successional habitat.

Strategies:

Contributing RON projects: 02005, 97001.

1. Use prescribed fire or mechanical treatment (mowing, discing) to disturb about 200 acres every 3 to 5 years. Add about 100 acres of 30-foot-wide borders of native warm-season grasses in row crop fields in the open portion of the Refuge.

2.5 Objective

Maintain 260 acres of native, warm-season grassland to benefit area sensitive grassland birds.

Strategies:

Contributing RON projects: 02008, 97001.

1. Prescribed burn all native warm-season grasslands on a 2- to 3-year cycle to favor grassland vegetation and control undesirable plants. Apply mechanical or herbicide treatments to control vegetation, when needed.

2.6 Objective

Maintain 1,000 acres of pasture, 700 acres of hay fields, and about 1,600 acres of clover fields with increased emphasis on habitat quality for grassland birds.

Strategies:

Contributing RON projects: 02008, 02002, 97001, 02007, 02009.

1. Remove 124 acres of linear forest habitat and 8 miles of hedge rows. Install fences to create paddocks within pastures to enable greater control of grazing intensity. Convert fescue pastures to other cool-season and native warm-season grasses by preparing the site and reseeding. The typical Refuge pasture would become three or four paddocks with a paddock of cool-season grass and two or three paddocks of native warm-season grasses. Cattle would enter the cool-season grass paddock in the spring switch to the warm season grasses in the summer, and move back to the cool season grass in the fall. The native warm season grass will provide the grassland birds with nesting, migration, and winter habitat. Vegetation structure will be managed by the amount of grazing applied to each paddock. Most of the pasture grass would not require fall mowing and would be taller than 6

inches during the winter. All mowing of hay fields, pastures, and clover fields will take place after August 1.

Goal 3. Ducks, Shorebirds, and Other Waterbirds

Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.

3.1 Objective

Provide 450 to 500 acres of moist-soil habitat during fall, winter, and spring for migrating shorebirds, waterfowl, and other waterbirds.

Strategies:

Contributing RONS projects: 02006, 97001.

1. Construct 50 to 70 acres of new moist-soil habitat. Maintain dikes and water control structures. Manipulate water levels and vegetation to encourage production of waterfowl foods.

Goal 4. Threatened and Endangered Species

Maintain or enhance populations of federal and, where compatible, state threatened and endangered species that occur at or near Crab Orchard National Wildlife Refuge.

4.1 Objective

Assure that federally listed species, state-listed species and federally proposed species and their habitats are protected.

Strategies:

1. No disturbance of bald eagles will take place during critical periods within protective zones as described in the 1983 Northern States Bald Eagle Recovery Plan, Appendix E. Management Guidelines for Breeding Areas. Areas are designated closed through signing and brochures.
2. Forest management activities, such as thinning and prescribed burning, will require close coordination with U.S. Fish and Wildlife Service, Ecological Services personnel. These activities may require standard surveys to determine whether Indiana bats are present in a given forest unit and/or forest management activities may be scheduled outside of the season when Indiana bats are likely to use Refuge forests.

Goal 5. Resident Fish and Wildlife

Maintain or enhance resident fish and wildlife populations consistent with management activities for federal trust resources in cooperation with the Illinois DNR.

5.1 Objective

Manage Refuge fisheries with emphasis on mixed-species, warmwater sport fishing.

Strategy:

1. Continue cooperative management of Refuge fisheries with Illinois DNR. Continue managing fish populations and habitat through activities such as: setting length and creel limits, seasonal closures of spawning bed areas, habitat enhancements, annual surveys, and fish stocking.

5.2 Objective

Manage Refuge resident wildlife populations at levels that allow opportunities for sport hunting of game species.

Strategies:

1. Continue managing the Refuge agriculture program with methods that benefit resident game species, such as: leave 25 percent of the corn crop unharvested, plant winter wheat in soy bean fields each fall, use low tillage planting techniques, keep fields in clover 2 years out of the 5-year rotation, delay mowing until after August 1, and use no insecticides.
2. Incorporate beneficial practices such as those suggested in the Northern Bobwhite Conservation Initiative: convert cool-season to warm-season grasses and burn and thin pine plantations.
3. Allow controlled hunting for turkey and deer in the restricted use portion of the Refuge.

Goal 6. Water Quality

Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.

6.1 Objective

Improve the quality of water within the watershed of the Refuge.

Strategies:

1. Cooperate with Illinois Environmental Protection Agency to monitor water quality. Identify landowners and land uses in the

watershed. Provide educational and technical assistance to landowners with particularly sensitive riparian areas. Work with municipalities and developers to enhance on-site storm water retention.

2. Work with farmers to establish buffer strips and keep livestock away from streams and ponds. Continue using current soil and water protection measures in the Refuge farm program: use no insecticides, use only Service-approved herbicides, use minimum tillage practices, and use winter cover crops.
3. Continue cleanup of contaminated sites. Ensure Refuge industrial operations conform to prescribed environmental standards.

Goal 7. Wilderness:

Protect the ecological integrity, preserve the wilderness character, restore natural conditions to the extent practicable, and provide opportunities for solitude and primitive recreation within the Crab Orchard Wilderness.

7.1 Objective

Recommend the designation of two parcels (120 acres) as Wilderness within 2 years of approval of the CCP.

Strategy

1. Prepare and submit a Wilderness Study Report. Service wilderness policy is currently under revision. The direction of the new policy will be followed when it is adopted.

7.2 Objective

Revise and implement the Crab Orchard Wilderness Management Plan within 5 years of approval of the CCP.

Strategy

1. Prepare and implement a Wilderness Management Plan. Service wilderness policy is currently under revision. The direction of the new policy will be followed when it is adopted.

7.3 Objective

Restore native hardwood forest on 325 acres of pine and pine-hardwood forest in the Crab Orchard Wilderness within 15 years of approval of the CCP.

Strategies

1. Thin the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness to promote establishment and growth of native hardwoods. Thinning would be conducted in several phases over a 10- to 15-year period to mimic the natural process of succession where pines are gradually replaced by hardwoods. Individual pines would be killed by cutting, girdling or injecting herbicide. No trees would be removed from the site. Treatments would be conducted so that the results would appear natural as much as possible. However, trees along heavily used trails may need to be felled to avoid personal injury to visitors, in which case this zone may appear unnatural for several years. Eventual removal of all the non-native pines would restore the natural vegetative cover of the area and enhance wilderness characteristics.
2. Prescribed burn the pine and pine-hardwood stands during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration. Control lines would be established by hand tools where necessary, using natural firebreaks as much as possible.

7.4 Objective

Control or eradicate invasive species (especially autumn-olive, multiflora rose, Amur honeysuckle, white poplar, and Oriental bittersweet) over the 15-year life of the CCP.

Strategy

1. Prepare and implement an Integrated Pest Management Plan following guidance developed by the Service's "Promises Invasive Species Team."

7.5 Objective

Explore ways to increase cooperation with the U.S. Forest Service on management of the Crab Orchard Wilderness and the adjoining Panther Den Wilderness within 2 years of approval of the CCP.

Strategy

1. Contact the Forest Supervisor of the Shawnee National Forest and discuss ways our agencies could work together in managing the adjoining wildernesses.

7.6 Objective

Provide opportunities for primitive recreation, such as hiking, hunting, nature study and wild food collection, over the 15-year life of the CCP.

Strategies

1. Continue current primitive recreational opportunities.
2. Strategy: Prepare and distribute a wilderness brochure and conduct interpretive programs to inform the public about primitive recreational opportunities available.

7.7 Objective

Within 5 years of approval of the CCP, determine an appropriate level of opportunities to offer equestrians based on an evaluation of the current level and extent of horseback riding use and its effects on the Wilderness.

Strategy

1. Evaluate the current, unauthorized River to River route. Cooperate with partners to plan, construct, and maintain an authorized River to River trail route through the Refuge.

1.2. Recreation/Public Use Goals

Goal 8. Hunting, Fishing, Wildlife Observation and Photography, Interpretation and Environmental Education:

Hunters, anglers, viewers and photographers of wildlife, general visitors and students will enjoy high quality experiences through a variety of opportunities that promote an understanding and appreciation of natural and cultural resources and their management.

8.1 Objective

Increase the quality of hunting opportunities to a level where 75 percent of hunters experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. Instill a sense of awareness among hunters of the Refuge as a component of the National Wildlife Refuge System and of hunting as a wildlife management tool.

Strategies:

1. In the public hunting area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.
2. In the restricted use area of the Refuge, maintain hunting opportunities, by permit, during shotgun deer and spring shotgun turkey seasons. Areas with high concentrations of waterfowl may occasionally be closed during the restricted use area shotgun hunts. Maintain shotgun deer season hunting opportunities for youth and persons with disabilities and, within 3 years of the plan's approval, provide these groups with opportunities for spring shotgun turkey season hunting when populations warrant.
3. Administer goose hunts in the controlled area through an agreement with a partner organization.
4. Over the life of the plan, promote ethical hunting behavior and increase hunter adherence to federal and state regulations through effective informational brochures and signs. Increase the visibility of Refuge law enforcement.
5. Over the life of the plan, enhance public understanding of Refuge hunting opportunities, ethical behaviors, the role of hunting in wildlife management, and the Refuge as a component of the National Wildlife Refuge System by increasing the quality of maps, signs, and brochures.

8.2 Objective

Increase the quality of fishing opportunities to a level where 75 percent of anglers experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. At least 75 percent of anglers understand the issues, strategies, and policies involved in Refuge fisheries management and conservation.

Strategies:

1. In the public fishing areas, continue the policy of providing fishing opportunities based on state and federal regulations.

2. Continue to allow tournaments and fish-offs on the Refuge. Continue current policies on limited closures of Refuge waters east of Wolf Creek Road.
3. Continue to provide bank and boat fishing opportunities in accordance with state and federal regulations. Maintain Refuge boat ramps, fishing piers, and parking facilities. Study the feasibility for and construct accessible fishing facilities at Little Grassy and Devils Kitchen lakes within 4 years of the plan's approval.
4. Over the life of the plan, promote Refuge fishing opportunities and encourage conservation practices, such as catch-and-release fishing, through the development and maintenance of high-quality maps, signs, brochures and the Refuge web page.
5. Ensure that the fishing public clearly understands fish consumption advisories for Crab Orchard Lake through signs and brochures.
6. Over the life of the plan, provide insight to anglers regarding Refuge strategies, issues, and policies for fisheries management and conservation by redesigning and developing more effective informational signs and brochures. Increase angler awareness of the Refuge as a component of the National Wildlife Refuge System by improving the quality and content of maps, signs, and brochures.

8.3 Objective

Ensure that viewing and photography opportunities meet the needs of 95 percent of Refuge visitors. Establish and maintain viewing and photography opportunities for all major Refuge habitat types and optimum seasons.

Strategies:

1. Within 2 years of the plan's approval, develop an annual observation/photography fact sheet for the Refuge that will include a calendar of established tours, programs, and events; information on identified and recommended viewing and photography areas; guidelines to enhance viewing enjoyment; and a Refuge map delineating trails, blinds, platforms, and identified viewing areas.
2. Continue popular, established programs and tours like the October Discovery Auto Tours, January Eagle Tours, and Spring Wildflower Walks that enhance visitor experience, bring visitors in closer proximity to resources, and provide optimum seasonal opportunities for observation and photography and continually evaluate these programs for effectiveness.
3. Within 2 years of the plan's approval, improve the existing photography/observation blinds and platforms by adding camouflage as needed to enhance viewing opportunities. Evaluate location of existing blinds and platforms and move as needed. Position interpretive and identification panels in or near blinds and platforms to promote understanding and appreciation of Refuge resources. Enhance panels to promote awareness of the Refuge as a component of the National Wildlife Refuge System.
4. Within 5 years of the plan's approval, evaluate need for and add additional blinds/platforms, including interpretive and identification panels, where and if needed to ensure observation and photography opportunities in all major Refuge habitat types. Maintain all identified viewing and photography sites.
5. Over the life of the plan and in cooperation with other partners, encourage utilization of the Refuge for birding and other wildlife observation through development of infor-

Visitor using a spotting scope, Crab Orchard NWR

mational materials, programs, trails, tours, and special events. Promote the Refuge as a site for quality wildlife observation and photography through participation in selected community and regional birding, nature, and photography festivals and events.

6. Within 8 years of the plan's approval, identify and create a Refuge birding trail that may include enhancement and coordination of existing trails, viewing areas and signs, and creation of a birding trail brochure and map.
7. Over the life of the plan, expand the Refuge web site to promote wildlife observation and photography. Include updates on Refuge and area sightings of rare birds and other wildlife; profiles of selected seasonally-occurring and resident species; suggested optimal viewing times and locations; and current Refuge programs, facilities, tours, and other opportunities for observation and photography.

8.4 Objective

Increase the effectiveness of the Refuge interpretive program so that 70 percent of visitors gain a better understanding of three primary concepts: (1) the value and unique purposes of the Refuge, (2) the Refuge as a component of the national network of refuges, and (3) the significance and mission of the National Wildlife Refuge System. Heighten awareness of conservation and stewardship concepts. Encourage visitors to adopt ethical behaviors and to take positive actions that support Refuge goals and the Refuge System mission.

Strategies:

1. Within 3 years of the plan's approval, develop the interpretation portion of the Visitor Services Plan outlining a comprehensive, multifaceted approach emphasizing selected themes and key Refuge resources. Themes will be selected based on importance to Refuge and System goals and relevance to surrounding communities. All interpretive materials, tours, and programs will focus on one or more of these Refuge themes, along with the three basic concepts of the Refuge and Refuge System. Refuge interpretive themes may be in a storyline form that includes three or more themes. Themes may include: Exploring the Diversity of Wildlife, Understanding the Past, Protecting the Balance, and Communicating Visitor Opportunities.
2. Within 4 years of the plan's approval, renovate and replace damaged and outdated interpretive and information panels on Refuge kiosks, wayside exhibits, trails, ramps, structures and other facilities. Ensure all panels comply with Service standards.
3. In cooperation with Refuge volunteers and other partners, conduct a variety of high quality interpretive programs annually. Continue popular and established interpretive programs and special events, such as the Families Understanding Nature program and National Wildlife Refuge Week. Ensure interpretive programming remains current and dynamic by continually creating new programs, incorporating new ideas, updating information, and revitalizing ongoing programs. Focus each interpretive program on one or more Refuge themes.
4. Over the life of the plan and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, revise Refuge interpretive brochures, handouts, and other written materials as needed to improve consistency and to meet Service standards.
5. Within 1 year of the plan's approval, create a custom audiovisual program that provides visitors with orientation information about the Refuge. Ensure this program and a variety of other wildlife-related audiovisual programs are made available for viewing at the Visitor Center and for use in interpretive programs.
6. Within 3 years of the plan's approval, establish and maintain an interpretive auto tour route, using existing roads, that will facilitate opportunities for wildlife and cultural resource observation and provide visitors with an overview of the Refuge, its resources, and its management. Include identified stations with interpretive panels and corresponding, radio-broadcasted interpretive messages.

8.5 Objective

Increase the effectiveness of the Refuge environmental education program so that 75 percent of participants gain a better understanding and appreciation of the resources, purposes, and value of the Refuge and the Refuge System. Heighten awareness of conservation and stewardship concepts and encourage participants to take positive actions on the Refuge and in their community that support Refuge goals and the Refuge System mission.

Strategies:

1. Within 2 years of the plan's approval, develop the environmental education portion of the Visitor Services Plan, outlining a comprehensive, curriculum-based approach structured to be compatible with state learning standards and national environmental education guidelines. Emphasize key Refuge resources, the Refuge, the National Wildlife Refuge System, and selected Refuge themes. These themes will be based on importance to Refuge and System goals and relevance to surrounding communities. All environmental education materials, facilities, and programs will focus on one or more of these Refuge themes, along with the basic concepts of the Refuge and the Refuge System. Refuge themes may be in a storyline form that incudes three or more themes. Themes may include: exploring the diversity of wildlife, understanding the past, protecting the balance, and communicating visitor opportunities.
2. Within 3 years of the plan's approval and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, create an array of environmental education kits, each focusing on one or more aspects of Refuge themes. Educational kits will include interactive materials and a detailed instructional and activity guide designed with a clear, consistent format and coordinated with state learning standards. Develop and maintain a multi-faceted environmental education resource library, available for use by educators and in Refuge educational programs, comprised of books, videos, posters, audio tapes, written materials, and environmental education kits.
3. Within 4 years of the plan's approval and in cooperation with other partners, establish an environmental education complex that incorporates an outdoor amphitheater with educational displays, a set of associated trails, the Refuge Visitor Center, and an educator's trail specifically designed to facilitate environmental education activities and function as an outdoor classroom.
4. Within 4 years of the plan's approval and in cooperation with other partners, create an Educator's Guide to Crab Orchard National Wildlife Refuge that provides an orientation, guidelines, grade-level and state learning standards information, maps, and site-specific activities that focus on one or more Refuge themes. Incorporate input from area educators to ensure the Refuge guide meets area teachers' needs.
5. In cooperation with other partners, conduct or host annual teacher workshops that encourage area educators to incorporate environmental education into their curriculum and to utilize Refuge materials, staff, and resources, both in the classroom and during field trips.
6. Continue currently-offered environmental education programs done by request, including on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Over the life of the plan, expand the environmental education program to include additional on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Develop pre- and post-visit activities in addition to on-site activities.
7. Over the life of the plan, establish partnerships with selected local schools, agencies, and nonprofit organizations to more effectively develop and expand environmental education programs. Involve volunteers in educational programs and explore the potential for environmental education interns through Southern Illinois University and John A. Logan College. Explore the potential for creating a grant program to help area schools with field trip expenses.

8. Conduct an annual review of the Refuge environmental education program. Invite feedback from area educators. Revise as necessary.

Goal 9. Customer Service:

Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.

9.1 Objective

Improve Refuge signs, kiosks, and facilities so that 90 percent of visitors feel welcome and secure, enjoy their visit, and recognize the area as a national wildlife refuge.

Strategies:

1. Within 3 years of the plan's approval, revise information on existing kiosks, trailhead and other identification markers, boundary signs, and other such signs as necessary to meet Service standards.
2. Within 5 years of the plan's approval, create and install additional kiosks where needed at Refuge access points to ensure that all visitors are greeted and informed that they are entering a national wildlife refuge.
3. Verify annually that visitors are welcomed and treated courteously by staff and volunteers. Confirm customer service standards during employee and volunteer orientations. Provide visitors with opportunities for feedback through suggestion cards, verbal reports, written mail, and e-mail through the Refuge web page. Address customer service issues promptly and professionally according to Service standards.
4. Within 2 years of the plan's approval, develop a Refuge brochure with detailed information on accessible facilities, trails, programs, and recreational opportunities at the Refuge.
5. Conduct semi-annual safety inspections of all Refuge facilities and reaffirm compliance with Service standards.
6. Maintain recognizable, consistent signs that clearly identify public hunting areas. Increase awareness among non-hunting visitors of hunting areas and seasons through effective signs and brochures.
7. Respond to notification of safety problems and unsafe situations promptly and in accordance with Service standards. Increase visibility of Refuge law enforcement, particularly during periods of heavy visitation.

Goal 10. Outreach:

Visitors, cooperators, tenants, and local residents will understand Refuge goals, issues and activities. Service personnel will understand the expectations and concerns of the general public by being receptive to their feedback.

10.1. Objective

The positive attitude toward Refuge management will increase among visitors, cooperators, tenants, and local residents throughout the life of this plan.

Strategies:

1. Issue press releases, hold Refuge open houses and hold regularly scheduled forums.
2. Within 2 years of this plan's approval, create and maintain a "listening log" of written and oral input from the public submitted to the Refuge. Review this log quarterly and address voiced community concerns.
3. Provide annual reports on the "State of the Refuge." Distribute these reports upon request at the Visitor Center and by mail and post the current year's report on the Refuge website.
4. Continue to permit selected annual and special events that are sponsored by nonprofit organizations, provided they do not damage Refuge resources or interfere with wildlife-dependent recreation.

Goal 11. Volunteers and Support Groups:

Volunteers and Refuge support groups will be stewardship partners and strong advocates for the Refuge.

11.1 Objective

Improve Refuge support for volunteer and Friends of Crab Orchard activities to a point where at least 95 percent of volunteers and Friends members feel like valued contributors to the success of Refuge programs and endeavors.

Strategies:

1. Continue to manage volunteer and support programs in accordance with Service guidelines detailed in "A Guidebook for Working with Volunteers." Maintain an active liaison with support groups and partners.
2. Provide in-depth initial training to Refuge volunteers that will enable them to effectively and efficiently complete projects and responsibilities. Encourage involvement in diverse volunteer activities that match volunteer interests.
3. Continue demonstrating Refuge appreciation for volunteer contributions and Friends support annually through a Volunteer Appreciation Banquet. Present awards for service hours in accordance with Service guidelines.

Goal 12. Other Land- and Water-based Recreation:

Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge when the Refuge was established.

12.1 Objective

Improve the quality of boat launches, marinas, beaches, picnic areas, and campground to industry standards within the life of the CCP.

Strategies:

1. Maintain picnicking at the Refuge recreational areas of Greenbriar, Wolf Creek, Harmony Trail, Playport Marina, and the Visitor Center. Develop a day use area at the current Images Marina site, and relocate picnic facilities from Cambria Neck to the site. Explore the option of concession-operated picnic shelters at Little Grassy and Crab Orchard campgrounds.
2. Explore the potential for a bicycle route within the restricted use area of the Refuge. The route would run mainly along old railroad beds.
3. Continue current policies on swimming at Devils Kitchen, Little Grassy and Crab Orchard lakes. Prohibit scuba diving.
4. Within 10 years of the plan's approval, upgrade boat ramps and associated parking at Devils Kitchen, Little Grassy and Crab Orchard lakes.
5. Continue current zoning on Crab Orchard Lake with additional no wake zones (see Figure 11 on page 53). Gas motors would be prohibited in the most southeastern arm of Devils Kitchen Lake, from the mouth of Grassy Creek south to the Refuge boundary, and in ponds within the public use area.
6. Horseback use on the Refuge would be confined to a designated River to River Trail (see Figure 13 on page 55) and erosion due to trail use would be actively controlled through maintenance and/or seasonal closures.
7. Camping at Devils Kitchen would be reduced to primitive sites only. Crab Orchard and Little Grassy campgrounds would be upgraded to standards comparable to others in the area.
8. Within 2 years of the plan's approval, consolidate Playport and Images marinas on Crab Orchard Lake. Images marina slips will be moved to Playport marina. Within 5 years of the plan's approval, remove the building at Images Marina and develop the area into a large access area to the lake with a comfort station.
9. After 2 years of the completion of the CCP, the Crab Orchard Boat & Yacht Club will be converted to a concession.

Goal 13. Protection:

Protect the integrity of Refuge biological and cultural resources and the health and safety of visitors, industrial workers, farmers, and Service staff.

13.1 Objective

Refuge lands and waters are safe for fish, wildlife, plants, and people.

Strategy:

1. Work with USEPA, Illinois EPA, Departments of Interior and Justice, and responsible parties to remediate contaminated sites. Where contamination is left in place, or where there is potential for undiscovered contamination that may pose a risk from exposure, institutional controls may be formulated. An institutional control plan would be written by the CERCLA staff and made available to Refuge management for implementation.

13.2 Objective

Visitors will feel safe on the Refuge and illegal harvest of fish and wildlife will be reduced.

Strategy:

1. Maintain full-time law enforcement staff.

13.3 Objective

Manage or eliminate invasive species on the Refuge.

Strategy:

1. Write and implement an Integrated Pest Management (IPM) Plan following guidance developed by the Service's "Promises Invasive Species Team." The IPM plan will address target species, control methods, mapping and monitoring.

13.4 Objective

Protect the cultural, historic, and pre-historic resources of federally-owned lands within the Refuge.

Strategy:

1. Implement the Cultural Resource Management Plan for Cultural Resources within the Crab Orchard National Wildlife Refuge (Godfrey and Stubbs 2001).
2. Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. Notify the Regional Historic Preservation Officer early in project planning or upon receipt of a request for permitted activities.
3. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program.
4. Complete accessioning, cataloging, inventorying, and preserving the museum collection at the Refuge in accordance with "Survey of Collections at Crab Orchard NWR" by Mayda S. Jensen.

13.5 Objective

Meet Service policy guidelines ("Administration and Enforcement Procedures for Conservation Easement") for 12 conservation easements by 2007, for all easements by 2010

1. Complete legal surveys on 50 percent (12 tracts) of all conservation easements by 2007 through contracted services. Complete contracted surves on the remaining tracts by 2010.
2. Conduct annual inspections of all conservation easements.
3. Develop land use plans for 50 percent (12 tracts) of the conservation easements and restore grassland and wetland habitats on 25 percent of these tracts by 2009.
4. Hire a permanent 6-month law enforcement officer to conduct annual inspections, develop land use plans, and restore wetland and grassland habitat projects.

Goal 14. Agriculture:

Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.

14.1 Objective

Continue farming operations on about 4,400 acres of row crops with greater emphasis on conservation practices.

Strategy:

1. Maintain infrastructure (roads, fences) in support of agricultural operations. Drop small, less profitable fields (less than 5 acres) from row cropping and convert to other cover (about 15 fields totaling 52 acres). Identify and drop farmed wetlands from the farm program. Permit cooperators to harvest corn remaining in the field in the spring. Emphasize Johnsongrass control. Prohibit mowing of clover in the crop rotation until after August 1. Enlist technical support from Natural Resource Conservation Service and University of Illinois Extension.

14.2 Objective

Continue farming operations on about 700 acres of hay fields with greater emphasis on conservation practices.

Strategy:

1. Prohibit mowing of hay until after August 1. Maintain an updated rate charge for hay.

14.3 Objective

Enhance nesting habitat for grassland birds while maintaining or increasing the value for grazing on about 1,000 acres of pastures.

Strategy:

1. Convert fescue pastures to other cool-season grasses and native warm season grasses with higher wildlife value. Divide existing pastures into three or four paddocks with a paddock of cool season grass and two or three paddocks of native warm season grasses. Rotate grazing cattle among the paddocks during the season. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.

Goal 15. Industrial Goal

Provide an industrial complex and attendant utility and transportation infrastructure, which conforms to prescribed safety, health, environmental and maintenance standards, that is utilized by compatible tenants.

15.1 Objective

Consolidate the areas occupied by industry.

Strategies:

1. Update Industrial Policy. Maintain the current infrastructure to support existing facilities.
2. Remove buildings that are no longer suitable for occupancy for reasons of contamination, safety or lack of structural integrity and restore to natural habitats.

2. Plan Implementation

2.1. New and Existing Projects

This CCP outlines an ambitious course of action for the future management of Crab Orchard National Wildlife Refuge. It will require considerable staff commitment as well as funding commitment to actively manage the wildlife habitats and add and improve public use facilities. The Refuge will continually need appropriate operational and maintenance funding to implement the objectives in this plan.

A full listing of unfunded Refuge projects and operational needs can be found in Appendix K. In the appendix, the highest priority Refuge projects are described briefly.

2.2. Staffing

Reforestation, aggressive control of invasive species, an increase in the number of acres managed as moist soil units, and improvements to the open land units will require additional staff and operating funds. A person with expertise in agriculture and invasive species will be added to the biological program staff. Also, a person with expertise in Geographic Information Systems will be needed to assist the biological staff with mapping and record keeping for invasive species control and other habitat work. A seasonal tractor operator will need to be hired to help accomplish the habitat work. To improve the quality of services, the Refuge will add a position in the visitor information center to assist with administrative duties.

The completion of the consolidation of the former Playport and Images Marinas will require moving the remainder of the docks from the Images area, removal of the concession building and construction of a boat ramp.

Meeting the goals and objectives of this plan will require a 15 percent increase in the Refuge's current operations and maintenance budget.

2.3. Partnership Opportunities

Partnerships have become an essential element for the successful accomplishment of Crab Orchard NWR goals, objectives and strategies. The objectives outlined in this CCP need the support and the partnerships of federal, state and local agencies, non-governmental organizations and individual citizens. This broad-based approach to managing Refuge resources extends beyond social and political boundaries and requires a foundation of support from many organizations and people. The Refuge will continue to seek creative partnership opportunities to achieve its vision for the future.

Southern Illinois Hunting and Fishing Days, Inc. is a non-profit organization that partners with the Refuge to promote hunting and fishing in the area. The Refuge initiated this program in the early 1980s. SI Hunting and Fishing Days assumed the lead for this activity in the early 1990s. Several thousand people now attend this annual weekend event, which is held at John A. Logan College.

Take Pride in America has been organized and worked with the Refuge since 1988. Take Pride in America has built courtesy docks for boat landings at all three lakes. Take Pride in America organized the construction of bass-rearing ponds and maintains Hogan's Point (Take Pride Point) for fish-offs.

The Crab Orchard Waterfowl Association has provided funds for the construction of moist soil units on the Refuge. Quail Unlimited has provided native grass seed for Refuge prairie restoration.

Touch of Nature, the Friends of Crab Orchard NWR and the Refuge's Visitor Services Program have partnered to provide environmental education opportunities for local schools.

With the help of the following partners, the Refuge is able to provide one of the most successful Kids Fishing Derbys in the area:

- University of Illinois Cooperative Extension Service
- Illinois DNR
- Southern Illinois National Hunting and Fishing Days
- Timberline Fisheries
- Zimmer Radio Group
- WalMart
- Silkworm Inc.
- Marion Pepsi-Cola
- Crab Orchard Boat & Yacht Club

The Refuge has many dedicated friends and volunteers that assist with a variety of tasks. The Friends of Crab Orchard National Wildlife Refuge, John A. Logan College, University of Southern Illinois, Southern Illinois Audubon Society, Williamson County Tourism, and Marion U.S. Penitentiary are just a few of the organizations that contribute time to the Refuge. We expect to maintain and enhance these partnerships in the future.

2.4. Step-down Management Plans

Step-down management plans describe the specific strategies and implementation schedules for meeting general goals and objectives identified in the CCP. Table 1 shows the step-down management plans we intend to prepare. We have completed two management plans that will be adopted/included under the CCP.

The Natural Resource Damage Assessment (NRDA) Restoration Plan was approved July 21, 1997. The NRDA Restoration Plan describes activities proposed to compensate for lost resources and the services they provide that resulted from PCB contamination on part of the Refuge. Restoration activities included in the plan include reforestation, shoreline and riparian restoration, grassland restoration, public education/outreach, and land acquisition.

The Fire Management Plan, approved January 16, 2002, provides direction and establishes procedures to guide various wildland fire program activities. The Fire Management Plan covers historical and ecological role of fire, fire management objectives, preparedness, suppression, fire management actions and responses, fire impacts, use of prescribed fire, and fire management restrictions.

2.5. Monitoring and Evaluation

Monitoring is critical to successful implementation of this plan. Monitoring is necessary to evaluate the progress toward objectives and to determine if conditions are changing.

Accomplishment of the objectives described in this CCP will be monitored annually by the Refuge Manager's supervisor. Successful performance will be tied to the accomplishment of objectives that are scheduled for that year. The public will be informed about the activities of the Refuge staff through an "Annual Report" that will be mailed to all persons on the Refuge mailing list, published on the Refuge's Web site, and its availability will be announced through news releases to the media. The annual report will be published each year in February.

The techniques and details for monitoring related to specific objectives will be specified in the Inventory and Monitoring Step Down Plan.

Substantial changes are likely to occur within the Service and the community during the next 15 years. This plan and its objectives will be examined at least every 5 years to determine if any modifications are necessary to meet the changing conditions.

2.6. Plan Review and Revision

The CCP for the Refuge is meant to provide guidance to refuge managers and staff over the next 15 years. However, the CCP is also a dynamic and flexible document and several of the strategies contained in this plan are subject to natural, uncontrollable events such as windstorms and droughts. Likewise, many of the strategies are dependent upon Service funding for staff and projects. Because of these factors, the recommendations in the CCP will be reviewed periodically and, if necessary, revised to meet new circumstances. If any revisions are major, the review and revision will include the public.

Table 1: Step-down Management Plans, Crab Orchard NWR

Title	Service Manual Reference
Occupational Safety and Health	Parts 240-249
Safety Program	240 FW 1-9
Safety Operations	241 FW 1-9
Industrial Hygiene	242 FW 1-13
Hazardous Materials Operations	242 FW 6
Contaminant Institutional Control	
Law Enforcement	Parts 440-459
Pollution Control	Parts 560-569
Policy and Responsibilities	560 FW 1
Pollution Prevention	560 FW 2
Compliance Requirements	Part 561
Clean Water Act	561 FW 3
RCRA – Hazardous Waste	561 FW 6
Pesticide Use and Disposal	Part 562
Pest Management	562 FW 1
External Threats to FWS Facilities	Part 563
Air Quality Protection	563 FW 2
National Wildlife Refuge System (NWRS) Uses	Part 603
NWRS Uses (Appropriate Refuge Uses)	603 FW 1
Priority Wildlife-dependent Recreation	Part 605
Hunting	605 FW 2
Fishing	605 FW 3
Wildlife Observation	605 FW 4
Wildlife Photography	605 FW 5
Environmental Education	605 FW 6
Interpretation	605 FW 7
Visitor Services	
Wilderness Management	Part 610
Special Area Management	Part 611
Research Natural Areas	611 FW 1
National Trails	611 FW 4
Minerals Management	Part 612
Minerals and Mining	612 FW 1
Oil and Gas	612 FW 2
Archeological Resources Inventory	Sec. 110 NHPA; sec. 14 ARPA
Habitat Management Planning	Part 620
Natural Resources Damage Assessment Restoration	
Fire Management	Part 621
Population Management	Part 701
Inventory and Monitoring	701 FW 2

Table 1: Step-down Management Plans, Crab Orchard NWR (Continued)

Title	Service Manual Reference
Propagation and Stocking	701 FW 3
Marking and Banding	701 FW 4
Disease Prevention and Control	701 FW 7
Trapping	701 FW 11
Fishery Resources Management	Part 710
Industrial Operations Management	

Appendix B: Glossary

Appendix B: Glossary

Aquatic Species

Includes all freshwater, anadromous and estuarine fishes, freshwater mollusks, freshwater crustaceans and freshwater amphibians.

Archaeological and Cultural Values

Any material remains of past human life or activity greater than 100 years old which are of archaeological interest as defined by Section 4(a) of the Archaeological Resources Protection Act and 43 CFR Part 7.3.

Biodiversity

The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Candidate Species

Those species for which the Service has on file sufficient information on biological vulnerability and threats to propose them for listing.

Compatible Use

A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director or designee, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge (PL 105-57).

Comprehensive Conservation Plan

Plan: A document, completed with public involvement, that describes the desired future condition and provides long-term (15 year planning horizon) guidance to accomplish the purposes of the refuge system and the individual refuge units.

Conservation

The management of natural resources to prevent loss or waste. Management actions may include preservation, restoration and enhancement.

Conservation (Species)

The use of all methods and procedures which are necessary to bring any species to the point at which the measures provided are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation. Conservation is the act of managing a resource to ensure its survival and availability.

Cultural Resources

Cultural Resources: "those parts of the physical environment – natural and built – that have cultural value to some kind of sociocultural group... [and] those non-material human social institutions...." (King, p.9). Cultural resources include historic sites, archeological sites and associated artifacts, sacred sites, traditional cultural properties, cultural items (human remains, funerary objects, sacred objects, and objects of cultural patrimony) (McManamon, Francis P. DCA-NPS; letter 12-23-97 to Walla Walla District, COE), and buildings and structures.

Deepwater

Permanently flooded lands lying below the deepwater boundary of wetlands (Cowardin *et al.*, 1979). Deepwater areas are located below the elevation of the extreme low water of the spring tide in oceans and estuaries, and those portions of rivers and lakes greater than 6.6 feet in depth.

Ecosystem

Dynamic and interrelating complex of plant and animal (including humans) communities and their associated non-living environment.

Ecosystem Approach

1) Protecting or restoring the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated. 2) Management of natural resources using system-wide concepts to ensure that all plants and animals in ecosystems are maintained at viable levels in native habitats and that basic ecosystem processes are perpetuated indefinitely (Clark and Zaunbrecher 1987).

Endangered Species

A listed species in danger of extinction throughout all or a significant portion of its range.

Enhance (habitats)

Improves habitat through alteration, treatment, or other land management of existing habitat to increase habitat value for one or more species without bringing the habitat to a fully restored or naturally occurring condition.

Forest Fragmentation

Fragmentation may occur when a forested landscape is subdivided into patches. Fragmentation may also occur when numerous openings for such things as fields, roads, and powerlines interrupt a continuous forest canopy. The resulting landscape pattern alters habitat connectivity and edge characteristics, influencing a variety of species.

Forest Stand Improvement Treatment

A non-commercial, intermediate treatment made in older stands to regulate composition by species and improve stand quality. Techniques include girdling, cutting, and application of herbicide to individual stems.

Geographic Information System, spatial

GIS aids in the collection, analysis, output and distribution of spaital data and information.

Goose-use-day

Enough food to feed one goose for one day.

Improvement Cutting

A commercial, intermediate cutting made in older stands to regulate composition by species and improve stand quality. This type of cutting treatment is accomplished by the sale and harvesting of merchantable trees.

Interjurisdictional Fish

Populations of fish that are managed by two or more states or national or tribal governments because of the scope of their geographic distributions or migrations.

Intermediate Cutting/Treatment

A cutting or treatment applied during that portion of the rotation from the reproduction stage to maturity.

Institutional Control

Institutional controls are non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use. They are generally used in conjunction with, rather than in lieu of, engineering measures such as waste treatment or containment. Institutional controls can be used during all stages of the clean-up process to accomplish various clean-up-related objectives. More than one institutional control should be used and they should be implemented in a series to provide overlapping assurances of protection from contamination.

Invasive Species

An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

Migratory Nongame Birds of Management Concern

Those species of nongame birds that (a) are believed to have undergone significant population declines; (b) have small or restricted populations; or (c) are dependent upon restricted or vulnerable habitats.

Migratory Species

Species that move substantial distances to satisfy one or more biological needs, most often to reproduce or escape intolerable cyclic environmental conditions.

National Wildlife Refuge System

All lands and waters and interests therein administered by the Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish and wildlife, including those that are threatened with extinction.

Protect (habitat)

Maintain current quality or prevent degradation to habitat. The act of ensuring that habitat quantity and quality do not change, most often as a result of human activities but sometimes in response to unwelcome natural processes or phenomena.

Recovery Plans (species)

Documents developed by the Service that outline tasks necessary to stabilize and recover listed species. Recovery plans include goals for measuring species progress towards recovery, estimated costs and time frames for the recovery process, and an identification of public and private partners that can contribute to implementation of the recovery plan.

Regeneration Cutting

A commercial cutting in a mature stand for the purposes of removing the old trees and creating environmental conditions favorable for establishment of reproduction.

Regeneration/Reproduction

These terms are synonymous, meaning the young trees established at the beginning of a rotation.

Restore (habitat)

Returns the quantity and quality of habitat to some previous naturally occurring condition, most often some baseline considered suitable and sufficient to support self-sustaining populations of fish and wildlife.

Riparian Habitats

Those lands adjacent to streams or rivers that form a transition zone between aquatic and upland systems and are typically dominated by woody vegetation that is of a noticeably different growth form than adjacent vegetation. Riparian areas may or may not meet the definition of wetlands used by Cowardin *et al.* (1979).

Rotation

The period during which a single generation is allowed to grow.

Shelterwood Method

A regeneration method in which the older stand is gradually removed in a series of partial cuttings to secure establishment of reproduction before completion of the preceding rotation. The sequence of operations may include preparatory cuttings, seed cuttings, and removal cuttings, in that order.

Species of Concern

A species not on the federal list of threatened or endangered species, but a species for which the Service or one of its partners has concerns.

Stakeholders

State, tribal, and local government agencies, academic institutions, the scientific community, nongovernmental entities including environmental, agricultural, and conservation organizations, trade groups, commercial interests, and private landowners.

Threatened Species

A listed species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Undertaking

A project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval..." (36 CFR 800.16(y); 12-12-2000), i.e., all Federal actions.

Uplands

All lands not meeting the definition of wetlands, deepwater, or riverine.

Watershed

The area drained by a river or stream and its tributaries.

Wetlands

Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin *et al.*, 1979. In layman's terms, this habitat category includes marshes, swamps and bogs.

Wildlife-dependent Recreational Use

A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation.

Appendix C: Laws and Orders

Appendix C: Laws and Orders

Numerous Congressional Acts, Executive Orders signed by the President, and regulations grant authority and govern the administration of the Refuge. The following laws and executive orders provide substantive and procedural requirements to be satisfied in the development and implementation of the CCP.

Public Law 80-361

(Approved August 5, 1947; 61 Stat. 770) This Act established Crab Orchard National Wildlife Refuge by directing the transfer of certain lands in Illinois to the Department of the Interior for wildlife conservation, and agricultural, recreational, industrial development and related purposes. The full text is presented in Appendix G.

Public Law 90-339

(Approved June 15, 1968; 82 Stat. 177) This Act provides for adjustment of legislative jurisdiction of the United States on the Refuge.

Public Law 95-616

(Approved November 8, 1978; 92 Stat. 3114) This Act provided that revenue generated on the Refuge will be subject to the Refuge Revenue Sharing Act rather than being deposited in the Treasury as general receipts.

Public Law 99-662

(Approved November 17, 1986; 100 Stat 4257) This Act directed the Secretary to sell surplus water which may be available from Devils Kitchen Lake on the Refuge to the City of Marion, Illinois.

National Wildlife Refuge System Administration Act of 1966

(Derived from sections 4 and 5 of Public Law 89-669, approved October 15, 1966; 80 Stat. 927; 16 USC 668dd et seq.) This Act serves as the "organic act" for the National Wildlife Refuge System. The Act, as amended (National Wildlife Refuge System Improvement Act, Public Law 105-57, October 9, 1997), consolidated the various categories of lands administered by the Secretary of the Interior (Secretary) through the Service into a single National Wildlife Refuge System.

The Act establishes a unifying mission for the Refuge System, a process for determining compatible uses of refuges, and a requirement for preparing comprehensive conservation plans. The Act states first and foremost that the mission of the National Wildlife Refuge System be focused singularly on wildlife conservation.

The Act identifies six priority wildlife-dependent recreation uses, clarified the Secretary's authority to accept donations of money for land acquisition and placed restrictions on the transfer, exchange or other disposal of lands within the Refuge System.

Most importantly, this Act reinforces and expands the "compatibility standard" of the Refuge Recreation Act. The Refuge Administration Act authorizes the Secretary, under such regulations as he may prescribe, to "permit the use of any area within the System for any purpose, including but not limited to hunting, fishing, public recreation and accommodations, and access whenever he determines that such uses are compatible with the major purposes for which such areas were established."

It provides guidelines and directives for administration and management of all areas in the system, including "wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas."

The Secretary is authorized to permit by regulations the use of any area within the system provided "such uses are compatible with the major purposes for which such areas were established."

Public Law 90-404

(Approved July 18, 1968, (82 Stat. 359) This law provides that proceeds from disposal of lands in the system acquired with "duck stamp" funds or by donation are to be paid into the Migratory Bird Conservation Fund, and that the Migratory Bird Conservation Commission must be consulted before disposal of any such acquired land.

A December 3, 1974, amendment entitled "National Wildlife Refuge System Administration Act Amendments of 1974" (P.L. 93-509; 88 Stat. 1603), requires payment of the fair market

value for rights-of-way or other interests granted, with the proceeds deposited into the Migratory Bird Conservation Fund and made available for land acquisition.

Public Law 94-215

(Approved February 17, 1976) (90 Stat. 190) clarified that acquired lands or interests therein can be exchanged for acquired or public lands.

An amendment of February 27, 1976, (P.L. 94-223; 90 Stat. 199) commonly called the Game Range Act, directs that all areas in the system on or after January 1, 1975, "shall be administered by the Secretary through the United States Fish and Wildlife Service" and cannot be transferred or disposed of unless otherwise directed by Acts of Congress. Exceptions are provided for areas administered as part of the system pursuant to cooperative agreements and for transfer or disposal and exchange of acquired lands.

Public Law 95-616

(Approved November 8, 1978, (92 Stat. 3110) amends the 1966 Act to permit the opening of more than 40 percent of an area acquired as a migratory bird sanctuary to hunting when it is determined to be beneficial to the species hunted. Contracts may be entered into for public accommodations and donations of funds may be accepted for land acquisition and management.

Public Law 100-653

(Approved November 14, 1988, (101 Stat. 3825) made violations of the Act or implementing regulations subject to fines under the provisions of Title 18 of the U.S. Code (sections 3571-3574), or one year's imprisonment, or both. This Act also authorized the Secretary to relinquish exclusive legislative jurisdiction over any Service lands to State or territorial authorities (16 U.S.C. 742m).

This Act, Refuge Revenue Sharing Act (16 U.S.C. 715s) – Section 401 of the Act of June 15, 1935, (49 Stat. 383) provided for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges.

Public Law 88-523

(Approved August 30, 1964, (78 Stat. 701) made major revisions by requiring that all revenues received from refuge products, such as animals, timber and minerals, or from leases or other privileges, be deposited in a special Treasury account and net receipts distributed to counties for public schools and roads.

Public Law 93-509

(Approved December 3, 1974, (88 Stat. 1603) required that moneys remaining in the fund after payments be transferred to the Migratory Bird Conservation Fund for land acquisition under provisions of the Migratory Bird Conservation Act.

Public Law 95-469

(Approved October 17, 1978, (92 Stat. 1319) expanded the revenue sharing system to include National Fish Hatcheries and Service research stations. It also included in the Refuge Revenue Sharing Fund receipts from the sale of salmonid carcasses. Payments to counties were established as:

- on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land; and
- on land withdrawn from the public domain, 25 percent of net receipts and basic payments under Public Law 94-565 (31 U.S.C. 1601-1607, 90 Stat. 2662), payment in lieu of taxes on public lands.

This amendment also authorized appropriations to make up any difference between the amount in the Fund and the amount scheduled for payment in any year. The stipulation that payments be used for schools and roads was removed, but counties were required to pass payments along to other units of local government within the county which suffer losses in revenues due to the establishment of Service areas.

Refuge Trespass Act (18 U.S.C. 41)

The Act of June 25, 1948, (62 Stat. 686) consolidated penalty provisions of various Acts from 1905 through 1934 establishing and protecting fish and wildlife areas, and restated the intent of Congress to protect all wildlife within Federal sanctuaries, refuges, fish hatcheries and breeding grounds.

Except as provided by rules and regulations promulgated under authority of law, the Act provides that anyone who hunts, traps or willfully disturbs any wildlife on such areas, or willfully injures, molests or destroys any property of the United States on such lands or waters, shall be fined not more than $500, imprisoned not more than six months, or both.

Public Law 100-653

(Approved November 14, 1988, (102 Stat. 3825) provided that any violation of the Refuge System Administration Act (16 U.S.C. 668dd et seq), or regulations issued under its authority, would be fined in accordance with uniform sentencing provisions established in Public Law 98-473, approved October 12, 1984, (98 Stat. 2028, 2031; 18 U.S.C. 3551 to 3586) or imprisoned not more than one year, or both. This largely supersedes the provisions of the Trespass Act, although the Act was not repealed.

Migratory Bird Treaty Act of 1918 (MBTA)

(16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) as amended by: Chapter 634; June 20, 1936; 49 Stat. 1556; P.L. 86-732; September 8, 1960; 74 Stat. 866; P.L. 90-578; October 17, 1968; 82 Stat. 1118; P.L. 91-135; December 5, 1969; 83 Stat. 282; P.L. 93-300; June 1, 1974; 88 Stat. 190; P.L. 95-616; November 8, 1978; 92 Stat. 3111; P.L. 99-645; November 10, 1986; 100 Stat. 3590 as amended. This Act designates the protection of migratory birds as a Federal responsibility. The Act enables the setting of seasons, and other regulations including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

The original 1918 statute implemented the 1916 Convention between the U.S. and Great Britain (for Canada) for the protection of migratory birds. Specific provisions in the statute included:

Establishment of a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention... for the protection of migratory birds... or any part, nest, or egg of any such bird." (16 U.S.C. 703) This prohibition applies to birds included in the respective international conventions between the U.S. and Great Britain, the U.S. and Mexico, the U.S. and Japan, and the U.S. and the Soviet Union.

Authority for the Secretary of the Interior to determine, periodically, when, consistent with the Conventions, "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any... bird, or any part, nest or egg" could be undertaken and to adopt regulations for this purpose. These determinations are to be made based on "due regard to the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times of migratory flight." (16 U.S.C. 704)

A decree that domestic interstate and international transportation of migratory birds which are taken in violation of this law is unlawful, as well as importation of any migratory birds which are taken in violation of Canadian laws. (16 U.S.C. 705)

Authority for Interior officials to enforce the provisions of this law, including seizure of birds illegally taken which can be forfeited to the U.S. and disposed of as directed by the courts. (16 U.S.C. 706)

Establishment of fines for violation of this law, including misdemeanor charges. (16 U.S.C. 707)

Authority for States to enact and implement laws or regulations to allow for greater protection of migratory birds, provided that such laws are consistent with the respective Conventions and that open seasons do not extend beyond those established at the national level. (16 U.S.C. 708)

Authority to take migratory birds exclusively for scientific or propagation purposes, pending the development of Federal regulations, provided that the take does not violate State or local laws. (16 U.S.C. 709)

A repeal of all laws inconsistent with the provisions of this Act.

Authority for the continued breeding and sale of migratory game birds on farms and preserves for the purpose of increasing the food supply. (16 U.S.C. 711)

The 1936 statute implemented the Convention between the U.S. and Mexico for the Protection of Migratory Birds and Game Mammals. Migratory bird import and export restrictions between Mexico and the U.S. were also authorized, and in issuing any regulations to implement this section, the Secretary of Agriculture was required to consider U.S. laws forbidding importation of certain mammals injurious to agricultural and horticultural interests. Monies for the Secretary of Agriculture to implement these provisions were also authorized.

The 1960 statute (P.L. 86-732) amended the MBTA by altering earlier penalty provisions. The new provisions stipulated that violations of this Act would constitute a misdemeanor and conviction would result in a fine of not more than $500 or imprisonment of not more than six months. Activities aimed at selling migratory birds in violation of this law would be subject to fine of not more than $2000 and imprisonment could not exceed two years. Guilty offenses would constitute a felony. Equipment used for sale purchases was authorized to be seized and held, by the Secretary of the Interior, pending prosecution, and, upon conviction, be treated as a penalty.

Section 10 of the 1969 amendments to the Lacey Act (P.L. 91-135) repealed the provisions of the MBTA prohibiting the shipment of wild game mammals or parts to and from the U.S. or Mexico unless permitted by the Secretary of the Interior. The definition of "wildlife" under these amendments does not include migratory birds, however, which are protected under the MBTA.

The 1974 statute (P.L. 93-300) amended the MBTA to include the provisions of the 1972 Convention between the U.S. and Japan for the Protection of Migratory Birds and Birds in Danger of Extinction. This law also amended the title of the MBTA to read: "An Act to give effect to the conventions between the U.S. and other nations for the protection of migratory birds, birds in danger of extinction, game mammals, and their environment."

Section 3(h) of the Fish and Wildlife Improvement Act of 1978 (P.L. 95-616) amended the MBTA to authorize forfeiture to the U.S. of birds and their parts illegally taken, for disposal by the Secretary of the Interior as he deems appropriate. These amendments also authorized the Secretary to issue regulations to permit Alaskan natives to take migratory birds for their subsistence needs during established seasons. The Secretary was required to consider the related migratory bird conventions with Great Britain, Mexico, Japan, and the Soviet Union in establishing these regulations and to establish seasons to provide for the preservation and maintenance of migratory bird stocks.

Public Law 95-616 also ratified a treaty with the Soviet Union specifying that both nations will take measures to protect identified ecosystems of special importance to migratory birds against pollution, detrimental alterations, and other environmental degradations. (See entry for the Convention Between the United States of America and the Union of Soviet Socialist Republics Concerning the Conservation of Migratory Birds and Their Environment; T.I.A.S. 9073; signed on November 19, 1976, and approved by the Senate on July 12, 1978; 92 Stat. 3110.)

The most recent amendment was part of the 1986 Emergency Wetlands Resources Act (P.L. 99-645), and amended the Act to require that felony violations under the MBTA must be "knowingly" committed.

Bald Eagle Protection Act of 1940

(16 U.S.C. 668-668d, 54 Stat. 250, approved June 8, 1940, and amended by P.L. 86-70 (73 Stat. 143) June 25, 1959; P.L. 87-884 (76 Stat. 1346) October 24, 1962; P.L. 92-535 (86 Stat. 1064) October 23, 1972; and P.L. 95-616 (92 Stat. 3114) November 8, 1978. This Act provides for the protection of the bald eagle (the national emblem) and the golden eagle on and off Federal lands by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds.

The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act. The 1978 amendment authorizes the Secretary of the Interior to permit the taking of golden eagle nests that interfere with resource development or recovery operations.

Migratory Bird Conservation Act of 1929

(16 U.S.C. 715-715d, 715e, 715f-715r approved February 18, 1929; 45 Stat. 1222) This Act established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The Commission consists of the Secretary of the Interior (as chairman), the Secretaries of Transportation and Agriculture, two members of the Senate and two of the House of Representatives, and an ex-officio member from each State in which acquisition is being considered.

The Commission, through its chairman, is directed to report by the first Monday in December of each year to Congress on its activities during the preceding fiscal year. The Secretary of the Interior is authorized to cooperate with local authorities in wildlife conservation and to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges. The Act provides for cooperation with States in enforcement. It established procedures for acquisition by purchase, rental or gift of areas approved by the Commission.

Public Law 94-215

(Approved February 17, 1976) (90 Stat. 190) included in acquisition authority under the Act the purchase or rental of a partial interest in land or waters.

Public Law 95-552

(Approved October 30, 1978, (92 Stat. 2071) required that the Secretary of the Interior consult with the appropriate units of local government and with the Governor of the State concerned, or the appropriate State agency, before recommending an area for purchase or rental under the provisions of the Act. This provision was subsequently amended by P.L. 98-200, approved December 2, 1983 (97 Stat. 1378); P.L. 98-548, approved October 26, 1984 (98 Stat. 2774); and P.L. 99-645, approved November 10, 1986 (100 Stat. 3584) to require that either the Governor or the State agency approve each proposed acquisition.

Public Law 95-616

(Approved November 8, 1978, (92 Stat. 3110) authorized acquisition of areas for purposes other than inviolate sanctuary.

Migratory Bird Hunting and Conservation Stamp Act of 1934

(16 U.S.C. 718-718j, 48 Stat. 452) This Act authorized opening a certain portion of a national wildlife refuge to waterfowl hunting.

North American Wetlands Conservation Act

(Public Law 101-233, enacted December 13, 1989; 103 Stat. 1968; 16 U.S.C. 4401-4412) This Act provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, U.S. and Mexico.

The Act converts the Pittman-Robertson account into a trust fund, with the interest available without appropriation through the year 2006 to carry out the programs authorized by the Act, along with an authorization for annual appropriation of $15 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act.

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

A North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. The Council is to be composed of the Director of the Service, the Secretary of the National Fish and Wildlife Foundation, a State fish and game agency director from each Flyway, and three representatives of different non-profit organizations participating in projects under the Plan or the Act. The Chairman of the

Council and one other member serve ex officio on the Commission for consideration of the Council's recommendations.

The Commission must justify in writing to the Council and, annually, to Congress, any decisions not to accept Council recommendations.

Public Law 101-593

(Approved November 16, 1990 (104 Stat. 2962) provided that the Director is the Federal official responsible for compliance with the National Environmental Policy Act (NEPA) with respect to Council actions, and that recommendation(s) from the Council to the Commission constitute agency action requiring the preparation of Environmental Assessments or Impact Statements. The Chairman of the Council is also required to take steps to ensure public notice of Council meetings.

This Act provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, Mexico and the U.S. It establishes a North American Wetlands Conservation Council, the purpose of which is to recommend wetlands conservation projects to the Migratory Bird Conservation Commission. Federal funds may be expended for payment of no more than half of the U.S. share of the cost of wetlands conservation projects in Canada, Mexico or the U.S. (or 100 percent of the cost of projects on federal lands). The Act directs the Secretary of the Interior to develop and implement a wetlands conservation strategy, and report to Congress on project implementation and assessment.

Clean Air Act of 1977, as amended.

The primary objective of this Act is to establish Federal standards for various pollutants from both stationary and mobile sources and to provide for the regulation of polluting emissions via state implementation plans. In addition, and of special interest for Refuges, some amendments are designed to prevent significant deterioration in certain areas where air quality exceeds national standards, and to provide for improved air quality in areas which do not meet Federal standards (non-attainment areas). Part C of the 1977 amendments stipulates requirements to prevent significant deterioration of air quality and, in particular, to preserve air quality in national parks, national wilderness areas, national monuments, and national seashores. The majority of the amendments to the Clean Air Act were enacted in 1977 and are known as the Clean Air Amendments of 1977 (P.L. 95-95; 91 Stat. 685). The primary objective of the Clean Air Act is to establish Federal standards for various pollutants from both stationary and mobile sources and to provide for the regulation of polluting emissions via state implementation plans. In addition, the amendments are designed to prevent significant deterioration in certain areas where air quality exceeds national standards, and to provide for improved air quality in areas which do not meet Federal standards ("nonattainment" areas).

Federal facilities are required to comply with air quality standards to the same extent as non-governmental entities (42 U.S.C. 7418). Part C of the 1977 amendments stipulates requirements to prevent significant deterioration of air quality and, in particular, to preserve air quality in national parks, national wilderness areas, national monuments and national seashores (42 U.S.C. 7470).

The amendments establish Class I, II and III areas, where emissions of particulate matter and sulfur dioxide are to be restricted. The restrictions are most severe in Class I areas and are progressively more lenient in Class II and III areas.

Mandatory Class I Federal lands include all national wilderness areas exceeding 500 acres. Such lands may not be redesignated (42 U.S.C. 7472). Additionally, national wildlife refuges which exceed 10,000 acres may only be redesignated by States as Class I or Class II areas (42 U.S.C. 7474).

Federal land managers are charged with direct responsibility to protect the air quality and related values (including visibility) of Class I lands and to consider, in consultation with EPA, whether proposed industrial facilities will have an adverse impact on these values (42 U.S.C. 7475(c)). Federal land managers are also required to determine whether existing industrial sources of air pollution must be retrofitted to reduce impacts on Class I areas to acceptable levels.

The Secretary of the Interior, in consultation with other Federal land managers, is required to review all mandatory Class I Federal areas and to identify those where visibility is an important value of the area (42 U.S.C. 7491). Such identifications are to be revised periodically.

EPA is requested to report to Congress regarding methods for achieving greater visibility and to issue regulations towards that objective (42 U.S.C. 7491). Exemptions from such regulations are contingent upon the concurrence of the involved Federal land manager.

Data Quality Act

The Data Quality Act (DQA) is an attempt by Congress to ensure that federal agencies use and disseminate accurate information. The DQA requires federal agencies to issue information quality guidelines ensuring the quality, utility, objectivity and integrity of information that it disseminates and provide mechanisms for affected persons to correct such information.

Federal Water Pollution Control Act, commonly known as the Clean Water Act

(P.L. 92-500, enacted in 1972; amended by P.L. 95-217 in 1977, P.L. 97-117 in 1981, and P.L. 100-4 in 1987). This is the principal law governing pollution in the nation's streams, lakes, and estuaries. It consists of two major parts: regulatory provisions that impose progressively more stringent requirements on industries and cities to abate pollution and meet the statutory goal of zero discharge of pollutants; and provisions that authorize federal financial assistance for municipal wastewater treatment construction. Both parts are supported by research activities, plus permit and enforcement provisions. Programs at the federal level are administered by the Environmental Protection Agency (EPA); state and local governments have major responsibilities to implement those programs.

The objective declared in the 1972 Act is to restore and maintain the chemical, physical, and biological integrity of the nation's water. That objective was accompanied by statutory goals to eliminate the discharge of pollutants into navigable waters by 1985 and to attain, wherever possible, waters deemed "fishable and swimmable" by 1983. While those goals have not yet been achieved, considerable progress has been made, especially in controlling conventional pollutants (suspended solids, bacteria, and oxygen-consuming materials) discharged by industries and municipal sewage treatment plants. Nearly 75% of assessed waters comply with standards for these pollutants. Progress has been mixed in controlling discharges of toxic pollutants (heavy metals, inorganic and organic chemicals), which are more numerous and can harm human health and the environment even when present in minute amounts-at the parts-per-billion level. Moreover, efforts to control pollution from diffuse sources (rainfall runoff, for example) have only recently begun. Overall, data reported by EPA and states indicate that 40% of waters surveyed by states fail to meet water quality standards. Forty-seven states now have some form of fish-consumption advisory in effect (including 100% of Great Lakes waters and a large portion of the nation's coastal waters), due to water pollution problems, and one-third of shellfishing beds are closed or restricted, due to toxic pollutant contamination.

Emergency Wetlands Resources Act of 1986

(Public Law 99-645, approved November 10, 1986; 100 Stat. 3582) The purpose of this Act is: "To promote the conservation of migratory waterfowl and to offset or prevent the serious loss of wetlands by the acquisition of wetlands and other essential habitat, and for other purposes." The Act authorized the purchase of wetlands from Land and Water Conservation Fund monies, removing a prior prohibition on such acquisitions. It required the Secretary to establish a National Wetlands Priority Conservation Plan, required the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transferred to the Migratory Bird Conservation Fund amounts equal to the import duties on arms and ammunition.

It extended the Wetlands Loan Act authorization through 1988, and forgave the previous advances under the Act. It also required the Secretary to report to Congress on wetlands loss, including an analysis of the role of Federal programs and policies in inducing such losses. In addition, it directed the Secretary, through the Service, to continue the National Wetlands Inventory; to complete by September 30, 1998, mapping of the contiguous United States; to produce, as soon as practicable, maps of Alaska and other noncontiguous portions of the United States; and to pro-

duce, by September 30, 1990, and at ten-year intervals thereafter, reports to update and improve in the September 1982 Status and Trends of Wetlands and Deepwater Habitat in the Conterminous United States, 1950s to 1970s.

Other provisions included: the establishment of entrance fees at National Wildlife Refuges, with fee receipts to be allocated 70 percent into the Migratory Bird Conservation Fund and 30 percent for operations and maintenance at the refuges; an increase in the price of duck stamps from $7.50 to $15.00, to be phased in through 1991; and the establishment of the Bayou Sauvage National Wildlife Refuge in Louisiana.

Fish and Wildlife Act of 1956

This Act established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Fish and Wildlife Coordination Act of 1958

This Act allows the Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Fish and Wildlife Improvement Act of 1978

(Public Law 95-616, approved November 8, 1978; 16 U.S.C. 7421; 92 Stat. 3110) This Act authorizes the Secretaries of the Interior and Commerce to establish, conduct, and assist with national training programs for State fish and wildlife law enforcement personnel. It also authorized funding for research and development of new or improved methods to support fish and wildlife law enforcement.

The law provides authority to the Secretaries to enter into law enforcement cooperative agreements with State or other Federal agencies, and authorizes the disposal of abandoned or forfeited items under the fish, wildlife, and plant jurisdictions of these Secretaries. It strengthened the law enforcement operational capability of the Service by authorizing the disbursement and use of funds to facilitate various types of investigative efforts.

The statute also contains amendments to: Bald Eagle Protection Act (16 USC 668-668d); Central Valley Project, California, Reauthorization Act of August 27, 1954 (16 USC 695d-695j); Cooperative Research and Training Units Act (16 USC 7853a-753h); Fish and Wildlife Act of 1956 (16 USC 742a-742j); Migratory Bird Conservation Act (16 USC 715 et seq.); Migratory Bird Treaty Act (16 USC 703 et. seq.); National Wildlife Refuge System Administration Act of 1966 (16 USC 668dd-668ee); Refuge Recreation Act (16 USC 460k-460k-4); the Act of August 5, 1947, (16 USC 666g) establishing Crab Orchard National Wildlife Refuge; the Act of April 23, 1928, (16 USC 690e) establishing the Bear River Migratory Bird Refuge; and the Coastal Barrier Resources Act (16 USC 3503).

Land and Water Conservation Fund Act

(Public Law 88-578, approved September 3, 1964; 78 Stat. 897; 16 USC 460l - 460l-11) Since its inception on January 1, 1965, the LWCF has been the principal source of funds for acquiring new recreation lands. It was originally intended to be a revolving fund, and the initial legislation required it to repay advanced appropriations in the 10th year of operation. However, it has never operated as a revolving fund. The authority has been amended frequently, most notably to increase the authorized level of the fund, and to mandate that offshore oil and gas leasing revenues should make up any shortfall from other authorized financing sources. However, the fund's basic purpose has not been altered.

Most appropriations in recent years have been to the four major federal land management agencies-the Forest Service in the Department of Agriculture, and the National Park Service, Fish and Wildlife Service, and Bureau of Land Management in the Department of the Interior. These agencies have purchased or acquired through exchange about 4.5 million acres

This Act authorizes the use of receipts from the sale of surplus Federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities. The Recreation Coordination and Development Act (Public Law 88-29, approved May 28, 1963, 77 Stat. 49) declared a Congressional policy that "present and future generations be assured adequate outdoor recreation resources" and that "all levels of government and private interests... take prompt and coordinated action... to conserve, develop, and utilize such [their] resources for the benefit and enjoyment of the American people." The Sec-

retary of the Interior was directed to inventory, evaluate and classify outdoor recreation facilities, and formulate and maintain a comprehensive nationwide outdoor recreation plan.

Public Law 88-578

Approved September 3, 1964, (78 Stat. 897) created the Land and Water Conservation Fund, derived from various types of revenue (primarily Outer Continental Shelf oil monies) and authorizes appropriations from the fund for (1) matching grants to States for outdoor recreation projects and (2) land acquisition for various Federal agencies.

P.L. 94-422

Approved September 28, 1976, (90 Stat. 1313) authorized funds for, among other things, the National Wildlife Refuge System for acquisition of: (1) habitat of endangered and threatened species of fish, wildlife and plants under section 5(a) of the Endangered Species Act; (2) areas authorized by section 2 of the Refuge Recreation Act; (3) areas under section 7(a)(5) of the Fish and Wildlife Act of 1956, except migratory waterfowl areas which are authorized by the Migratory Bird Conservation Act; and (4) any areas authorized by specific Acts of Congress.

P.L. 95-42

Approved June 10, 1977, (91 Stat. 210) increased the authorizations for acquisition of certain previously authorized areas.

P.L. 98-369

Approved July 18, 1984, (98 Stat. 1020) provided that up to $1 million annually in excess motorboat fuels tax revenues shall be transferred to the Fund.

P.L. 100-17

Approved April 2, 1987, (101 Stat. 132) extended the motorboat fuels tax component of the Fund through October 1993, and extended the authorization to pay funds received to the Land and Water Conservation Fund, and the Sport Fish Restoration Account through that date.

Public Law 100-203

Approved December 22, 1987, (101 Stat. 1330) reauthorized the Fund without change through the

Lacey Act Amendments

This Act replaces the Black Bass Act of 1926 and most of the original Lacey Act. The Lacey Act Amendments make it unlawful to import, export, transport, buy or sell fish, wildlife and plants taken or possessed in violation of federal, state or tribal law. Interstate or foreign commerce in fish and wildlife taken or possessed in violation of foreign law also is illegal. The Act requires that packages containing fish or wildlife be plainly marked. Enforcement measures include civil and criminal penalties, cancellation of hunting and fishing licenses, and forfeiture.

Timber Protection Act

(Approved September 20, 1922; 16 U.S.C. 594; 42 Stat. 857) This Act authorizes the Secretary of the Interior to protect timber on lands under the Department's jurisdiction from fire, disease and insects, and to cooperate with other Federal agencies, States, or owners of timber.

Reciprocal Fire Protection Act

(Approved May 27, 1955) as amended by the Wildfire Suppression Assistance Act of 1989 (69 Stat. 66, 67; 42 U.S.C. 1856a)(102 Stat. 1615) This Act authorizes reciprocal fire protection agreements with any fire organization for mutual aid with or without reimbursement and allows for emergency assistance in the vicinity of agency facilities in extinguishing fires when no agreement exists.

Wilderness Act of 1964

(PL 88-577, 78 Stat. 890; 16 USC 1121 [note], 1131-1136), as amended. In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. or this purpose there is hereby established a National Wilderness Preservation

System to be composed of federally owned areas designated by Congress as "wilderness areas," and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this chapter or by a subsequent Act.

Public Law 94-577

(Approved October 19, 1976 (90 Stat. 2633) Section 1(f) designated the Crab Orchard Wilderness and Section 6 addressed the administration and management of the area.

Endangered Species Act of 1973

(16 U.S.C. 1531 et seq. as amended) This Act directs Federal agencies to take actions that would further the purposes of the Act and to ensure that actions they carry out, authorize or fund do not jeopardize endangered species or their critical habitat. The Act also provides authority for land acquisition. Conservation of threatened and endangered species has become a major objective of both land acquisition and Refuge management programs.

The Recreation Act

(Public Law 87-714, approved September 28, 1962, 76 Stat. 653; as amended by Public Law 89-669, approved October 14, 1966, 80 Stat. 930; and Public Law 92-534, approved October 23, 1972, 86 Stat. 1063; 16 U.S.C. 460k-460k-4) This Act authorized the Secretary of the Interior to administer refuges, hatcheries and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. The Act requires that any recreational use on areas of the National Wildlife Refuge System be "compatible" with the primary purpose(s) for which the area was acquired or established. The Act also requires that sufficient funding be available for the development, operation and maintenance of recreational uses that are not directly related to the area's primary purpose(s). The Act provided for public use fees and permits, and penalties for violation of regulations. It also authorized the acceptance of donations of funds and real and personal property to assist in carrying out its purposes.

Public Law 93-205

Approved December 28, 1973 (87 Stat. 902), authorized acquisition of lands and interests suitable for: 1) fish and wildlife-oriented recreation, 2) protection of natural resources, 3) conservation of endangered or threatened species, or 4) carrying out two or more of the above. Such lands were required to be adjacent to or within an existing conservation area. Acquisition was not permitted with "duck stamp" receipts for these purposes.

Enforcement provisions were amended by Public Law 95-616, approved November 8, 1978 (92 Stat. 3110), and were further revised by Public Law 98-473, approved October 12, 1984 (98 Stat. 2028, 2031), which made violations misdemeanors in accordance with the uniform sentencing provisions of that law (18 U.S.C. 3551-3586).

National Trails System Act

(Public Law 90-543, approved October 2, 1968; 82 Stat. 919; 16 U.S.C. 1241-1249) This Act and its subsequent amendments authorized a national system of trails and defined four categories of trails.

Public Law 95-625

Approved November 10, 1978, (92 Stat. 3511) amended the NTSA to create a new category of National Historic Trails, to closely follow original routes of national historic significance.

National Recreation Trails may be established by the Secretaries of Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved State(s), and other land managing agencies, if any. National Scenic and National Historic Trails may only be designated by an Act of Congress. Connecting or Side Trails provide access to or among the other classes of trails.

As of 1998, the National Trails System included 20 trails (8 scenic, 12 historic), and of these, segments of 12 crossed units of the National Wildlife Refuge System.

Legislation is pending to add National Discovery Trails as a new category of long-distance trails and designate the American Discovery Trail as the first National Discovery Trail. The American Discovery Trail covers more than 6,000 miles from Delaware to California and crosses through the southern portion of Crab Orchard Refuge.

National Hunting and Fishing Day Statutes

National Hunting and Fishing Day Statutes establishing the fourth Saturday in September of the year indicated as National Hunting and Fishing Day include:

1973 – Public Law 93-23, approved April 20, 1973 (87 Stat. 24)
1974 – Public Law 93-424, approved September 27, 1974 (88 Stat. 1166)
1975 – Public Law 94-96, approved September 18, 1975 (89 Stat. 478)

In addition, P.L. 99-217, approved April 1, 1986 (100 Stat. 81), and P.L. 100-22, approved April 10, 1987 (101 Stat. 267), established the first week of June of those years as National Fishing Week.

After 1975, private organizations have worked directly with the White House to secure Presidential proclamations for the designation. In 1979, former President Carter designated the third Saturday in October of that year, "and thereafter," as National Hunting and Fishing Day, eliminating the need for annual proclamations. Since then, it has been the usual practice for the President to issue a statement each year commemorating the day.

Take Pride in America Program

(Title XI of Public Law 101-628, signed November 28, 1990; 16 USC 4601 note; 104 Stat. 4502) This Act established the TPIA within the Department of the Interior. The purposes of the program include:

Establishing and maintaining a public awareness campaign to instill in the public an appreciation for Federal, State, and local lands, facilities, and cultural and natural resources.
Conducting a national awards program to honor individuals and entities that distinguish themselves in the appreciation, conservation, and stewardship of these resources.
Administering the "Take Pride in America" slogan and logo.

Environmental Education Act of 1990

(Public Law 101-619, signed November 16, 1990; 20 USC 5501-5510; 104 Stat. 3325) This Act established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a Federal environmental education program.

Responsibilities of the Office include developing and supporting programs to improve understanding of the natural and developed environment, and the relationships between humans and their environment; supporting the dissemination of educational materials; developing and supporting training programs and environmental education seminars; managing a Federal grant program; and administering an environmental internship and fellowship program. The Office is required to develop and support environmental programs in consultation with other Federal natural resource management agencies, including the Fish and Wildlife Service.

The Act requires the Education Office Advisory Council to submit a report to Congress by November 16, 1992, regarding obstacles to improving environmental education programs, including those relating to national parks and wildlife refuges.

Antiquities Act of 1906 (16 U.S.C. 431-433)

This Act authorizes the scientific investigation of antiquities on Federal land, subject to the stipulations outlined in permits issued to recognized educational, scientific, and other institutions for the purposes of systematically gathering data. The Act provides that objects taken or collected without a permit may result in a fine and imprisonment of the convicted person.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470-470t)

This Act establishes as policy that the Federal Government is to provide leadership in the preservation of the Nation's prehistoric and historic resources. Historic preservation is defined in the Act as the protection, rehabilitation, restoration, and reconstruction of sites, buildings, structures, and objects significant in American history, architecture, engineering, and archaeology. Sections

106 and 110 of the Act define the primary requirements for Federal agencies to follow in identifying, evaluating, and protecting significant cultural resources.

Archeological and Historic Preservation Act of 1974 (16 U.S.C. 469-469c)

This Act directs the preservation of historic and archaeological data in Federal construction projects. The Act authorizes Federal agencies to seek future appropriations, to obligate available funding, or to reprogram existing appropriations to provide for the identification and preservation of data.

Archaeological Resources Protection Act of 1979, as amended

This Act protects materials of archaeological interest from unauthorized removal or destruction, and requires Federal managers to develop plans and schedules to locate archaeological resources.

National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321-4347; 40 CFR 1500).

This Act requires Federal agencies to examine the impacts upon the environment that their actions might have, to incorporate the best available environmental information, and public participation in the planning and implementation of any major Federal action significantly affecting the quality of the human environment. All Federal agencies must integrate NEPA with other planning

Executive Order 11593, Protection and Enhancement of the Cultural Environment (1971)

This Executive Order directs the Service to consult with Federal and State Historic Preservation Officers when the Service proposes any development activities that would affect archaeological or historic sites to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

Executive Order 11644, Use of Off-road Vehicles on Public Lands

(Signed February 8, 1972) This purpose of this Executive Order is to establish policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.

Executive Order 12962, Recreational Fisheries

This Executive Order directs the Service to conserve, restore, and enhance aquatic ecosystems to provide for increased recreational fishing opportunities nationwide. Additionally, the Order directs the Service to provide access to, and promote awareness of, opportunities for public participation and enjoyment of U.S. recreational fishery resources.

Executive Order 11988, Floodplain Management (signed May 24, 1977)

This Executive Order states that each Federal agency shall, in the course of fulfilling their respective authorities, provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. The purpose of this Order is to prevent Federal agencies from contributing to the "adverse impacts associated with the occupancy and modification of floodplains" and the "direct or indirect support of floodplain development."

Before proposing, conducting, supporting or allowing an action in a floodplain, each agency is to determine if planned activities will affect the floodplain and evaluate the potential effects of the intended actions on its functions. Agencies shall avoid siting development in a floodplain "to avoid adverse effects and incompatible development in the floodplains."

Executive Order 11990, Protection of Wetlands

(Signed May 24, 1977) The purpose of this Executive Order is to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Executive Order 12372, Intergovernmental Review of Federal Programs

(Signed July 14, 1982) The purpose of this Executive Order is to foster an intergovernmental partnership and a strengthened federalism by relying on State and local processes for the State and local government coordination and review of proposed Federal financial assistance and direct Federal development.

Executive Order 12898, Environmental Justice in Minority Populations and Low-income Populations

(Signed February 11, 1994; 59 FR 7629; February 16, 1994; Amends: EO 12250, November 2, 1980; Amended by: EO 12948, January 30, 1995)

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System

(Signed March 25, 1996; 61 FR 13647; March 28, 1996; See: EO 13022, October 31, 1996) This Executive Order states that the System provides important opportunities for compatible wildlife-dependent recreational activities involving hunting, fishing, wildlife viewing, and photography. The Order also directs the Service to recognize these compatible wildlife-dependent uses as priority general public uses of the System, and uses through which the American public can develop an appreciation for fish and wildlife.

Executive Order 13112, Management of Invasive Species

(Signed February 3, 1999) The purpose of this Executive Order is to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. Each Federal agency whose actions may affect the status of invasive species is directed, to the extent practicable and permitted by law, to identify such actions; and, subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: prevent the introduction of invasive species; detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; monitor invasive species populations accurately and reliably; provide for restoration of native species and habitat conditions in ecosystems that have been invaded; conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and promote public education on invasive species and the means to address them; and not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species.

Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

(Signed January 10, 2001) This Executive Order directed each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within 2 years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service that promotes the conservation of migratory bird populations. A subsequent Director's Order (No. 172), developed in accordance with Executive Order 13186, provides guidance for Service programs relative to the management and conservation of migratory birds. Its purpose is to minimize the potential adverse effects of migratory bird take, with the goal of striving to eliminate take, while implementing our mission. The Director's Order includes guidelines for Migratory Birds and State Programs, National Wildlife Refuge System, Endangered Species, Fisheries and Habitat Conservation, Law Enforcement, International Affairs, and Business Management and Operations.

Federal Noxious Weed Act of 1974

(Public Law 93-629, enacted January 3, 1975; 7 U.S.C. 2801 et. seq.; 88 Stat. 2148) This Act requires the use of integrated management systems to control or contain undesirable plant species, and an interdisciplinary approach with the cooperation of other Federal and State agencies.

The Secretary of Agriculture was given the authority to designate plants as noxious weeds by regulation, and the movement of all such weeds in interstate or foreign commerce was prohibited except under permit. The Secretary was also given authority to inspect, seize and destroy products, and to quarantine areas, if necessary to prevent the spread of such weeds. He was also authorized to cooperate with other Federal, State and local agencies, farmers associations and private individuals in measures to control, eradicate, or prevent or retard the spread of such weeds.

Section 1453 of P.L. 101-624, the 1990 Farm Bill

Enacted November 28, 1990 (104 Stat 3611), amended the Act by requiring each Federal land-managing agency to:

Designate an office or person adequately trained in managing undesirable plant species to develop and coordinate a program to control such plants on the agency's land;
Establish and adequately fund this plant management program through the agency's budget process;
Complete and implement cooperative agreements (requirements for which are provided) with the States regarding undesirable plants on agency land; and
Establish integrated management systems (as defined in the section) to control or contain undesirable plants targeted under the cooperative agreements.

The law also requires that any environmental assessments or impact statements that may be required to implement plant control agreements must be completed within 1 year of the time the need for the document is established.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

(26 U.S.C. 4611-4682; P.L. 96-510, December 11, 1980; 94 Stat. 2797). Major amendments were enacted in 1983 (42 U.S.C. 9601-9657; P.L. 98-802, August 23, 1983; 97 Stat. 485) and in 1986 (P.L. 99-499; October 17, 1986; 100 Stat. 1613). (The two sets of amendments reconstituted the 26 U.S.C. 4611-82 provisions into a new trust fund at 26 U.S.C. 9507 and operational provisions into the Title 42 sections.) This Act created the Superfund program to clean up hazardous waste sites that pose the greatest risk to public health in the United States and established the National Priorities List (NPL) to track them.

The 1980 statute authorized, through 1985, the collection of taxes on crude oil and petroleum products, certain chemicals, and hazardous wastes. It also established liability to the U.S. Government for damage to natural resources over which the U.S. has sovereign rights [42 U.S.C. 9607(f)(1)] and requires the President to designate Federal officials to act as trustees for natural resources. Use of Superfund monies to conduct natural resource damage assessments was provided in section 11(c)(1) [42 U.S.C. 9611 (c)(1)].

Subchapter I of the 1983 amendments established a comprehensive system to react to releases of hazardous substances and to determine liability and compensation for those affected (42 U.S.C. 9601-9626). The President is authorized to notify Federal and State natural resource trustees of potential damages to natural resources and to coordinate related assessments [42 U.S.C. 9604 (b)(2)]. Revisions to the national contingency plan for removal of oil and hazardous substances and to prioritize such releases were required by the 1983 amendments [42 U.S.C. 9605(a)].

Amendments enacted in 1986 (known as the Superfund Amendment and Reauthorization Act, or SARA):

listed conditions under which a facility or vessel owner may be authorized by the President to conduct remedial or removal actions for the release of hazardous substances (42 U.S.C. 9604);
added effects on natural resources as a criterion for determining facilities to be placed on the National Priorities List, and required the National Contingency Plan to be revised to incorporate a Hazard Ranking System (42 U.S.C. 9605);
mandated the designation of Federal officials to act as trustees for natural resources and to assess damages and injury to, as well as destruction of, or loss of, natural resources (42 U.S.C. 9607);
stipulated that Superfund monies may only be used for natural resource damage claims if all administrative and judicial remedies to recover costs from liable parties have been exhausted (42 U.S.C. 9611);
provided that claims cannot be made to recover for natural resource damages unless the claim is presented within three years after discovering the loss (42 U.S.C. 9612);
added a new section to clarify that Federal facilities are subject to the same cleanup requirements and liability standards as non-governmental entities (42 U.S.C. 9620);

specified that no Federal permits are required for remedial action conducted entirely on-site when such actions comply with the cleanup standards (42 U.S.C. 9604);

required that Federal trustees be notified of any settlement negotiations regarding damages to natural resources, and established circumstances under which Federal trustees may agree not to sue for natural resource damages (42 U.S.C. 9607); and

eliminated the authorization for use of Superfund monies to conduct damage assessments - section 517 of SARA, codified at 26 U.S.C. 9507(c), and reinforced by section 531 of SARA.

The Department of the Interior is a trustee for natural resources, and the Service is responsible for the protection and restoration of trust resources injured by uncontrolled releases of hazardous materials. The Service is responsible for conducting assessments to establish injury and the dollar equivalent of that injury for collection of damages from parties responsible for releasing hazardous materials.

Rehabilitation Act of 1973

This Act requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the Federal government to ensure that anybody can participate in any program.

Architectural Barriers Act of 1968

This Act requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Americans With Disabilities Act of 1992

This Act prohibits discrimination in public accommodations and services.

Bureau and agency legal and policy guidance is found in:

1. Departmental Manual: The Departmental Manual can be accessed on-line at http://elips.doi.gov/tableofcontents1.cfm
2. Fish and Wildlife Service Manual: The Fish and Wildlife Service Manual has regulatory force and effect within the Service. It implements the Service's authorities and the Director's policies, and steps down the Service's compliance with other requirements, such as statutes, Executive Orders, Departmental directives, and regulations of other agencies. The Fish and Wildlife Service Manual can be accessed on-line at http://policy.fws.gov/manual.html
3. Refuge Manual: Guidance found in the earlier Refuge Manual may be used when the specific chapter of the Fish and Wildlife Service Manual has not yet been published.

Appendix D: Species List

Appendix D: Species Lists, Crab Orchard NWR

This bird list contains 220 species which have been recorded on the refuge. Another 40 species, very rare or accidental and out of their normal range, are listed under "Accidental" birds. This list is based on: U.S. Fish and Wildlife Service. 1994. Birds of Crab Orchard National Wildlife Refuge, Illinois.

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
# – irruptive species seen only during invasion years (2-10 year intervals) * – nests on refuge Sp – March-May S – June-August F – September-November W – December-February a – abundant: common species that is very numerous c – common: certain to be seen in suitable habitat u – uncommon: present but not certain to be seen o – occasional: seen only a few times during a season r – rare: seen only once or twice a year; some years not at all.				
LOONS	u	-	o	u
Common Loon				
GREBES	Sp	S	F	W
Pied-billed Grebe	u	-	c	c
Horned Grebe	c	-	c	o
Eared Grebe	o	-	-	o
CORMORANTS	Sp	S	F	W
Double-crested Cormorant	c	o	a	a
BITTERNS, HERONS	Sp	S	F	W
American Bittern	o	-	r	-
Great Blue Heron	c	c	c	c
Great Egret	o	u	u	-
Little Blue Heron	u	u	u	-
Cattle Egret	o	u	o	-
Green Heron*	u	c	c	-
Black-crowned Night-Heron*	r	o	o	-
Yellow-crowned Night-Heron	r	-	o	-

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
SWANS, GEESE, DUCKS	Sp	S	F	W
Tundra Swan (Whistling Swan)	o	r	u	u
Mute Swan	r	-	r	r
Greater White-fronted Goose	-	-	r	o
Snow Goose	o	-	u	u
Canada Goose*	c	u	a	a
Wood Duck	c	c	c	c
Green-winged Teal	o	-	o	r
American Black Duck	c	-	a	a
Mallard*	c	c	a	a
Northern Pintail	o	-	u	c
Blue-winged Teal	c	u	a	o
Northern Shoveler	a	o	a	c
Gadwall	a	-	a	a
American Wigeon	c	-	c	u
Canvasback	u	-	o	c
Redhead	a	-	u	o
Ring-necked Duck	a	-	a	a
Greater Scaup	r	-	r	-
Lesser Scaup	a	-	a	c
Common Goldeneye	c	-	o	a
Bufflehead	c	-	c	c
Hooded Merganser	c	-	a	a
Common Merganser	a	-	c	a
Red-breasted Merganser	a	-	c	o
Ruddy Duck	a	-	u	c
VULTURES, HAWKS, FALCONS	Sp	S	F	W
Turkey Vulture*	c	c	c	r
Osprey	o	r	o	r
Mississippi Kite	r	r	r	-
Bald Eagle*	u	u	c	c
Northern Harrier (Marsh Hawk)	o	r	o	o
Sharp-shinned Hawk	o	-	u	u
Cooper's Hawk*	u	u	u	o
Northern Goshawk	r	-	r	r
Red-shouldered Hawk*	c	u	u	c
Broad-winged Hawk*	o	u	u	o
Red-tailed Hawk*	c	c	c	c
Rough-legged Hawk	o	r	r	o

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
Golden Eagle	o	-	o	o
American Kestrel*	c	c	c	c
Merlin	r	-	r	r
GALLINACEOUS BIRDS	Sp	S	F	W
Wild Turkey*	c	c	c	c
Northern Bobwhite*	c	c	c	c
RAILS	Sp	S	F	W
Virginia Rail	r	r	r	-
Sora	o	-	o	-
American Coot	u	u	c	c
SHOREBIRDS	Sp	S	F	W
American Golden-Plover	c	-	u	-
Semipalmated Plover	c	-	o	-
Killdeer*	c	c	c	c
American Avocet	-	-	o	-
Greater Yellowlegs	c	-	u	-
Lesser Yellowlegs	c	u	c	-
Solitary Sandpiper	c	o	c	-
Willet	r	o	-	-
Spotted Sandpiper*	u	u	-	-
Semipalmated Sandpiper	u	-	u	-
Least Sandpiper	c	u	u	-
White-rumped Sandpiper	o	-	r	-
Pectoral Sandpiper	a	c	c	-
Stilt Sandpiper	r	-	u	-
Short-billed Dowitcher	o	-	c	-
Long-billed Dowitcher	o	-	o	-
Common Snipe	c	-	c	o
American Woodcock*	c	c	c	o
Wilson's Phalarope	o	r	o	-
GULLS, TERNS	Sp	S	F	W
Bonaparte's Gull	c	-	u	c
Ring-billed Gull	a	o	c	a
Herring Gull	c	-	u	c
Caspian Tern	r	-	r	-
Forster's Tern	o	-	r	-
Black Tern	o	r	u	-

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
DOVES	Sp	S	F	W
Rock Dove	u	u	u	u
Mourning Dove	c	c	c	c
CUCKOOS	Sp	S	F	W
Black-billed Cuckoo	o	o	o	-
Yellow-billed Cuckoo	u	c	c	-
OWLS	Sp	S	F	W
Barn Owl	o	o	o	o
Eastern Screech-Owl*	u	u	u	u
Great Horned Owl*	c	c	c	c
Barred Owl*	c	c	c	c
Short-eared Owl	r	-	o	r
GOATSUCKERS	Sp	S	F	W
Common Nighthawk*	o	u	o	-
Chuck-will's-widow*	o	o	-	-
Whip-poor-will	u	u	o	-
SWIFTS, HUMMINGBIRDS	Sp	S	F	W
Chimney Swift*	c	c	c	-
Ruby-throated Hummingbird*	u	c	o	-
KINGFISHERS	Sp	S	F	W
Belted Kingfisher*	u	u	u	u
WOODPECKERS	Sp	S	F	W
Red-headed Woodpecker*	u	u	u	u
Red-bellied Woodpecker*	c	c	c	c
Yellow-bellied Sapsucker	o	-	o	r
Downy Woodpecker*	c	c	c	c
Hairy Woodpecker*	o	o	o	o
Northern Flicker (Common Flicker)*	c	c	c	c
Pileated Woodpecker*	o	o	o	o
FLYCATCHERS	Sp	S	F	W
Olive-sided Flycatcher	r	-	r	-
Eastern Wood-Pewee*	c	c	u	u
Yellow-bellied Flycatcher	r	-	r	-

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
Acadian Flycatcher*	o	u	u	-
Alder Flycatcher*	r	-	r	-
Willow Flycatcher	r	-	r	-
Least Flycatcher	o	-	o	-
Eastern Phoebe*	c	c	c	o
Great Crested Flycatcher*	c	c	r	-
Eastern Kingbird*	c	c	o	-
LARKS	Sp	S	F	W
Horned Lark*	o	o	o	o
SWALLOWS	Sp	S	F	W
Purple Martin*	c	c	o	-
Tree Swallow*	c	c	c	-
Northern Rough-winged Swallow*	u	c	u	-
Bank Swallow	o	-	-	-
Cliff Swallow*	c	c	o	-
Barn Swallow*	c	c	u	-
JAYS, CROWS	Sp	S	F	W
Blue Jay*	a	a	a	a
American Crow*	c	c	c	-
Fish Crow	o	o	o	o
CHICKADEES	Sp	S	F	W
Carolina Chickadee*	c	c	c	c
Tufted Titmouse*	c	c	c	c
NUTHATCHES	Sp	S	F	W
Red-breasted Nuthatch	o	-	o	u
White-breasted Nuthatch	u	o	u	u
CREEPERS	Sp	S	F	W
Brown Creeper	o	-	o	o
WRENS	Sp	S	F	W
Carolina Wren*	c	c	c	u
House Wren*	c	c	c	-
Winter Wren	o	o	o	-
Sedge Wren	o	o	o	-
Marsh Wren	r	-	r	-

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
KINGLETS	Sp	S	F	W
Golden-crowned Kinglet	u	-	u	u
Ruby-crowned Kinglet	u	-	u	u
Blue-gray Gnatcatcher*	c	c	o	-
THRUSHES	Sp	S	F	W
Eastern Bluebird*	c	c	c	c
Veery	o	-	r	-
Gray-cheeked Thrush	u	-	u	-
Swainson's Thrush	o	-	o	-
Hermit Thrush	o	-	u	r
Wood Thrush*	o	u	r	-
American Robin*	c	c	c	u
THRASHERS	Sp	S	F	W
Gray Catbird*	c	c	c	-
Northern Mockingbird*	c	c	c	c
Brown Thrasher*	c	c	c	o
WAXWINGS	Sp	S	F	W
Cedar Waxwing*	c	u	u	c
SHRIKES	Sp	S	F	W
Loggerhead Shrike	u	u	u	u
STARLINGS	Sp	S	F	W
European Starling*	a	a	a	a
VIREOS	Sp	S	F	W
White-eyed Vireo*	c	c	u	-
Bell's Vireo	r	r	-	-
Yellow-throated Vireo*	o	u	o	-
Warbling Vireo*	c	c	o	-
Red-eyed Vireo*	u	u	o	-
WOOD WARBLERS	Sp	S	F	W
Blue-winged Warbler	o	r	r	-
Golden-winged Warbler	o	r	-	r
Tennessee Warbler	u	-	o	-
Nashville Warbler	r	-	r	-

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
Northern Parula*	c	c	u	-
Yellow Warbler*	o	o	-	-
Chestnut-sided Warbler	o	-	o	-
Magnolia Warbler	o	-	o	-
Cape May Warbler	r	-	r	-
Yellow-rumped Warbler	u	-	u	o
Black-throated Green Warbler	o	-	o	-
Blackburnian Warbler	o	r	r	-
Pine Warbler*	o	u	o	-
Prairie Warbler*	u	u	o	-
Palm Warbler	o	-	o	-
Bay-breasted Warbler	u	-	o	-
Blackpoll Warbler	u	-	r	-
Cerulean Warbler*	o	r	-	-
Black-and-white Warbler	o	r	o	-
American Redstart	o	r	o	-
Prothonotary Warbler*	u	u	r	-
Worm-eating Warbler	r	-	r	-
Ovenbird	o	r	r	-
Northern Waterthrush	o	-	o	-
Louisiana Waterthrush	u	u	r	-
Kentucky Warbler*	u	u	r	-
Common Yellowthroat*	c	c	c	r
Hooded Warbler	o	-	r	-
Wilson's Warbler	o	-	o	-
Canada Warbler	o	-	r	-
Yellow-breasted Chat*	u	u	o	-
TANAGERS	Sp	S	F	W
Summer Tanager*	u	u	o	-
Scarlet Tanager*	u	u	o	-
SPARROWS	Sp	S	F	W
Northern Cardinal*	a	a	a	a
Rose-breasted Grosbeak	o	-	o	-
Blue Grosbeak*	o	o	o	-
Indigo Bunting*	a	a	a	-
Dickcissel*	u	u	-	-
Rufous-sided Towhee*	c	c	c	u
American Tree Sparrow*	c	-	o	c
Chipping Sparrow*	u	u	o	-

Bird Species Found on Crab Orchard NWR

Species	Sp	S	F	W
Field Sparrow*	u	u	o	-
Savannah Sparrow	o	-	u	o
Grasshopper Sparrow*	o	o	r	-
Le Conte's Sparrow	o	-	o	u
Fox Sparrow	o	-	r	u
Song Sparrow*	u	o	o	c
Swamp Sparrow	u	-	u	u
White-throated Sparrow	c	-	c	c
White-crowned Sparrow	c	-	c	c
Dark-eyed Junco	a	-	c	a
MEADOWLARKS, BLACK-BIRDS, ORIOLES	Sp	S	F	W
Red-winged Blackbird*	c	c	a	c
Eastern Meadowlark*	c	c	c	c
Common Grackle*	c	c	a	c
Brown-headed Cowbird*	c	c	c	c
Orchard Oriole*	u	u	o	-
Baltimore Oriole*	u	u	o	-
FINCHES	Sp	S	F	W
House Finch	c	c	c	c
Purple Finch	c	-	u	c
Pine Siskin#	o	-	o	o
American Goldfinch*	c	c	c	c
Evening Grosbeak#	o	-	-	o
OLD WORLD SPARROWS	Sp	S	F	W
House Sparrow*	c	c	c	c

Accidental Species:

Least Bittern

Vermillion Flycatcher

Glossy Ibis

Scissor-tailed Flycatcher

Sandhill Crane

Bewick's Wren

Whooper Swan

Rock Wren

Trumpeter Swan

Water Pipit

Oldsquaw

Solitary Vireo

White-winged Scoter

Philadelphia Vireo

Black Vulture

Orange-crowned Warbler

Common Moorhen

Black-throated Blue Warbler

Black-bellied Plover
Mourning Warbler
Ruddy Turnston
Connecticut Warbler
Dunlin
Swainson's Warbler
Sanderling
Henslow's Sparrow
Baird's Sandpiper
Vesper Sparrow
Upland Sandpiper
Lark Sparrow
Franklin's Gull
Lincoln's Sparrow
Laughing GullLapland Longspur
Black-headed Gull
Pine Grosbeak
Sabine's Gull
Red Crossbill
Least Tern
Rusty Blackbird

Potential Reptile and Amphibian Check List for Crab Orchard National Wildlife Refuge

Common Name	Scientific Name	Class	Residence	Status on Refuge	Habitat
Salamanders					
spotted salamander	*Ambystoma maculatum*	A	B, W	U	W, BF, UF
marbled salamander	*Ambystoma opacum*	A	B, W	U	W, BF
smallmouth salamander	*Ambystoma texanum*	A	B, W	U	W, BF
tiger salamander	*Ambystoma tigrinum*	A	B, W	U	W, UF, BF
eastern newt	*Notophthalmus viridescens*	A	B, W	U	W, BF
northern slimy salamander	*Plethodon glutinosus*	A	B, W	C	UF, BF, RB
lesser siren	*Siren intermedia*	A	B, W	U	W, S
Toads and Frogs					
cricket frog	*Acris crepitans*	A	B, W	A	W, RB, R, UF, S, BF
American toad	*Bufo americanus*	A	B, W	C	W, RB, UF, PF, BF
Fowler-s toad	*Bufo fowleri*	A	B, W	C	W, RB, UF, PF, BF
green treefrog	*Hyla cinerea*	A	B, W	U	W, R, BF
gray treefrog	*Hyla chrysoscelis / versicolor*	A	B, W	C	W, UF, BF, PF
spring peeper	*Pseudacris crucifer*	A	B, W	C	W, UF, BF
upland chorus frog	*Pseudacris feriarum*	A	B, W	C	W, RB, UF, BF
crawfish frog	*Rana areolata*	A	B, W	R	W
bullfrog	*Rana catesbeiana*	A	B, W	A	W, R, BF, S
green frog	*Rana clamitans*	A	B, W	C	W, R, BF, S
southern leopard frog	*Rana sphenocephala*	A	B, W	A	W, R, BF, S
wood frog	*Rana sylvatica*	A	B, W	R	W, BF
eastern spadefoot	*Scaphiopus holbrookii*	A	B, W	R	W, BF
Turtles					
snapping turtle	*Chelydra serpentina*	R	B, W	C	W, R, S
painted turtle	*Chrysemys picta*	R	B, W	C	W, S
eastern box turtle	*Terrapene carolina*	R	B, W	A	RB, UF, PF, BF
red-eared slider	*Trachemys scripta*	R	B, W	C	W, R, S
eastern mud turtle	*Kinosternon subrubrum*	R	B, W	U	W, BF
common musk turtle	*Sternotherus odoratus*	R	B, W	C	W, BF
spiny softshell turtle	*Apalone spinifera*	R	B, W	U	W, R, S
Lizards					
fence lizard	*Sceloporus undulatus*	R	B, W	U	UF, RB, BF
ground skink	*Scincella lateralis*	R	B, W	C	UF, RB, BF
five-lined skink	*Eumeces fasciatus*	R	B, W	C	UF, RB, BF
six-lined racerunner	*Cnemidophorus sexlineatus*	R	B, W	R	RB
Snakes					
worm snake	*Carphophis amoenus*	R	B, W	U	RB, UF, BF
racer	*Coluber constrictor*	R	B, W	C	RB, UF, PF, BF

Potential Reptile and Amphibian Check List for Crab Orchard National Wildlife Refuge

Common Name	Scientific Name	Class	Residence	Status on Refuge	Habitat
ringneck snake	*Diadophis punctatus*	R	B, W	U	RB, UF, BF
rat snake	*Elaphe obsoleta*	R	B, W	C	RB, UF, PF, BF
mud snake	*Farancia abacura*	R	B, W	R	W
eastern hognose snake	*Heterodon platirhinos*	R	B, W	U	RB, UF, PF, BF
prairie kingsnake	*Lampropeltis calligaster*	R	B, W	C	RB
common kingsnake	*Lampropeltis getula*	R	B, W	U	RB, UF, BF
plainbelly water snake	*Nerodia erythrogaster*	R	B, W	C	W, R, S
diamondback water snake	*Nerodia rhombifer*	R	B, W	C	W, R, S
midland water snake	*Nerodia sipedon*	R	B, W	C	W, R, S
rough green snake	Opheodrys aestivus	R	B, W	U	RB, UF, BF, PF
brown snake	Storeria dekayi	R	B, W	U	RB, UF, BF
redbelly snake	Storeria occipitomaculata	R	B, W	R	RB, UF, BF
common garter snake	Thamnophis sirtalis	R	B, W	C	W, S, RB, UF, BF
smooth earth snake	Virginia valeriae	R	B, W	R	RB, UF, BF
copperhead	Agkistrodon contortrix	R	B, W	U	RB, UF, BF
Total Amphibians = 20		Total Reptiles = 28			

Mammal Checklist, CrabOrchard NWR

Common Name	Scientific Name	Status on Refuge
Virginia opossum	*Didelphis virginiana*	C
Southeastern shrew	*Sorex longirostris*	U
Southern short-tailed shrew	*Blarina carolinensis*	U
Least Shrew	*Cryptotis parva*	U
Eastern mole	*Scalopus aquaticus*	U
Little brown bat	*Myotis lucifugus*	U
Northern myotis	*Myotis septentrionalis*	U
Indiana bat	*Myotis sodalis*	unknown
Silver-haired bat	*Lasionycteris noctivagans*	U
Eastern pipistrelle	*Pipistrellus subflavus*	U
Big brown bat	*eptesicus fuscus*	U
Red bat	*Lasiurus borealis*	U
Hoary bat	*Lasiurus cinereus*	U
Evening bat	*Nycticeius humeralis*	unknown
Eastern cottontail	*Sylvilagus floridanus*	U
Swamp rabbit	*Sylvilagus aquaticus*	U
Eastern chipmunk	*Tamias striatus*	U
Woodchuck	*Marmota monax*	U
Gray squirrel	*Sciurus carolinensis*	A
Fox squirrel	*Sciurus niger*	A
Southern flying squirrel	*Glaucomys volans*	U
Beaver	*Castor canadensis*	C
Marsh rice rat	*oryzomys palustris*	unknown
Deer mouse	*Peromyscus maniculatus*	U
White-footed mouse	*Peromyscus leucopus*	U
Cotton mouse	*peromyscus gossypinus*	U
Golden mouse	*Peromyscus nuttalli*	R
Prairie vole	*microtus ochrogaster*	U
Woodland (pine) vole	*Microtus pinetorum*	U
Muskrat	*Ondatra zibethicus*	U
Norway rat	*Rattus norvegicus*	U
House mouse	*Mus musculus*	U
Meadow jumping mouse	*Zapus hudsonius*	U
Coyote	*Canis latrans*	U
Red fox	*Vulpes fulva*	U
Gray fox	*urocyon cinereoargenteus*	R
Raccoon	*Procyon lotor*	C
Long-tailed weasel	*Mustela frenata*	U
Mink	*Mustela vison*	U
Striped skunk	*Mephitis mephitis*	C
River otter	*Lutra canadensis*	R
Bobcat	*Felis rufus*	U
White-tailed deer	*Odocoileus virginianus*	C

Class Code	Type Code	Status Code	Habitat Code
A= Agnatha C= Chondricthyes O= Osteichthyes	A= anadromous C= catadromous F= freshwater S= saltwater	A= Abundant, a common species that is very common C= Common, certain to be seen or encountered in suitable habitat U= Uncommon, present but not always seen R= Rare, seen only occasionally S= Stocked populations	L= Lake R= River P= Pone SL=Slough S=Stream
Names of the fish herein are after: Mayden, R.L. 1992. *Systematics, Historical Ecology, & North American Freshwater Fishes*. Stanford University Press. Stanford, California. Fish distribution data were collected from the following sources:Runyon, K.R. 1997. Determination of the effects of discharge from Little Grassy Fish Hatchery on Little Grassy Creek. M.S. Thesis. Southern Illinois University, Carbondale. 82p.U.S. Fish and Wildlife Service. 1999. Survey of the fish of Crab Orchard National Wildlife Refuge. Illinois Environmental Protection Agency. 1997. An intensive survey of the Big Muddy River Basin.Additional presence, absence and distributional data was obtained from the ichthyology museum at Southern Illinois University at Carbondale.			

Fish Species of Crab Orchard National Wildlife Refuge

Common Name	Scientific Name	Class	Type	Status on Refuge	Habitat	Exotic or Native
Bigmouth buffalo	*Ictiobus cyprinellus*	O	F	U	L	N
Black bullhead	*Ameiurus melas*	O	F	C	L,S,SL,P,R	N
Black buffalo	*Ictiobus niger*	O	F	U	R	N
Black crappie	*Pomoxis nigromaculatus*	O	F	C	L,S,SL,P,R	N
Blacknose dace	*Rhinichthys atratulus*	O	F	R	S	N
Blackspotted topminnow	*Fundulus olivaceus*	O	F	C	S,L,P,R	N
Blackstripe topminnow	*Fundulus notatus*	O	F	C	S,L,P,R	N
Bluegill	*Lepomis macrochirus*	O	F	A	L,S,SL,P,R	N
Bluntnose darter	*Etheostoma chlorosomum*	O	F	R	S,R	N
Bluntnose minnow	*Pimephales notatus*	O	F	A	L,S,R	N
Bowfin	*Amia calva*	O	F	C	L,SL,P,R	N
Brown trout	*Salmo trutta*	O	F	U,S	L	E
Brook silverside	*Labidesthes sicculus*	O	F	C	L,S,R	N
Bullhead minnow	*Pimephales vigilax*	O	F	U	S,SL	N
Central stoneroller	*Campostoma anomalum*	O	F	U	S,R	N
Channel catfish	*Ictalurus punctatus*	O	F	C	S,L,P,R	N
Creek chubsucker	*Erimyzon oblongus*	O	F	C	S,SL	N
Common carp	*Cyprinus carpio*	O	F	A	L,S,SL,P,R	E
Creek chub	*Semotilus atromaculatus*	O	F	C	S,R	N
Fathead minnow	*Pimephales promelas*	O	F	U	S,SL	N
Flathead catfish	*Pylodictis olivaris*	O	F	U,S	L	E
Flier	*Centrarchus macropterus*	O	F	U	S,SL	N
Freshwater drum	*Aplodinotus grunniens*	O	F	U	R	N
Gizzard shad	*Dorosoma cepedianum*	O	F	A	L,S,R	N
Golden shiner	*Notemigonus crysoleucas*	O	F	C	L,S,SL,P,R	N
Grass pickeral	*Esox americanus*	O	F	C	L,S,SL,P,R	N
Green sunfish	*Lepomis cyanellus*	O	F	C	L,S,SL,P,R	N
Hybrid stripedbass		O	F	U,S	L	E
Johnny darter	*Etheostoma nigrum*	O	F	U	S,R	N
Largemouth bass	*Micropterus salmoides*	O	F	C	L,S,SL,P,R	N
Logperch	*Percina caprodes*	O	F	U	L,S	N
Longear sunfish	*Lepomis megalotis*	O	F	C	L,S,P,R	N

Fish Species of Crab Orchard National Wildlife Refuge

Common Name	Scientific Name	Class	Type	Status on Refuge	Habitat	Exotic or Native
Mosquitofish	*Gambusia affinis*	O	F	A	L,S,SL,P,R	N
Orangespotted sunfish	*Lepomis humilis*	O	F	U	L,S,SL,P,R	N
Orangethroat darter	*Etheostoma spectabile*	O	F	U	S,R	N
Paddlefish	*Polyodon spathula*	A	F	R	R	N
Pirate perch	*Aphredoderus sayanus*	O	F	U	S,SL	N
Rainbow trout	*Oncorhynchus mykiss*	O	F	U,S	L	E
Red shiner	*Cyprinella lutrensis*	O	F	C	S,R	N
Redear sunfish	*Lepomis microlophus*	O	F	C	L,S,P,R	N
Redfin shiner	*Lythrurus umbratilis*	O	F	U	S,R	N
Ribbon Shiner	*Lythrurus fumeus*	O	F	R	S,R	N
River darter	*Percina shumardi*	O	F	R	R	N
Shortnose gar	*Lepisosteus platostomus*	O	F	R	R	N
Slough darter	*Etheostoma gracile*	O	F	U	S,SL	N
Small mouth bass	*Micropterus dolomieu*	O	F	R,S	L	E
Small mouth buffalo	*Ictiobus bubalus*	O	F	U	R	N
Spotted bass	*Micropterus punctulatus*	O	F	R	S	N
Spotted sucker	*Minytrema melanops*	O	F	C	L,S,R	N
Steelcolor shiner	*Cyprinella whipplei*	O	F	U	L,S,R	N
Striped bass	*Morone saxatilis*	O	F	C,S	L,R	E
Tadpole madtom	*Noturus gyrinus*	O	F	U	S,R	N
Threadfin shad	*Dorosoma petenense*	O	F	C,S	L	E
Walleye	*Stizostedion vitreum*	O	F	U,S	L	E
Walleye x sauger hybrid		O	F	U,S	L	E
Warmouth	*Chaenobryttus gulosus*	O	F	C	L,S,SL,P,R	N
White bass	*Morone chrysops*	O	F	C	L,S,R	N
White crappie	*Pomoxis annularis*	O	F	C	L,S,SL,P,R	N
White sucker	*Catostomus commersoni*	O	F	U	L,S,R	N
Yellow bass	*Morone mississippiensis*	O	F	C	L,R	N
Yellow bullhead	*Ameiurus natalis*	O	F	U	L,S,SL,P,R	N
Yellow perch	*Perca flavescens*	O	F	C	L	N

TOTALSPECIESCOUNT=61

Vascular Plants of Crab Orchard NWR

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Lycopodiales	*Lycopodiaceae* C Clubmoss	ground-cedar	*Lycopodium complanatum var. flabelliforme*		U			N	
Isoetales	*Isoetaceae* C Quillwort	black quillwort	*Isoetes melanopoda*		U				1
Equisetales	*Equisetaceae* C Horsetail	common horsetail [field horsetail]	*Equisetum arvense*		LC				1
Equisetales	*Equisetaceae* C Horsetail	scouring rush	*Equisetum hyemale affine*		LA				1
Ophioglossales	*Ophioglossaceae* C Adder-s-tongue	bronze fern [cut-leaved grape fern]	*Botrychium dissectum dissectum*		U				1
Ophioglossales	*Ophioglossaceae* C Adder-s-tongue	bronze fern [grape fern]	*Botrychium dissectum obliquum*		LC				1
Ophioglossales	*Ophioglossaceae* C Adder-s-tongue	rattlesnake fern	*Botrychium virginianum*		C				1
Ophioglossales	*Ophioglossaceae* C Adder-s-tongue	adder-s-tongue fern	*Ophioglossum vulgatum pycnostichumm*		O				1
Ficales	*Osmundaceae* C Royal Fern	interrupted fern	*Osmunda claytoniana*		R				1
Ficales	*Polypodiaceae* C Fern	resurrection fern	*Polypodium polypodioides*		U				1
Ficales	*Polypodiaceae* C Fern	polypody	*Polypodium virginianum*		LC				1
Ficales	*Polypodiaceae* C Fern	maidenhair fern	*Adiantum pedatum*		LC				1
Ficales	*Polypodiaceae* C Fern	pinnatifid [lobed] spleenwort	*Asplenium pinnatifidum*		R				1
Ficales	*Polypodiaceae* C Fern	ebony spleenwort	*Asplenium platyneuron*		C				1
Ficales	*Polypodiaceae* C Fern	walking fern	*Asplenium rhizophyllum*		LC				1
Ficales	*Polypodiaceae* C Fern	maidenhair spleenwort	*Asplenium trichomanes ssp. trichomanes*		U				1
Ficales	*Polypodiaceae* C Fern	lady fern	*Athyrium angustum*		U				1
Ficales	*Polypodiaceae* C Fern	southern lady fern	*Athyrium asplenioides*		U				1
Ficales	*Polypodiaceae* C Fern	glade fern [narrow-leaved spleenwort]	*Athyrium pycnocarpon*		U				1
Ficales	*Polypodiaceae* C Fern	silvery spleenwort	*Athyrium thelypterioides*		U				1
Ficales	*Polypodiaceae* C Fern	fragile fern	*Cystopteris protrusa*		LA				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Ficales	*Polypodiaceae* C Fern	Tennessee fragile fern	*Cystopteris X tennesseensis*		R				1
Ficales	*Polypodiaceae* C Fern	Goldie-s fern	*Dryopteris goldiana*		U				1
Ficales	*Polypodiaceae* C Fern	marginal shield fern [leather fern]	*Dryopteris marginalis*		LC				1
Ficales	*Polypodiaceae* C Fern	sensitive fern	*Onoclea sensibilis*		O				1
Ficales	*Polypodiaceae* C Fern	Christmas fern	*Polystichum acrostichoides*		LC				1
Ficales	*Polypodiaceae* C Fern	blunt-lobed woodsia [common woodsia]	*Woodsia obtusa*		O-C				1
Ginkgoales	*Ginkgoaceae*C Ginkgo	ginkgo [maidenhair tree]	*Ginkgo biloba*	tree	R			E	
Coniferales	*Pinaceae* C Pine	shortleaf pine	*Pinus echinata*	tree	A		E	E	1
Coniferales	*Pinaceae* C Pine	loblolly pine	*Pinus taeda*	tree	C			E	1
Coniferales	*Pinaceae* C Pine	Virginia pine [scrub, Jersey, poverty pine]	*Pinus virginiana*	tree	C			E	1
Coniferales	*Pinaceae* C Pine	Scotch pine	*Pinus sylvestris*	tree	R			E	
Coniferales	*Pinaceae* C Pine	ponderosa pine	*Pinus ponderosa*	tree	R			E	
Coniferales	*Pinaceae* C Pine	eastern white pine	*Pinus strobus*	tree	R			E	
Coniferales	*Pinaceae* C Pine	Norway spruce	*Picea abies*	tree	R			E	
Coniferales	*Taxodiaceae* C Baldcypress	baldcypress	*Taxodium distichum*	tree	O			E	
Coniferales	*Cupressaceae* C Cypress	eastern redcedar	*Juniperus virginiana*	tree	LC			N	1
Typhales	*Typhaceae* C Cat-tail	narrow-leaved cat-tail	*Typha angustifolia*						1
Typhales	*Typhaceae* C Cat-tail	common cat-tail	*Typha latifolia*						1
Najadales	*Potamogetonaceae* C Pond-weed	waterthread pondweed	*Potamogeton diversifolius*		O				1
Najadales	*Potamogetonaceae* C Pond-weed	leafy pondweed	*Potamogeton foliosus*		U				1
Najadales	*Potamogetonaceae* C Pond-weed	American pondweed	*Potamogeton nodosus*		LC				1
Alismatales	*Alismaceae* C Water Plantain	arrowhead [arrowleaf]	*Sagittaria calycina*		R				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Alismatales	*Alismaceae* C Water Plantain	water plantain [small-flowered water plantain]	*Alisma plantago-aquatica parviflorum*		R(1) C				1
Hydrocharitales	*Hydrocharitaceae* C Frog-s-bit	anacharis [Canadian waterweed]	*Elodea canadensis*		U				1
Cyperales	*Poaceae* C Grass	giant cane	*Arundinaria gigantea*	shrub	U			N	
Cyperales	*Poaceae* C Grass	goose grass [yard grass]	*Eleusine indica*		LC			E	1
Cyperales	*Poaceae* C Grass	three-flowered melic grass	*Melica nitens*		U				1
Cyperales	*Poaceae* C Grass	orchard grass	*Dactylis glomerata*		C				1
Cyperales	*Poaceae* C Grass	bluegrass	*Poa angustifolia*		R				1
Cyperales	*Poaceae* C Grass	annual bluegrass [low speargrass]	*Poa annua*		O				1
Cyperales	*Poaceae* C Grass	Canadian bluegrass	*Poa compressa*		O				1
Cyperales	*Poaceae* C Grass	Kentucky bluegrass	*Poa pratensis*		LC				1
Cyperales	*Poaceae* C Grass	woodland bluegrass	*Poa sylvestris*		U				1
Cyperales	*Poaceae* C Grass	chess [field brome]	*Bromus arvensis*		LC				1
Cyperales	*Poaceae* C Grass	hairy brome [hairy chess]	*Bromus commutatus*		LC				1
Cyperales	*Poaceae* C Grass	awnless brome [Hungarian, smooth brome]	*Bromus inermis*		O				1
Cyperales	*Poaceae* C Grass	Japanese brome [Japanese chess]	*Bromus japonicus*		LC				1
Cyperales	*Poaceae* C Grass	Canada brome [woodland brome]	*Bromus pubescens*		O				1
Cyperales	*Poaceae* C Grass	bald brome [chess]	*Bromus racemosus*		LA				1
Cyperales	*Poaceae* C Grass	cheat grass brome [downy brome]	*Bromus tectorum*		LA				1
Cyperales	*Poaceae* C Grass	fowl manna grass	*Glyceria striata*		LC				1
Cyperales	*Poaceae* C Grass	purple-top [false red-top, tall red-top]	*Tridens flavus*		A				1
Cyperales	*Poaceae* C Grass	lace grass	*Eragrostis capillaris*		O				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Cyperales	*Poaceae* C Grass	stink grass [stinking love grass]	*Eragrostis cilianensis*		O				1
Cyperales	*Poaceae* C Grass	sandbar love grass	*Eragrostis frankii*		U				1
Cyperales	*Poaceae* C Grass	Carolina love grass [small love grass]	*Eragrostis pectinacea*		LC				1
Cyperales	*Poaceae* C Grass	purple love grass [sand love grass]	*Eragrostis spectabilis*		O				1
Cyperales	*Poaceae* C Grass	nodding fescue	*Festuca obtusa*		O				1
Cyperales	*Poaceae* C Grass	English bluegrass [meadow fescue]	*Festuca pratensis*		O-LA				1
Cyperales	*Poaceae* C Grass	curly grass [poverty oat grass]	*Danthonia spicata*		LC				1
Cyperales	*Poaceae* C Grass	shining wedge grass	*Sphenopholis nitida*		R				1
Cyperales	*Poaceae* C Grass	prairie wedge grass [prairie wedgescale]	*Sphenopholis obtusata*		O				1
Cyperales	*Poaceae* C Grass	bearded wheat [wheat]	*Triticum aestivum*		R				1
Cyperales	*Poaceae* C Grass	little barley [small wild barley]	*Hordeum pusillum*		LC				1
Cyperales	*Poaceae* C Grass	bottlebrush grass	*Elymus histrix*						1
Cyperales	*Poaceae* C Grass	hairy wild rye [silky wild rye, slender wild rye]	*Elymus villosus*						1
Cyperales	*Poaceae* C Grass	lyme grass [Virginia wild rye]	*Elymus virginicus virginicus*						1
Cyperales	*Poaceae* C Grass	lyme grass [Virginia wild rye]	*Elymus virginicus glabriflorus*						1
Cyperales	*Poaceae* C Grass	giant foxtail [nodding foxtail]	*Setaria faberii*		LC			E	1
Cyperales	*Poaceae* C Grass	pigeon grass [yellow foxtail]	*Setaria glauca*		O-LC			E	1
Cyperales	*Poaceae* C Grass	common foxtail [green foxtail]	*Setaria viridis*		O			E	1
Cyperales	*Poaceae* C Grass	barnyard grass	*Echinochloa muricata*		LC				1
Cyperales	*Poaceae* C Grass	bead grass [hairy lens grass]	*Paspalum ciliatifolium*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Cyperales	*Poaceae* C Grass	bead grass	*Paspalum dissectum*		R				1
Cyperales	*Poaceae* C Grass	smooth lens grass	*Paspalum laeve*		LA				1
Cyperales	*Poaceae* C Grass	bead grass [hairy seed paspalum]	*Paspalum pubiflorum*		O-LA				1
Cyperales	*Poaceae* C Grass	panic grass	*Panicum anceps*		LC				1
Cyperales	*Poaceae* C Grass	fall panicum [knee grass]	*Panicum dichotomiflorum*		LC				1
Cyperales	*Poaceae* C Grass	panic grass	*Panicum gattingeri*		LA				1
Cyperales	*Poaceae* C Grass	Munro grass	*Panicum rigidulum*		LC				1
Cyperales	*Poaceae* C Grass	smooth crab grass	*Digitaria ischaemum*		LA				1
Cyperales	*Poaceae* C Grass	hairy crab grass [common crab grass]	*Digitaria sanguinalis*		LC				1
Cyperales	*Poaceae* C Grass	stoutwood reed	*Cinna arundinacea*		O				1
Cyperales	*Poaceae* C Grass	red top	*Agrostis alba*		LC				1
Cyperales	*Poaceae* C Grass	tickle-grass [hair grass, winter bent grass]	*Agrostis hyemalis*		LC				1
Cyperales	*Poaceae* C Grass	autumn bent grass [upland bent grass]	*Agrostis perennans*		C				1
Cyperales	*Poaceae* C Grass	muhly	*Muhlenbergia bushii*		R				1
Cyperales	*Poaceae* C Grass	common satin grass [nimble will, wirestem muhly]	*Muhlenbergia frondosa*		LC				1
Cyperales	*Poaceae* C Grass	nimble will	*Muhlenbergia schreberi*		LC				1
Cyperales	*Poaceae* C Grass	muhly [rock satin grass]	*Muhlenbergia sobolifera*		O				1
Cyperales	*Poaceae* C Grass	three-awn	*Aristida longispica*		O				1
Cyperales	*Poaceae* C Grass	plains three-awn [prairie three-awn, wire grass]	*Aristida oligantha*		LC				1
Cyperales	*Poaceae* C Grass	timothy	*Phleum pratense*		O				1
Cyperales	*Poaceae* C Grass	dropseed [rough dropseed, tall dropseed]	*Sporobolus asper*		U				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Cyperales	*Poaceae* C Grass	northern rush grass [poverty dropseed]	*Sporobolus vaginiflorus*		LC				1
Cyperales	*Poaceae* C Grass	long-awned wood grass	*Brachyelytrum erectum*		O				1
Cyperales	*Poaceae* C Grass	rice cutgrass	*Leersia oryzoides*		LC				1
Cyperales	*Poaceae* C Grass	white grass	*Leersia virginica*		O				1
Cyperales	*Poaceae* C Grass	silver plume grass	*Erianthus alopecuroides*		LC				1
Cyperales	*Poaceae* C Grass	Indian grass [yellow Indian grass]	*Sorghastrum nutans*		LC				1
Cyperales	*Poaceae* C Grass	Johnsongrass [Egyptian millet]	*Sorghum halepense*		LC				1
Cyperales	*Poaceae* C Grass	Elliott-s broom-sedge	*Andropogon elliotii*		LC				1
Cyperales	*Poaceae* C Grass	big bluestem [turkeyfoot]	*Andropogon gerardii*		LC				1
Cyperales	*Poaceae* C Grass	broom-sedge	*Andropogon virginicus*		C				1
Cyperales	*Poaceae* C Grass	little bluestem	*Schizachyrium scoparium [Andropogon scoparius]*		LC				1
Cyperales	*Poaceae* C Grass	gama grass	*Tripsacum dactyloides*		LC				1
Cyperales	*Poaceae* C Grass	corn [maize]	*Zea mays*		LA				
Cyperales	*Cyperaceae* C Sedge	bearded flat sedge	*Cyperus aristatus*		O				1
Cyperales	*Cyperaceae* C Sedge	chufa [ground almond, nut sedge, yellow nutgrass]	*Cyperus esculentus*		LC				1
Cyperales	*Cyperaceae* C Sedge	slender flatsedge	*Cyperus ferruginescens*		O				1
Cyperales	*Cyperaceae* C Sedge	fern flatsedge	*Cyperus filiculmis*		R				1
Cyperales	*Cyperaceae* C Sedge	hedgehog club rush	*Cyperus ovularis*		O				1
Cyperales	*Cyperaceae* C Sedge	straw colored flatsedge	*Cyperus strigosus*		LC				1
Cyperales	*Cyperaceae* C Sedge	needle spike rush	*Eleocharis acicularis*		LC				1
Cyperales	*Cyperaceae* C Sedge	spike rush	*Eleocharis elliptica elliptica*		U				1
Cyperales	*Cyperaceae* C Sedge		*Eleocharis obtusa*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Cyperales	*Cyperaceae* C Sedge	hair sedge [threadleaf beak-seed]	*Bulbostylis capillaris*		U				
Cyperales	*Cyperaceae* C Sedge	dark green rush [green bulrush]	*Scirpus atrovirens*		LC				
Cyperales	*Cyperaceae* C Sedge	wool grass	*Scirpus cyperinus*		LC				
Cyperales	*Cyperaceae* C Sedge	red bulrush	*Scirpus pendulus*		O				
Cyperales	*Cyperaceae* C Sedge	great bulrush	*Scirpus acutus*		R				2
Cyperales	*Cyperaceae* C Sedge	nut-rush	*Scleria pauciflora*		R				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex albursina*		O-C				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex artitecta*		C				1
Cyperales	*Cyperaceae* C Sedge	woodland sedge	*Carex blanda*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex bushii*		C				1
Cyperales	*Cyperaceae* C Sedge		*Carex cephalophora*		O				1
Cyperales	*Cyperaceae* C Sedge		*Carex convoluta*		O				1
Cyperales	*Cyperaceae* C Sedge	fringed sedge	*Carex crinita*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex cristatella*		U				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex digitalis*		U				1
Cyperales	*Cyperaceae* C Sedge	Emory sedge	*Carex emoryi*		U				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex festucacea*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex frankii*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex glaucodea*		C				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex hirsutella*		LC				1
Cyperales	*Cyperaceae* C Sedge	bottlebrush sedge	*Carex hystricina*		LC				1
Cyperales	*Cyperaceae* C Sedge	grass sedge	*Carex jamesii*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex lurida*		LC				1
Cyperales	*Cyperaceae* C Sedge	Mead sedge	*Carex meadii*		U				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex muhlenbergii*		C				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex normalis*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex oligocarpa*		R				1
Cyperales	*Cyperaceae* C Sedge	Pennsylvania sedge	*Carex pennsylvanica*		LC				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex physorhyncha*		LC				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex retroflexa*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex rosea*		O				1
Cyperales	*Cyperaceae* C Sedge	broom sedge	*Carex scoparia*		U				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex styloflexa*		U				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex tenera*		U				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex texensis*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex torta*		LA				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex tribuloides*		O				1
Cyperales	*Cyperaceae* C Sedge	sedge	*Carex umbellata*		O				1
Cyperales	*Cyperaceae* C Sedge	fox sedge	*Carex vulpinoidea*		LC				1
Arales	*Araceae* C Arum	green dragon	*Arisaema dracontium*		O				1
Arales	*Araceae* C Arum	jack-in-the-pulpit [Indian turnip]	*Arisaema triphyllum*		C-O				1
Arales	*Araceae* C Arum	sweet flag [flag root, calamus]	*Acorus americanus*		U				1
Arales	*Lemnaceae* C Duckweed	Columbian water-meal [common water-meal]	*Wolffia columbiana*		LA				1
Arales	*Lemnaceae* C Duckweed	big duckweed [common ducksmeat, duckweed]	*Spirodela polyrhiza*		LA				1
Arales	*Lemnaceae* C Duckweed	duckweed	*Wolffiella gladiata*		LA				1
Commelinales	*Commelinaceae* C Spiderwort	spiderwort	*Tradescantia ohiensis*		U				1
Commelinales	*Commelinaceae* C Spiderwort	common spiderwort	*Tradescantia virginiana*		C				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Commelinales	*Commelinaceae* C Spider-wort	wide-leaved spiderwort	*Tradescantia subaspera*		LC				1
Commelinales	*Commelinaceae* C Spider-wort	common dayflower	*Commelina communis*		LC				1
Juncales	*Juncaceae* C Rush	knotty-leaved rush [tapertip rush]	*Juncus acuminatus*		LC				1
Juncales	*Juncaceae* C Rush	two-flowered rush	*Juncus biflorus*		LC				1
Juncales	*Juncaceae* C Rush	rush	*Juncus brachycarpus*		LA				1
Juncales	*Juncaceae* C Rush	Dudley rush	*Juncus dudleyi*		O				1
Juncales	*Juncaceae* C Rush	common rush	*Juncus effusus solutus*		O				1
Juncales	*Juncaceae* C Rush	inland rush	*Juncus interior*		U				1
Juncales	*Juncaceae* C Rush	rush	*Juncus nodatus*		U				1
Juncales	*Juncaceae* C Rush	rush	*Juncus secundus*		O				1
Juncales	*Juncaceae* C Rush	path rush [poverty rush]	*Juncus tenuis*		LA				1
Juncales	*Juncaceae* C Rush	Torrey rush	*Juncus torreyi*		LC				1
Juncales	*Juncaceae* C Rush	common wood rush	*Luzula multiflora multiflora*		C				1
Juncales	*Juncaceae* C Rush	wood rush	*Luzula multiflora echinata*		O				1
Liliales	*Liliaceae* C Lily	large-flowered bellwort [big merry bells]	*Uvularia grandiflora*		O				1
Liliales	*Liliaceae* C Lily	field garlic	*Allium vineale*		A			E	1
Liliales	*Liliaceae* C Lily	wild garlic [wild onion]	*Allium canadense*		LA				1
Liliales	*Liliaceae* C Lily	garlic [garlic onion]	*Allium sativum*		O				1
Liliales	*Liliaceae* C Lily	false garlic [crow poison]	*Nothoscordum bivalve*		LC				1
Liliales	*Liliaceae* C Lily	orange day-lily [day-lily]	*Hemerocallis fulva*		LC			E	1
Liliales	*Liliaceae* C Lily	Turk-s-cap lily [Michigan lily]	*Lilium michiganense*		U				1
Liliales	*Liliaceae* C Lily	superb lily [Turk-s-cap lily]	*Lilium superbum*		R				1
Liliales	*Liliaceae* C Lily	yellow dog-tooth violet [yellow adder-s tongue]	*Erythronium americanum*		LA				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Liliales	*Liliaceae* C Lily	common star-of-Bethlehem [dove=s dung]	*Ornithogalum umbellatum*		LC				1
Liliales	*Liliaceae* C Lily	yucca [Adam=s needle, Spanish bayonet]	*Yucca flaccida*		U				1
Liliales	*Liliaceae* C Lily	asparagus [garden asparagus]	*Asparagus officinalis*		O				1
Liliales	*Liliaceae* C Lily	false Solomon=s-seal [wild spikenard]	*Smilacina racemosa*		LA				1
Liliales	*Liliaceae* C Lily	small Solomon=s-seal	*Polygonatum biflorum*		O				1
Liliales	*Liliaceae* C Lily	great Solomon=s-seal	*Polygonatum commutatum*		U				1
Liliales	*Liliaceae* C Lily	red trillium [recurved waker-obin]	*Trillium recurvatum*		C				1
Liliales	*Liliaceae* C Lily	white trillium [declined trillium]	*Trillium flexipes*		LC				1
Liliales	*Smilacaceae* C Greenbrier	greenbrier [catbrier, bullbrier]	*Smilax bona-nox*		U				1
Liliales	*Smilacaceae* C Greenbrier	greenbrier [catbrier]	*Smilax glauca*		LC				1
Liliales	*Smilacaceae* C Greenbrier	bristly greenbrier [catbrier]	*Smilax hispida*		O				1
Liliales	*Smilacaceae* C Greenbrier	carrion flower	*Smilax pulverulenta*		O				1
Liliales	*Smilacaceae* C Greenbrier	greenbrier [catbrier]	*Smilax rotundifolia*		U				1
Liliales	*Dioscoreaceae* C Yam	wild yam	*Dioscorea villosa*		LC				1
Liliales	*Dioscoreaceae* C Yam	wild yam	*Dioscorea quaternata*		C				1
Liliales	*Dioscoreaceae* C Yam	Chinese yam [cinnamon vine]	*Dioscorea oppositifolia [D. batatas]*		U			E	
Liliales	*Amaryllidaceae* C Amaryllis	common goldstargrass [yellow stargrass]	*Hypoxis hirsuta*		LC				1
Liliales	*Amaryllidaceae* C Amaryllis	daffodil	*Narcissus pseudo-narcissus*		LC				1
Liliales	*Amaryllidaceae* C Amaryllis	poet=s narcissus	*Narcissus poeticus*		U				1
Liliales	*Iridaceae* C Iris	blackberry lily	*Belamcanda chinensis*		U			E	
Liliales	*Iridaceae* C Iris	flag [German iris, fleur-de-lis]	*Iris X germanica*		O				

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Liliales	*Iridaceae* C Iris	blue-eyed grass	*Sisyrinchium albidum*		O				
Liliales	*Iridaceae* C Iris	common blue-eyed grass [stout blue-eyed grass]	*Sisyrinchium angustifolium*		O				
Orchidales	*Orchidaceae* C Orchid	nodding ladies-tresses	*Spiranthes cernua*		O-LC				
Orchidales	*Orchidaceae* C Orchid	little ladies-tresses	*Spiranthes tuberosa*		U				
Orchidales	*Orchidaceae* C Orchid	rattlesnake plantain	*Goodyera pubescens*		R				
Orchidales	*Orchidaceae* C Orchid	large twayblade [lily tway-blade, purple twayblade]	*Liparis lilifolia*		LC-O				
Orchidales	*Orchidaceae* C Orchid	puttyroot orchid [Adam-and-Eve]	*Aplectrum hyemale*		LC-O				
Orchidales	*Orchidaceae* C Orchid	Wister-s coral-root orchid [coral root]	*Corallorhiza wisteriana*		R				
Piperales	*Saururaceae* C Lizard-tail	lizard-s-tail	*Saururus cernuus*		LC				
Salicales	*Salicaceae* C Willow	black willow	*Salix nigra*	tree	C			N	1
Salicales	*Salicaceae* C Willow	brittle willow [crack willow]	*Salix fragilis*		O			E	1
Salicales	*Salicaceae* C Willow	prairie willow [dwarf prairie willow]	*Salix humilis*		R				1
Salicales	*Salicaceae* C Willow	sandbar willow	*Salix exigua [S. interior]*		O				1
Salicales	*Salicaceae* C Willow	white poplar	*Populus alba*	tree	O			E	1
Salicales	*Salicaceae* C Willow	eastern cottonwood	*Populus deltoides*	tree	C			N	1
Juglandales	*Juglandaceae* C Walnut	butternut [white walnut]	*Juglans cinerea*	tree	R			N	1
Juglandales	*Juglandaceae* C Walnut	black walnut	*Juglans nigra*	tree	O			N	1
Juglandales	*Juglandaceae* C Walnut	shagbark hickory [scaly-bark hickory]	*Carya ovata*	tree	O-C			N	1
Juglandales	*Juglandaceae* C Walnut	shellbark hickory [kingnut hickory]	*Carya laciniosa*	tree	R			N	1
Juglandales	*Juglandaceae* C Walnut	mockernut hickory	*Carya tomentosa*	tree	O			N	1
Juglandales	*Juglandaceae* C Walnut	pignut hickory	*Carya glabra*	tree	C			N	1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Juglandales	*Juglandaceae* C Walnut	small pignut hickory [false shagbark hickory]	*Carya ovalis*	tree	C			N	1
Juglandales	*Juglandaceae* C Walnut	bitternut hickory	*Carya cordiformis*	tree	C			N	1
Juglandales	*Juglandaceae* C Walnut	black hickory	*Carya texana*	tree	R			N	1
Juglandales	*Juglandaceae* C Walnut	pecan	*Carya illinoensis*	tree	O			N	
Fagales	*Betulaceae* C Birch	river birch [red birch]	*Betula nigra*	tree	C			N	1
Fagales	*Betulaceae* C Birch	common alder [smooth alder]	*Alnus serrulata*	tree	R			N	
Fagales	*Betulaceae* C Birch	eastern hophornbeam [ironwood]	*Ostrya virginiana*	tree	C			N	
Fagales	*Betulaceae* C Birch	American hornbeam [blue-beech]	*Carpinus caroliniana*	tree	R			N	
Fagales	*Betulaceae* C Birch	hazelnut [American filbert]	*Corylus americana*	shrub	O			N	
Fagales	*Fagaceae* C Beech	American beech [beech]	*Fagus grandifolia caroliniana*	tree	O			N	1
Fagales	*Fagaceae* C Beech	American chestnut	*Castanea dentata*	tree	R			N	
Fagales	*Fagaceae* C Beech	Chinese chestnut (various hybrids)	*Castanea mollissima*	tree	R			E	
Fagales	*Fagaceae* C Beech	white oak	*Quercus alba*	tree	C			N	1
Fagales	*Fagaceae* C Beech	post oak	*Quercus stellata*	tree	A			N	1
Fagales	*Fagaceae* C Beech	bur oak [mossy cup oak]	*Quercus macrocarpa*	tree	O			N	1
Fagales	*Fagaceae* C Beech	swamp white oak	*Quercus bicolor*	tree	R			N	
Fagales	*Fagaceae* C Beech	swamp chestnut oak [cow oak, basket oak]	*Quercus michauxii*	tree	C			N	
Fagales	*Fagaceae* C Beech	chinkapin oak [yellow chestnut oak]	*Quercus prinoides acuminata [Q. muehlenbergii]*	tree	O			N	
Fagales	*Fagaceae* C Beech	northern red oak	*Quercus rubra*	tree	C			N	1
Fagales	*Fagaceae* C Beech	pin oak	*Quercus palustris*	tree	A			N	1
Fagales	*Fagaceae* C Beech	scarlet oak	*Quercus coccinea*	tree	R			N	1
Fagales	*Fagaceae* C Beech	black oak [yellow-barked oak]	*Quercus velutina*	tree	C-O			N	1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Fagales	*Fagaceae* C Beech	southern red oak [Spanish oak]	*Quercus falcata*	tree	O			N	1
Fagales	*Fagaceae* C Beech	cherrybark oak	*Quercus pagoda*	tree	R			E	
Fagales	*Fagaceae* C Beech	blackjack oak	*Quercus marilandica*	tree	O			N	1
Fagales	*Fagaceae* C Beech	willow oak	*Quercus phellos*	tree	R			E	
Fagales	*Fagaceae* C Beech	shingle oak	*Quercus imbricaria*	tree	A			N	1
Fagales	*Fagaceae* C Beech	Shumard oak	*Quercus shumardii*	tree	O			N	1
Utricales	*Ulmaceae* C Elm	sugarberry	*Celtis laevigata*	tree	R			N	1
Utricales	*Ulmaceae* C Elm	common hackberry	*Celtis occidentalis*	tree	C			N	1
Utricales	*Ulmaceae* C Elm	dwarf hackberry	*Celtis tenuifolia var. georgiana*	tree	R			N	1
Utricales	*Ulmaceae* C Elm	slippery elm [red elm]	*Ulmus rubra*	tree	O			N	1
Utricales	*Ulmaceae* C Elm	American elm	*Ulmus americana*	tree	C			N	1
Utricales	*Ulmaceae* C Elm	winged elm	*Ulmus alata*	tree	C			N	1
Utricales	*Moraceae* C Mulberry	osage-orange [hedge-apple]	*Maclura pomifera*	tree	O			E	1
Utricales	*Moraceae* C Mulberry	red mulberry	*Morus rubra*	tree	O			N	1
Utricales	*Moraceae* C Mulberry	white mulberry	*Morus alba*	tree	O			E	1
Utricales	*Moraceae* C Mulberry	paper-mulberry	*Broussonetia papyrifera*	shrub	O			E	
Utricales	*Urticaceae* C Nettle	Canada wood nettle [wood nettle]	*Laportea canadensis*		LA				1
Utricales	*Urticaceae* C Nettle	Pennsylvania pellitory	*Parietaria pensylvanica*		U				1
Utricales	*Urticaceae* C Nettle	false nettle	*Boehmeria cylindrica*		LC				1
Utricales	*Urticaceae* C Nettle	Canada clearweed [coolwort, richweed]	*Pilea pumila*		LC				1
Aristolochiales	*Aristolochiaceae* C Birthwort	Virginia snakeroot [birthwort]	*Aristolochia serpentaria*		O				1
Aristolochiales	*Aristolochiaceae* C Birthwort	Canada wild ginger	*Asarum canadense reflexum*		C-LA				1
Polygonales	*Polygonaceae* C Buckwheat	slender knotweed	*Polygonum tenue*		C				1
Polygonales	*Polygonaceae* C Buckwheat	knotweed	*Polygonum aviculare*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Polygonales	*Polygonaceae* C Buckwheat	copse bindweed [false buckwheat]	*Polygonum cristatum [P. scandens dumetorum]*		O				1
Polygonales	*Polygonaceae* C Buckwheat	Virginia knotweed	*Polygonum virginianum*		C				1
Polygonales	*Polygonaceae* C Buckwheat	curttop lady=s thumb [pale smartweed]	*Polygonum lapathifolium*		O				1
Polygonales	*Polygonaceae* C Buckwheat	Pennsylvania smartweed [common smartweed]	*Polygonum pensylvanicum laevigatum*		O				1
Polygonales	*Polygonaceae* C Buckwheat	mild water pepper [swamp smartweed]	*Polygonum hydropiperoides*		LA				1
Polygonales	*Polygonaceae* C Buckwheat	bristly smartweed [smartweed]	*Polygonum setaceum interjectum*		U				1
Polygonales	*Polygonaceae* C Buckwheat	dotted smartweed	*Polygonum punctatum*		LC				1
Polygonales	*Polygonaceae* C Buckwheat	spotted lady=s thumb	*Polygonum persicaria*		U				1
Polygonales	*Polygonaceae* C Buckwheat	creeping smartweed	*Polygonum cespitosum longisetum*		LC				1
Polygonales	*Polygonaceae* C Buckwheat	common sorrel [red sorrel, sheep sorrel]	*Rumex acetosella*		LC				1
Polygonales	*Polygonaceae* C Buckwheat	bitter dock [blunt-leaved dock, broad-leaved dock]	*Rumex obtusifolius*		U				1
Polygonales	*Polygonaceae* C Buckwheat	curly dock [sour dock, yellow dock]	*Rumex crispus*		O				1
Polygonales	*Polygonaceae* C Buckwheat	pale dock [smooth dock, water dock]	*Rumex altissimus*		R				1
Caryophyllales	*Chenopodiaceae* C Goosefoot	goosefoot	*Chenopodium standleyanum [C. boscianum]*		U				1
Caryophyllales	*Chenopodiaceae* C Goosefoot	lamb=s-quarters	*Chenopodium album*		O-LC				1
Caryophyllales	*Amaranthaceae* C Amaranth	pigweed	*Amaranthus sp.*						
Caryophyllales	*Phytolaccaceae* C Pokeweed	pokeweed	*Phytolacca americana*		O-LC				1
Caryophyllales	*Portulacaceae* C Purslane	common garden purslane	*Portulaca oleracea*		LC				1
Caryophyllales	*Portulacaceae* C Purslane	spring beauty	*Claytonia virginica*		LA				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Caryophyllales	*Caryophyllaceae* C Pink	nodding mouse-ear chickweed	*Cerastium nutans*		O				1
Caryophyllales	*Caryophyllaceae* C Pink	mouse-ear chickweed	*Cerastium pumilum*		O				1
Caryophyllales	*Caryophyllaceae* C Pink	common mouse-ear chickweed	*Cerastium vulgatum*		LC				1
Caryophyllales	*Caryophyllaceae* C Pink	common chickweed	*Stellaria media*		LA				1
Caryophyllales	*Caryophyllaceae* C Pink	thyme-leaved sandwort	*Arenaria serpyllifolia*		O				1
Caryophyllales	*Caryophyllaceae* C Pink	jagged chickweed	*Holosteum umbellatum*		U				1
Caryophyllales	*Caryophyllaceae* C Pink	Debtford pink	*Dianthus armeria*		LC				1
Caryophyllales	*Caryophyllaceae* C Pink	sleepy catchfly	*Silene antirrhina*		O				1
Caryophyllales	*Caryophyllaceae* C Pink	starry campion	*Silene stellata*		O				1
Magnoliales	*Magnoliaceae* C Magnolia	yellow-poplar [tulip-tree, tulip-poplar]	*Liriodendron tulipifera*	tree	O-LC			N	1
Magnoliales	*Annonaceae* C Custard-apple	common pawpaw [banana tree]	*Asimina triloba*	small tree	LC			N	1
Ranunculales	*Ranunculaceae* C Buttercup	wild columbine	*Aquilegia canadensis*		R				1
Ranunculales	*Ranunculaceae* C Buttercup	dwarf larkspur [wild larkspur]	*Delphinium tricorne*		LC				1
Ranunculales	*Ranunculaceae* C Buttercup	virgin=s bower	*Clematis virginiana*		O				1
Ranunculales	*Ranunculaceae* C Buttercup	bristly buttercup	*Ranunculus hispidus*		C				1
Ranunculales	*Ranunculaceae* C Buttercup	early buttercup	*Ranunculus fascicularis*		LC				1
Ranunculales	*Ranunculaceae* C Buttercup	hooked buttercup	*Ranunculus recurvatus*		O				1
Ranunculales	*Ranunculaceae* C Buttercup	little-leaf buttercup [small-flowered crowfoot]	*Ranunculus abortivus abortivus*		C				1
Ranunculales	*Ranunculaceae* C Buttercup	small-flowered crowfoot	*Ranunculus abortivus acrolasius*		U				1
Ranunculales	*Ranunculaceae* C Buttercup	small-flowered crowfoot	*Ranunculus micranthus*		O				1
Ranunculales	*Ranunculaceae* C Buttercup	goldenseal	*Hydrastis canadensis*		LC				1
Ranunculales	*Ranunculaceae* C Buttercup	tall anemone	*Anemone virginiana*		O				1
Ranunculales	*Ranunculaceae* C Buttercup	doll=s-eyes [white baneberry]	*Actaea pachypoda*		LC				1
Ranunculales	*Ranunculaceae* C Buttercup	false rue-anemone	*Isopyrum biternatum*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Ranunculales	*Berberidaceae* C Barberry	mayapple	*Podophyllum peltatum*		LA				1
Ranunculales	*Berberidaceae* C Barberry	blue cohosh	*Caulophyllum thalictroides*		U				1
Ranunculales	*Berberidaceae* C Barberry	Japanese barberry	*Berberis thunbergii*	shrub	R			E	1
Ranunculales	*Menispermaceae* C Moonvine	moonseed	*Menispermum canadense*		O				1
Ranunculales	*Menispermaceae* C Moonvine	cupseed	*Calycocarpum lyonii*		R				1
Nymphaeales	*Nelumbonaceae* C Lotus	American lotus [giant lotus lily]	*Nelumbo lutea*		LC				
Nymphaeales	*Nymphaeaceae* C Waterlily	spatterdock	*Nuphar luteum*		LA				1
Nymphaeales	*Ceratophyllaceae* C Hornwort	coontail [hornwort]	*Ceratophyllum demersum*		U				1
Magnoliales	*Lauraceae* C Laurel	common sassafras [red sassafras, white sassafras]	*Sassafras albidum*	tree	C			N	1
Magnoliales	*Lauraceae* C Laurel	spicebush [feverbush, wild allspice]	*Lindera benzoin*	shrub	LA			N	1
Papaverales	*Papaveraceae* C Poppy	bloodroot	*Sanguinaria canadensis*		C			N	1
Papaverales	*Papaveraceae* C Poppy	Celandine poppy [wood poppy]	*Stylophorum diphyllum*		LA				1
Papaverales	*Papaveraceae* C Poppy	Celandine	*Chelidonium majus*					E	2
Papaverales	*Fumariaceae* C Fumitory	pale corydalis	*Corydalis flavula*		LA				1
Papaverales	*Fumariaceae* C Fumitory	squirrel-corn	*Dicentra canadensis*		LA				1
Papaverales	*Fumariaceae* C Fumitory	Dutchman=s-breeches	*Dicentra cucullaria*		C				1
Capparales	*Cruciferae* C Mustard	mouse-eared cress	*Arabidopsis thaliana*		O				1
Capparales	*Cruciferae* C Mustard	smooth rock cress	*Arabis laevigata*		LC				
Capparales	*Cruciferae* C Mustard	wintercress [yellow rocket]	*Barbarea vulgaris*		O			E	1
Capparales	*Cruciferae* C Mustard	bird=s rape [field mustard, turnip]	*Brassica rapa*		R				1
Capparales	*Cruciferae* C Mustard	shepherd=s-purse	*Capsella bursa-pastoris*		O			E	1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Capparales	*Cruciferae* C Mustard	Pennsylvania bitter cress	*Cardamine pensylvanica*		LC				1
Capparales	*Cruciferae* C Mustard	hairy bitter cress	*Cardamine hirsuta*		O			E	1
Capparales	*Cruciferae* C Mustard	small-flowered bitter cress	*Cardamine parviflora arenicola*		U				1
Capparales	*Cruciferae* C Mustard	toothwort [pepper-root]	*Dentaria laciniata*		LA			N	1
Capparales	*Cruciferae* C Mustard	short-fruited Whitlow-grass	*Draba brachycarpa*		O				1
Capparales	*Cruciferae* C Mustard	mouse-eared Whitlow-grass [vernal Whitlow-grass]	*Eriophila verna*		O				1
Capparales	*Cruciferae* C Mustard	common peppergrass [poor-man=s pepper]	*Lepidium virginicum*		O-LA				1
Capparales	*Cruciferae* C Mustard	field peppergrass [field cress]	*Lepidium campestre*		O				1
Hamamelidales	*Hamamelidaceae* C Witch-hazel	sweetgum [red gum]	*Liquidambar styraciflua*	tree	O-LA			N	1
Hamamelidales	*Platanaceae* C Planetree	American sycamore [button-wod]	*Platanus occidentalis*	tree	LC			N	1
Rosales	*Crassulaceae* C Stonecrop	widow=s-cross [stonecrop]	*Sedum pulchellum*		LC				1
Rosales	Escalloniaceae	Virginia willow [sweet-spires]	*Itea virginica*	shrub	?				
Rosales	*Saxifragaceae* C Saxifrage	ditch stonecrop	*Penthorum sedoides*		O				1
Rosales	*Saxifragaceae* C Saxifrage	wild hydrangea	*Hydrangea arborescens*	shrub	O			N	
Rosales	*Saxifragaceae* C Saxifrage	Forbes= saxifrage	*Saxifraga forbesii*		LA				1
Rosales	*Saxifragaceae* C Saxifrage	bishop=s-cap	*Mitella diphylla*		R				1
Rosales	*Saxifragaceae* C Saxifrage	small-flowered alumroot [late alumroot]	*Heuchera parviflora rugelii*		LC				1
Rosales	*Saxifragaceae* C Saxifrage	tall alumroot	*Heuchera americana hirsuticaulis*		C				1
Rosales	*Rosaceae* C Rose	Allegheny blackberry [common blackberry]	*Rubus allegheniensis*		C				1
Rosales	*Rosaceae* C Rose	blackberry	*Rubus alumnus [R. orarius]*		O				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Rosales	*Rosaceae* C Rose	arching dewberry [southern dewberry]	*Rubus enslenii*		U				1
Rosales	*Rosaceae* C Rose	dewberry	*Rubus flagellaris*		C				1
Rosales	*Rosaceae* C Rose	black raspberry [blackcap raspberry]	*Rubus occidentalis*		LC				1
Rosales	*Rosaceae* C Rose	blackberry	*Rubus pensylvanicus*		C				1
Rosales	*Rosaceae* C Rose	velvet-leaved dewberry	*Rubus roribaccus*		LC				1
Rosales	*Rosaceae* C Rose	hawthorn	*Crataegus pruniosa*		?			N	
Rosales	*Rosaceae* C Rose	red haw	*Crataegus mollis*		C			N	
Rosales	*Rosaceae* C Rose	cock-spur hawthorn	*Crataegus crus-galli*	small tree	O			N	
Rosales	*Rosaceae* C Rose	serviceberry [shadbush, shad-blow, juneberry]	*Amelanchier arborea*	small tree	LC			N	1
Rosales	*Rosaceae* C Rose	common apple	*Malus pumila*	tree	R				
Rosales	*Rosaceae* C Rose	wild sweet crabapple	*Malus coronaria*	tree	U				1
Rosales	*Rosaceae* C Rose	Iowa crabapple	*Malus ioensis*	tree	U				1
Rosales	*Rosaceae* C Rose	common pear	*Pyrus communis*	tree	R				
Rosales	*Rosaceae* C Rose	pasture rose	*Rosa carolina*	vine	C			N	1
Rosales	*Rosaceae* C Rose	swamp rose	*Rosa palustris*	vine	O			N	
Rosales	*Rosaceae* C Rose	multiflora rose [Japanese rose]	*Rosa multiflora*	shrub	A			E	1
Rosales	*Rosaceae* C Rose	Illinois rose [prairie rose, climbing rose]	*Rosa setigera*		O-LC				
Rosales	*Rosaceae* C Rose		*Rosa sp. (Hybrid cultivar)*						
Rosales	*Rosaceae* C Rose	black cherry	*Prunus serotina*	tree	C			N	1
Rosales	*Rosaceae* C Rose	American plum [wild plum]	*Prunus americana*	shrub	C			N	1
Rosales	*Rosaceae* C Rose	Chickasaw plum	*Prunus angustifolia*		LC				1
Rosales	*Rosaceae* C Rose	wild goose plum	*Prunus hortulana*		U				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Rosales	*Rosaceae* C Rose	peach	*Prunus persica*	tree	R				1
Rosales	*Rosaceae* C Rose	swamp agrimony [small-flowered agrimony]	*Agrimonia parviflora*		LC				1
Rosales	*Rosaceae* C Rose	soft agrimony	*Agrimonia pubescens*		U				1
Rosales	*Rosaceae* C Rose	woodland agrimony	*Agrimonia rostellata*		C				1
Rosales	*Rosaceae* C Rose	wild strawberry	*Fragaria virginiana*		LC				1
Rosales	*Rosaceae* C Rose	white avens	*Geum canadense*		C				1
Rosales	*Rosaceae* C Rose	spring avens	*Geum vernum*		LC				1
Rosales	*Rosaceae* C Rose	sulfur cinquefoil	*Potentilla recta*		LC			E	1
Rosales	*Rosaceae* C Rose	common cinquefoil	*Potentilla simplex*		C				1
Rosales	*Rosaceae* C Rose	Indian physic [American ipecac]	*Porteranthus stipulatus [Gillenia stipulata]*		C				1
Rosales	*Caesalpiniaceae* CCaesalpinia	eastern redbud	*Cercis canadensis*	tree	O-C			N	1
Rosales	*Caesalpiniaceae* CCaesalpinia	honeylocust	*Gleditsia triacanthos*	tree	O			N	1
Rosales	*Caesalpiniaceae* CCaesalpinia	Kentucky coffeetree	*Gymnocladus dioicus*	tree	O			N?	
Rosales	*Caesalpiniaceae* CCaesalpinia	wild senna	*Cassia marilandica*						
Rosales	*Caesalpiniaceae* CCaesalpinia	partridge pea [locust-weed]	*Cassia fasciculata*						
Rosales	*Fabaceae* CBean	kudzu-vine	*Puereria lobata*	vine	R			E	
Rosales	*Fabaceae* CBean	soybean	*Glycine max*		LA			E	
Rosales	*Fabaceae* CBean	American wisteria	*Wisteria frutescens*	vine	?				
Rosales	*Fabaceae* CBean	sesbania	*Sesbania macrocarpa [S. exaltata]*		LC				
Rosales	*Fabaceae* CBean	dull-leaf indigobush [false indigobush]	*Amorpha fruticosa*	shrub	R			N	1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Rosales	*Fabaceae* CBean	black-locust	*Robinia pseudoacacia*	tree	LC			N?	1
Rosales	*Fabaceae* CBean	rattlebox	*Crotalaria sagittalis*		O				1
Rosales	*Fabaceae* CBean	pencil-flower	*Stylosanthes biflora*		O				1
Rosales	*Fabaceae* CBean	low hop clover	*Trifolium campestre*		O				1
Rosales	*Fabaceae* CBean	Alsike clover	*Trifolium hybridum*		U				1
Rosales	*Fabaceae* CBean	red clover	*Trifolium pratense*		LC				1
Rosales	*Fabaceae* CBean	white clover	*Trifolium repens*		LC				1
Rosales	*Fabaceae* CBean	black medic	*Medicago lupulina*		O				1
Rosales	*Fabaceae* CBean	alfalfa	*Medicago sativa*		U				1
Rosales	*Fabaceae* CBean	butterfly-pea	*Clitoria mariana*		U				1
Rosales	*Fabaceae* CBean	hoary tick trefoil	*Desmodium canescens*		O				1
Rosales	*Fabaceae* CBean	hairy tick trefoil	*Desmodium ciliare*		LC				1
Rosales	*Fabaceae* CBean	beggar-s lice [pointed tick trefoil]	*Desmodium glutinosum*		U				1
Rosales	*Fabaceae* CBean	glaucus tick trefoil	*Desmodium laevigatum*		C				1
Rosales	*Fabaceae* CBean	bare-stemmed tick trefoil	*Desmodium nudiflorum*		LC				1
Rosales	*Fabaceae* CBean	Nuttall-s tick trefoil	*Desmodium nuttallii*		O				1
Rosales	*Fabaceae* CBean	stiff tick trefoil	*Desmodium obtusum*		U				1
Rosales	*Fabaceae* CBean	panicled tick trefoil	*Desmodium paniculatum*		C				1
Rosales	*Fabaceae* CBean	beggar-s lice [white-flowered tick trefoil]	*Desmodium pauciflorum*		U				1
Rosales	*Fabaceae* CBean	round-leaved tick trefoil	*Desmodium rotundifolium*		U				1
Rosales	*Fabaceae* CBean	sessile-leaved tick trefoil	*Desmodium sessilifolium*		U				1
Rosales	*Fabaceae* CBean	scurf-pea [Sampson-s snakeroot]	*Psoralea psoralioides eglandulosa*		LC				1
Rosales	*Fabaceae* CBean	wild bean	*Strophostyles helvola*		O				1
Rosales	*Fabaceae* CBean	wild bean	*Strophostyles leiosperma*		O				1
Rosales	*Fabaceae* CBean	umbellate wild bean	*Strophostyles umbellata*		U				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Rosales	*Fabaceae* CBean	hog-peanut	*Amphicarpa bracteata bracteata*		U				1
Rosales	*Fabaceae* CBean	hog-peanut	*Amphicarpa bracteata comosa*		O				1
Rosales	*Fabaceae* CBean	hairy-fruited vetch	*Vicia dasycarpa*		LA				1
Rosales	*Fabaceae* CBean	ground nut	*Apios americana*		LC				1
Rosales	*Fabaceae* CBean	goat-s-rue	*Tephrosia virginiana*		O				1
Rosales	Mimosaceae	mimosa	*Albizia julibrissin*	tree	R			E	
Rosales	Mimosaceae	Illinois/prairie mimosa [Illinois bundleflower]	*Desmanthus illinoensis*					N	
Geraniales	*Geraniaceae* C Geranium	Carolina cranesbill	*Geranium carolinianum*		LC				1
Geraniales	*Geraniaceae* C Geranium	wild geranium	*Geranium maculatum*		C				1
Geraniales	*Oxalidaceae* C Wood-sorrel	upright yellow wood-sorrel	*Oxalis dillenii*		A				1
Geraniales	*Oxalidaceae* C Wood-sorrel	common wood-sorrel [yellow wood sorrel]	*Oxalis stricta*		U				1
Geraniales	*Oxalidaceae* C Wood-sorrel	violet wood-sorrel [purple oxalis]	*Oxalis violacea*		LC-O				1
Geraniales	*Balsaminaceae* C Balsam	orange-spotted touch-me-not [jewelweed]	*Impatiens capensis [I. Biflora]*		LA				1
Geraniales	*Balsaminaceae* C Balsam	pale touch-me-not	*Impatiens pallida*		LA				1
Linales	*Linaceae* C Flax	flax	*Linum medium*		LC				1
Linales	*Linaceae* C Flax	stiff yellow flax	*Linum striatum*		U-R				1
Sapindales	*Rutaceae* C Rue	prickly-ash [toothache tree]	*Zanthoxylum americanum*		U-R				1
Sapindales	*Simarubaceae* C Quassia	tree-of-heaven	*Ailanthus altissima*	tree	U-R			E	1
Sapindales	*Anacardiaceae* C Sumac	smooth sumac	*Rhus glabra*	shrub	C			N	1
Sapindales	*Anacardiaceae* C Sumac	winged [shining, dwarf] sumac	*Rhus copallina*	shrub	C			N	1
Sapindales	*Anacardiaceae* C Sumac	fragrant sumac [aromatic sumac]	*Rhus aromatica*	shrub	O			N	1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Sapindales	*Anacardiaceae* C Sumac	poison-ivy	*Toxicodendron radicans*	shrub, vine	A			N	1
Sapindales	*Staphyleaceae* C Bladdernut	American bladdernut	*Staphylea trifolia*	shrub	LA			N	1
Sapindales	*Aceraceae* C Maple	sugar maple [hard maple, rock maple]	*Acer saccharum*	tree	C			N	1
Sapindales	*Aceraceae* C Maple	southern sugar maple	*Acer barbatum*	tree	O			N	
Sapindales	*Aceraceae* C Maple	silver maple [river, soft, white maple]	*Acer saccharinum*	tree	C			N	1
Sapindales	*Aceraceae* C Maple	red maple	*Acer rubrum var. rubrum*	tree	O			N	1
Sapindales	*Aceraceae* C Maple	red maple	*Acer rubrum var. trilobum*	tree	R			N	1
Sapindales	*Aceraceae* C Maple	boxelder [ash-leaved maple]	*Acer negundo*	tree	O-LA			N	1
Polygalales	*Polygalaceae* C Milkwort	red milkwort [field milkwort]	*Polygala sanguinea*		O				1
Euphorbiales	*Euphorbiaceae* C Spurge	nodding spurge [wartweed]	*Chamaesyce maculata [Euphorbia maculata]*		C				1
Euphorbiales	*Euphorbiaceae* C Spurge	milk spurge	*Chamaesyce supina [Euphorbia supina]*		LC				1
Euphorbiales	*Euphorbiaceae* C Spurge	milk spurge	*Chamaesyce humistrata [Euphorbia humistrata]*		U				1
Euphorbiales	*Euphorbiaceae* C Spurge	flowering spurge	*Euphorbia corollata*		C				1
Euphorbiales	*Euphorbiaceae* C Spurge	wood spurge	*Euphorbia commutata*		LC				1
Euphorbiales	*Euphorbiaceae* C Spurge	wild poinsettia	*Euphorbia dentata [Poinsettia dentata]*		O				1
Euphorbiales	*Euphorbiaceae* C Spurge	sand croton [rushfoil]	*Crotonopsis elliptica*		LC				1
Euphorbiales	*Euphorbiaceae* C Spurge	capitate croton [wooly croton]	*Croton capitatus*		O				1
Euphorbiales	*Euphorbiaceae* C Spurge	croton [prairie tea]	*Croton monanthogynus*		LC				1
Euphorbiales	*Euphorbiaceae* C Spurge	slender three-seeded mercury	*Acalypha gracilens*		O				1
Euphorbiales	*Euphorbiaceae* C Spurge	three-seeded mercury	*Acalypha rhomboidea*		C				1
Euphorbiales	*Euphorbiaceae* C Spurge	Virginia three-seeded mercury	*Acalypha virginica*		O				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Celastrales	*Celastraceae* C Staff-tree	bittersweet [climbing bittersweet]	*Celastrus scandens*	vine	C			N	1
Celastrales	*Celastraceae* C Staff-tree	eastern wahoo [burningbush]	*Euonymus atropurpureus*	shrub	O			N	1
Celastrales	*Celastraceae* C Staff-tree	climbing euonymus [winter creeper]	*Euonymus fortunei var. radicans*	vine	O			E	
Celastrales	*Aquifoliaceae* C Holly	deciduous holly [swamp holly]	*Ilex decidua*	shrub	R			N	1
Celastrales	*Aquifoliaceae* C Holly	American holly	*Ilex opaca*	shrub	R			N	
Rhamnales	*Rhamnaceae* C Buckthorn	New-Jersey-tea [wild snowball]	*Ceanothus americanus*	shrub	O			N	1
Rhamnales	*Vitaceae* C Grape	Virginia creeper	*Parthenocissus quinquefolia*	vine	C			N	1
Rhamnales	*Vitaceae* C Grape	raccoon grape	*Ampelopsis cordata*	vine	U			N	1
Rhamnales	*Vitaceae* C Grape	summer grape	*Vitis aestivalis*	vine	C			N	1
Rhamnales	*Vitaceae* C Grape	winter grape	*Vitis cinerea*	vine	U			N	1
Rhamnales	*Vitaceae* C Grape	frost grape	*Vitis vulpina*	vine	O			N	1
Malvales	*Tiliaceae* C Linden	American linden [basswood]	*Tilia americana*	tree	U-R			N	1
Malvales	*Malvaceae* C Mallow	prickly sida	*Sida spinosa*		O			E	1
Theales	*Hypericaceae* C St. John=s-wort	marsh St. John=s-wort	*Triadenum walteri*		O				1
Theales	*Hypericaceae* C St. John=s-wort	shrubby St. John's-wort	*Hypericum prolificum*	shrub	LC			N	1
Theales	*Hypericaceae* C St. John=s-wort	nits-and-lice	*Hypericum drummondii*		U				1
Theales	*Hypericaceae* C St. John=s-wort	pineweed	*Hypericum gentianoides*		O				1
Theales	*Hypericaceae* C St. John=s-wort	dwarf St. John=s-wort	*Hypericum mutilum*		O				1
Theales	*Hypericaceae* C St. John=s-wort	common St. John=s-wort	*Hypericum perforatum*		U				1
Theales	*Hypericaceae* C St. John=s-wort	spotted St. John=s-wort	*Hypericum punctatum*		O				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Theales	*Hypericaceae* C St. John-s-wort	St. Andrew-s cross	*Hypericum stragulum*		O				1
Violales	*Cistaceae* C Rockrose	narrow-leaved pinweed	*Lechea tenuifolia*		O				1
Violales	*Violaceae* C Violet	common blue violet	*Viola pratincola*		LC				1
Violales	*Violaceae* C Violet	downy yellow violet	*Viola pubescens*		C				1
Violales	*Violaceae* C Violet	Johnny-jump-up [wild pansy]	*Viola rafinesquii*		LA				1
Violales	*Violaceae* C Violet	wooly blue violet	*Viola sororia*		C				1
Violales	*Violaceae* C Violet	cream violet [common white violet]	*Viola striata*		LA				1
Violales	*Violaceae* C Violet	cleft violet	*Viola triloba var. triloba*		C				1
Violales	*Violaceae* C Violet	lobed violet [cleft violet]	*Viola triloba var. dilatata [V. falcata]*		O				1
Violales	*Violaceae* C Violet	green violet	*Hybanthus concolor*		LC				1
Violales	*Passifloraceae* C Passion-flower	small passion-flower	*Passiflora lutea var. glabri-flora*		O				1
Violales	*Passifloraceae* C Passion-flower	large passion-flower [may-pops]	*Passiflora incarnata*		R				1
Proteales	*Elaeagnaceae* C Oleaster	autumn-olive [oleaster]	*Elaeagnus umbellata*	shrub	LC			E	1
Myrtales	*Lythraceae* C Loosestrife	tooth-cup	*Rotala ramosior*		O				1
Myrtales	*Lythraceae* C Loosestrife	purple loosestrife	*Lythrum salicaria*	shrub	R			E	
Myrtales	*Lythraceae* C Loosestrife	water-willow [swamp loos-estrife]	*Decodon verticillatus*						
Myrtales	*Onagraceae* C Evening Prim-rose	enchanter-s nightshade	*Circaea lutetiana*		O				1
Myrtales	*Onagraceae* C Evening Prim-rose	marsh purslane	*Ludwigia palustris var. americana*		U				1
Myrtales	*Onagraceae* C Evening Prim-rose	seedbox	*Ludwigia alternifolia*		LC				1
Myrtales	*Onagraceae* C Evening Prim-rose	creeping primrose willow	*Ludwigia peploides*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Myrtales	*Onagraceae* C Evening Primrose	common evening primrose	*Oenothera biennis*		C				1
Myrtales	*Onagraceae* C Evening Primrose	ragged evening primrose	*Oenothera laciniata*		U				1
Myrtales	*Onagraceae* C Evening Primrose	cinnamon willow herb	*Epilobium coloratum*		O				1
Caryophyllales	*Cactaceae* C Cactus	prickly-pear	*Opuntia humifusa [O. rafinesquii, O. compressa]*						1
Haloragales	*Haloragidaceae* C Water Milfoil	spiked water milfoil	*Myriophyllum exalbescens*		LA				1
Lamiales	*Callitrichaceae* C Water Starwort	terrestrial starwort [water starwort]	*Callitriche terestris*		O				1
Cornales	*Cornaceae* C Dogwood	blackgum [sour gum, black tupelo]	*Nyssa sylvatica*	tree	O			N	
Cornales	*Cornaceae* C Dogwood	flowering dogwood [white dogwood]	*Cornus florida*	small tree	C			N	1
Cornales	*Cornaceae* C Dogwood	rough-leaved dogwood	*Cornus drummondii*	shrub	O			N	1
Cornales	*Cornaceae* C Dogwood	gray [panicled] dogwood	*Cornus racemosa*	shrub	O			N	
Umbellales	*Araliaceae* C Ginseng	devil's-walking-stick [Hercules'-club, angelica-tree]]	*Aralia spinosa*	small tree	O			N	1
Umbellales	*Araliaceae* C Ginseng	American spikenard	*Aralia racemosa*		R				1
Umbellales	*Araliaceae* C Ginseng	ginseng	*Panax quinquefolium*		U				1
Umbellales	*Apiaceae* CCarrot or Parsley	rattlesnake master	*Eryngium yuccifolium*						1
Umbellales	*Apiaceae* CCarrot or Parsley	Queen Anne-s lace [wild carrot]	*Daucus carota*					E	1
Umbellales	*Apiaceae* CCarrot or Parsley	water hemlock	*Cicuta maculata*						1
Umbellales	*Apiaceae* CCarrot or Parsley	wood angelica	*Angelica venenosa*		R				1
Umbellales	*Apiaceae* CCarrot or Parsley	wild chervil	*Chaerophyllum procumbens*		LC				1
Umbellales	*Apiaceae* CCarrot or Parsley	wild chervil	*Chaerophyllum tainturieri*		U				1
Umbellales	*Apiaceae* CCarrot or Parsley	honewort	*Cryptotaenia canadensis*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Umbellales	*Apiaceae* CCarrot or Parsley	harbinger-of-spring [pepper-and-salt]	*Erigenia bulbosa*		C				1
Umbellales	*Apiaceae* CCarrot or Parsley	anise-root	*Osmorhiza longistylis*						1
Umbellales	*Apiaceae* CCarrot or Parsley	Canadian black snakeroot [short-styled snakeroot]	*Sanicula canadensis*		C				1
Umbellales	*Apiaceae* CCarrot or Parsley	yellow meadow parsnip	*Thaspium trifoliatum var. flavum*		R				1
Umbellales	*Apiaceae* CCarrot or Parsley	meadow parsnip	*Thaspium trifoliatum var. trifoliatum*		O				1
Umbellales	*Apiaceae* CCarrot or Parsley	hedge parsley	*Torilis japonica*		LC				1
Ericales	*Ericaceae* C Heath	farkleberry	*Vaccinium arboreum*	shrub	C			N	1
Primulales	*Primulaceae* C Primrose	shooting-star	*Dodecatheon meadia*		LC				1
Primulales	*Primulaceae* C Primrose	French-s shooting-star	*Dodecatheon frenchii*		LC				1
Primulales	*Primulaceae* C Primrose	brookweed [water pimpernel]	*Samolus valerandii*		U				1
Primulales	*Primulaceae* C Primrose	fringed loosestrife	*Lysimachia ciliata*		LC				1
Primulales	*Primulaceae* C Primrose	lance-leaved loosestrife [narrow-leaved loosestrife]	*Lysimachia lanceolata*		O				1
Ebenales	*Ebenaceae* C Ebony	common persimmon [possum-wood]	*Diospyros virginiana*	tree	A			N	1
Scrophulariales	*Oleaceae* C Olive	white ash	*Fraxinus americana*	tree	O			N	1
Scrophulariales	*Oleaceae* C Olive	green ash	*Fraxinus pennsylvanica*	tree	A			N	1
Scrophulariales	*Oleaceae* C Olive	Forsythia	*Forsythia spp.*	shrub	R				
Scrophulariales	*Oleaceae* C Olive	common lilac	*Syringa vulgaris*	shrub	R				
Scrophulariales	*Oleaceae* C Olive	European privet	*Ligustrum vulgare*	shrub	R			E	
Gentianales	*Gentianaceae* C Gentian	American columbo	*Frasera caroliniensis*		O				1
Gentianales	*Gentianaceae* C Gentian	rose gentian [rose pink, marsh pink]	*Sabatia angularis*		O				1
Gentianales	*Apocynaceae* C Dogbane	dogbane [Indian hemp]	*Apocynum cannabinum*		LC				1
Gentianales	*Asclepiadaceae* C Milkweed	tall green milkweed	*Asclepias hirtella*		U				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Gentianales	*Asclepiadaceae* C Milkweed	swamp milkweed	*Asclepias incarnata*		LC				1
Gentianales	*Asclepiadaceae* C Milkweed	purple milkweed	*Asclepias purpurascens*		O				1
Gentianales	*Asclepiadaceae* C Milkweed	common milkweed	*Asclepias syriaca*		C				1
Gentianales	*Asclepiadaceae* C Milkweed	butterfly-weed	*Asclepias tuberosa var. interior*		C				1
Gentianales	*Asclepiadaceae* C Milkweed	variegated milkweed [white milkweed]	*Asclepias variegata*		O				1
Gentianales	*Asclepiadaceae* C Milkweed	horsetail milkweed [whorled milkweed]	*Asclepias verticillata*		O				1
Gentianales	*Asclepiadaceae* C Milkweed	blue vine	*Cynanchum laeve*		O				1
Polemoniales	*Convolvulaceae* C Morning-glory	small white morning-glory	*Ipomoea lacunosa*		O				1
Polemoniales	*Convolvulaceae* C Morning-glory	wild sweet potato vine	*Ipomoea pandurata*		U				1
Polemoniales	*Polemoniaceae* C Phlox	cleft phlox	*Phlox bifida*		LC				1
Polemoniales	*Polemoniaceae* C Phlox	blue phlox	*Phlox divaricata ssp. laphamii*		C				1
Polemoniales	*Polemoniaceae* C Phlox	garden phlox	*Phlox paniculata*		O-LC				1
Polemoniales	*Polemoniaceae* C Phlox	Jacob-s-ladder	*Polemonium reptans*		C				1
Polemoniales	*Hydrophyllaceae* C Waterleaf	broad-leaved waterleaf	*Hydrophyllum canadense*		LA				1
Polemoniales	*Hydrophyllaceae* C Waterleaf		*Phacelia bipinnatifida*		C				1
Lamiales	*Boraginaceae* C Borage	wild comfrey	*Cynoglossum virginianum*		O				1
Lamiales	*Boraginaceae* C Borage	stickseed	*Hackelia virginiana*		LC				1
Lamiales	*Boraginaceae* C Borage	bluebells [Virginia cowslip]	*Mertensia virginica*		LA				1
Lamiales	*Boraginaceae* C Borage	scorpion-grass	*Myosotis macrosperma*		O				1
Lamiales	*Verbenaceae* C Verbena	blue vervain	*Verbena hastata*		O				1
Lamiales	*Verbenaceae* C Verbena		*Verbena X illicita*		R				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Lamiales	*Verbenaceae* C Verbena	narrow-leaved vervain	*Verbena simplex*		U				1
Lamiales	*Verbenaceae* C Verbena	white vervain	*Verbena urticifolia*		O				1
Lamiales	*Verbenaceae* C Verbena	fog-fruit	*Phyla lanceolata*		LC				1
Lamiales	*Lamiaceae* C Mint	lyre-leaved sage [cancer-weed]	*Salvia lyrata*		O				1
Lamiales	*Lamiaceae* C Mint	downy skullcap	*Scutellaria incana*		LC				1
Lamiales	*Lamiaceae* C Mint	mad-dog skullcap	*Scutellaria lateriflora*		O				1
Lamiales	*Lamiaceae* C Mint	small skullcap	*Scutellaria leonardii*		U				1
Lamiales	*Lamiaceae* C Mint	ground ivy [gill-over-the-ground]	*Glechoma hederacea var. micrantha*		LC			E	1
Lamiales	*Lamiaceae* C Mint	burgamot mint [Monarda, bee balm]	*Monarda bradburiana*		LC				1
Lamiales	*Lamiaceae* C Mint	wild bergamot	*Monarda fistulosa*		O				1
Lamiales	*Lamiaceae* C Mint	henbit	*Lamium amplexicaule*		O			E	1
Lamiales	*Lamiaceae* C Mint	purple dead nettle	*Lamium purpureum*		LA			E	1
Lamiales	*Lamiaceae* C Mint	pagoda plant [wood mint]	*Blephilia ciliata*		O				1
Lamiales	*Lamiaceae* C Mint	pagoda plant	*Blephilia hirsuta*		LC				1
Lamiales	*Lamiaceae* C Mint	stone mint [dittany]	*Cunila origanoides*		C-O				1
Lamiales	*Lamiaceae* C Mint	common water horehound	*Lycopus americanus*		O				1
Lamiales	*Lamiaceae* C Mint	bugle weed	*Lycopus virginicus*		LC				1
Lamiales	*Lamiaceae* C Mint	self heal [heal-all]	*Prunella vulgaris var. elongata*		LC				1
Lamiales	*Lamiaceae* C Mint	mountain mint	*Pycnanthemum pycnanthemoides*		O				1
Lamiales	*Lamiaceae* C Mint	slender mountain mint	*Pycnanthemum tenuifolium [P. flexuosum]*		C				1
Lamiales	*Lamiaceae* C Mint	American germander [wood sage]	*Teucrium canadense var. virginicum*		O				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Lamiales	*Lamiaceae* C Mint	richweed [citronella horse balm]	*Collinsonia canadensis*		U				1
Lamiales	*Lamiaceae* C Mint	yellow giant hyssop	*Agastache nepetoides*		R				1
Lamiales	*Lamiaceae* C Mint	beefsteak plant	*Perilla frutescens*		LC				1
Lamiales	*Lamiaceae* C Mint	hairy synandra [white-flowered mint, synandra]	*Synandra hispidula*		R		E		
Lamiales	*Lamiaceae* C Mint	false pennyroyal	*Trichostema brachiatum*		LC				1
Polemoniales	*Solanaceae* C Nightshade	ground-cherry	*Physalis heterophylla*		U				1
Polemoniales	*Solanaceae* C Nightshade	annual ground-cherry	*Physalis pubescens*		R				1
Polemoniales	*Solanaceae* C Nightshade	horse-nettle	*Solanum carolinense*		O				1
Polemoniales	*Solanaceae* C Nightshade	black nightshade	*Solanum ptycanthum*		U				1
Scrophulariales	*Scrophulariaceae* C Figwort	moth mullein	*Verbascum blattaria*		O				1
Scrophulariales	*Scrophulariaceae* C Figwort	wooly mullein	*Verbascum thapsus*		C			E	1
Scrophulariales	*Scrophulariaceae* C Figwort	candelabra plant [Culver-s-root]	*Veronicastrum virginicum*		O				1
Scrophulariales	*Scrophulariaceae* C Figwort	corn speedwell [blue speedwell]	*Veronica arvensis*		C				1
Scrophulariales	*Scrophulariaceae* C Figwort	purslane speedwell [white speedwell]	*Veronica peregrina*		C				1
Scrophulariales	*Scrophulariaceae* C Figwort	false pimpernel	*Lindernia dubia*		U				1
Scrophulariales	*Scrophulariaceae* C Figwort	clammy hedge-hyssop [common hedge-hyssop]	*Gratiola neglecta*		O				1
Scrophulariales	*Scrophulariaceae* C Figwort		*Leucospora multifida*		O				1
Scrophulariales	*Scrophulariaceae* C Figwort	smooth false foxglove	*Aureolaria flava*		LC				1
Scrophulariales	*Scrophulariaceae* C Figwort	water hyssop	*Bacopa rotundifolia*		LC				1
Scrophulariales	*Scrophulariaceae* C Figwort	smooth beard-tongue	*Penstemon calycosus*		O				1
Scrophulariales	*Scrophulariaceae* C Figwort	foxglove beard-tongue [foxglove penstemon]	*Penstemon digitalis*		O				1
Scrophulariales	*Scrophulariaceae* C Figwort	pale beard-tongue	*Penstemon pallidus*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Scrophulariales	*Scrophulariaceae* C Figwort	winged monkey-flower [common monkey-flower]	*Mimulus alatus*		O				1
Scrophulariales	*Scrophulariaceae* C Figwort	blue-eyed Mary	*Collinsia verna*		LA				1
Scrophulariales	*Scrophulariaceae* C Figwort	late figwort	*Scrophularia marilandica*		LC				1
Scrophulariales	*Scrophulariaceae* C Figwort	false foxglove	*Agalinis fasciculata*		U				1
Scrophulariales	*Scrophulariaceae* C Figwort	false foxglove	*Agalinis paupercula*		U				1
Scrophulariales	*Scrophulariaceae* C Figwort	slender false foxglove	*Agalinis tenuifolia*		O				1
Scrophulariales	*Acanthaceae* C Acanthus	water-willow	*Justicia americana*		LC				1
Scrophulariales	*Acanthaceae* C Acanthus	hairy ruellia [wild petunia]	*Ruellia humilis*		O				1
Scrophulariales	*Acanthaceae* C Acanthus	stalked ruellia [wild petunia]	*Ruellia pedunculata*		C				1
Scrophulariales	*Bignoniaceae* C Trumpet Creeper	trumpet-creeper [trumpet-vine]	*Campsis radicans*	vine	C			N	1
Scrophulariales	*Bignoniaceae* C Trumpet Creeper	northern [hardy] catalpa [cigar tree, Indian bean]	*Catalpa speciosa*	tree	O			N	1
Scrophulariales	*Bignoniaceae* C Trumpet Creeper	southern [common] catalpa [lady cigar tree]	*Catalpa bignonioides*	tree	R			E	
Plantaginales	*Plantaginaceae* C Plantain	bracted plantain	*Plantago aristata*		LA				1
Plantaginales	*Plantaginaceae* C Plantain	buckhorn [English plantain]	*Plantago lanceolata*		LC			E	1
Plantaginales	*Plantaginaceae* C Plantain	common plantain	*Plantago major*		LC			E	1
Plantaginales	*Plantaginaceae* C Plantain	small plantain	*Plantago pusilla*		O				1
Plantaginales	*Plantaginaceae* C Plantain	red-stalked plantain [Rugel-s plantain]	*Plantago rugelli*		LC			N	1
Plantaginales	*Plantaginaceae* C Plantain	dwarf plantain	*Plantago virginica*		LC				1
Rubiales	*Rubiaceae* C Madder	common buttonbush	*Cephalanthus occidentalis*	shrub	O			N	1
Rubiales	*Rubiaceae* C Madder	annual bedstraw [goosegrass, cleavers]	*Galium aparine*		LA				1
Rubiales	*Rubiaceae* C Madder	wild licorice	*Galium circaezans*		C				1
Rubiales	*Rubiaceae* C Madder	shining bedstraw	*Galium concinnum*		C-O				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Rubiales	*Rubiaceae* C Madder	hairy bedstraw [purple bedstraw]	*Galium pilosum*		O				1
Rubiales	*Rubiaceae* C Madder	sweet-scented bedstraw	*Galium triflorum*		O				1
Rubiales	*Rubiaceae* C Madder	rough buttonweed [poorjoe]	*Diodia teres*		LC				1
Rubiales	*Rubiaceae* C Madder	large buttonweed [Virginia buttonweed]	*Diodia virginiana*		R				1
Rubiales	*Rubiaceae* C Madder	tiny bluets	*Hedyotis crassifolia [Houstonia minima]*		LC				1
Rubiales	*Rubiaceae* C Madder	long-leaved bluets	*Hedyotis longifolia [Houstonia longifolia]*		O				1
Rubiales	*Rubiaceae* C Madder	slender-leaved bluets	*Hedyotis nuttalliana [Houstonia tenuifolia]*		O				1
Rubiales	*Rubiaceae* C Madder	broad-leaved bluets	*Hedyotis purpurea [Houstonia purpurea]*		U				1
Rubiales	*Rubiaceae* C Madder	small bluets [star violet]	*Hedyotis pusilla [Houstonia pusilla]*		LC				1
Dipsacales	*Caprifoliaceae* C Honeysuckle	arrowwood	*Viburnum dentatum [recognitum]*	shrub	C			N	
Dipsacales	*Caprifoliaceae* C Honeysuckle	southern wild-raisin	*Viburnum nudum*	shrub	?				
Dipsacales	*Caprifoliaceae* C Honeysuckle	smooth arrowood	*Viburnum recognitum*		?				
Dipsacales	*Caprifoliaceae* C Honeysuckle	nannyberry	*Viburnum lentago*	shrub	?				
Dipsacales	*Caprifoliaceae* C Honeysuckle	rusty nannyberry [southern blackhaw]	*Viburnum rufidulum*	shrub	U			N	1
Dipsacales	*Caprifoliaceae* C Honeysuckle	blackhaw [nannyberry]	*Viburnum prunifolium*	shrub	O				1
Dipsacales	*Caprifoliaceae* C Honeysuckle	American elder [elderberry, golden elder]	*Sambucus canadensis*	shrub	LC			N	1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Dipsacales	*Caprifoliaceae* C Honeysuckle	coralberry [Indian-currant, buck-brush]	*Symphoricarpos orbiculatus*	shrub	LC			N	1
Dipsacales	*Caprifoliaceae* C Honeysuckle	Japanese honeysuckle	*Lonicera japonica var. japonica*	vine	A			E	1
Dipsacales	*Caprifoliaceae* C Honeysuckle	Japanese honeysuckle	*Lonicera japonica var. chinense*	vine	R			E	1
Dipsacales	*Caprifoliaceae* C Honeysuckle	Amur honeysuckle	*Lonicera maackii*		U				1
Dipsacales	*Caprifoliaceae* C Honeysuckle	trumpet honeysuckle [firecracker honeysuckle]	*Lonicera sempervirens*	vine	U			N	1
Dipsacales	*Caprifoliaceae* C Honeysuckle	Illinois horse gentian	*Triosteum illinoense*		O				1
Dipsacales	*Caprifoliaceae* C Honeysuckle	late horse gentian	*Triosteum perfoliatum*		O				1
Dipsacales	*Valerianaceae* C Valerian	pink valerian	*Valeriana pauciflora*		LC				1
Dipsacales	*Valerianaceae* C Valerian	corn salad [lamb-s lettuce]	*Valerianella radiata*		LC				1
Dipsacales	*Dipsacaceae* C Teasel	common teasel	*Dipsacus sylvestris*		O			E	1
Cucurbitales	Cucurbitaceae CGourd	bur cucumber	*Sicyos angulatus*	vine					
Campanulales	*Campanulaceae* C Bellflower	Venus- looking glass	*Triodanis perfoliata*		LC				1
Campanulales	*Campanulaceae* C Bellflower	American bellflower	*Campanula americana*		C				1
Campanulales	*Campanulaceae* C Bellflower	cardinal-flower	*Lobelia cardinalis*		U				1
Campanulales	*Campanulaceae* C Bellflower	Indian tobacco	*Lobelia inflata*		LC				1
Campanulales	*Campanulaceae* C Bellflower	blue cardinal-flower	*Lobelia siphilitica*		O				1
Asterales	*Asteraceae* C Aster	common milfoil [common yarrow, nosebleed]	*Achillea millefolium*		C				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Asterales	*Asteraceae* C Aster	common ragweed [bitterweed, Roman wormwood]	*Ambrosia artemisiifolia*		C				1
Asterales	*Asteraceae* C Aster	lanceleaf ragweed [southern ragweed]	*Ambrosia bidentata*		LC				1
Asterales	*Asteraceae* C Aster	giant ragweed [buffalo weed, horse weed]	*Ambrosia trifida*		O				1
Asterales	*Asteraceae* C Aster	everlasting [ladies- tobacco]	*Antennaria plantaginifolia var. plantaginifolia*		LC				1
Asterales	*Asteraceae* C Aster	everlasting [ladies- tobacco, pussytoes]	*Antennaria plantaginifolia var. ambigens*		U				1
Asterales	*Asteraceae* C Aster	common burdock [smaller burdock]	*Arctium minus*		U				1
Asterales	*Asteraceae* C Aster	Drummond-s aster	*Aster drummondii*		O-LC				1
Asterales	*Asteraceae* C Aster	side-flowered aster [white woodland aster]	*Aster lateriflorus*		LA				1
Asterales	*Asteraceae* C Aster	New England aster	*Aster novae-angliae*		R				1
Asterales	*Asteraceae* C Aster	purple daisy [spreading aster]	*Aster patens*		C-O				1
Asterales	*Asteraceae* C Aster	hairy aster	*Aster pilosus*		C				1
Asterales	*Asteraceae* C Aster	arrow aster [arrow-leaved aster]	*Aster X sagittifolius*		U				1
Asterales	*Asteraceae* C Aster	Short-s aster	*Aster shortii*		LC				1
Asterales	*Asteraceae* C Aster	panicled aster [tall white aster, white field aster]	*Aster simplex*		R				1
Asterales	*Asteraceae* C Aster	aster	*Aster turbinellus*		O				1
Asterales	*Asteraceae* C Aster	swamp marigold [tickseed sunflower]	*Bidens aristosa*		LA				1
Asterales	*Asteraceae* C Aster	Spanish needles	*Bidens bipinnata*		LC				1
Asterales	*Asteraceae* C Aster	nodding beggar-ticks [stick-tight]	*Bidens cernua*		U				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Asterales	*Asteraceae* C Aster	European beggar-ticks [swamp tickseed]	*Bidens tripartita*		O			E	1
Asterales	*Asteraceae* C Aster	false aster	*Boltonia asteroides*		LC				1
Asterales	*Asteraceae* C Aster	false boneset	*Brickellia eupatorioides*		O				1
Asterales	*Asteraceae* C Aster	pale Indian plantain	*Cacalia atriplicifolia*		O				1
Asterales	*Asteraceae* C Aster	great Indian plantain	*Cacalia muhlenbergii*		LC				1
Asterales	*Asteraceae* C Aster	common chicory [blue sailors]	*Cichorium intybus*		R				1
Asterales	*Asteraceae* C Aster	field thistle [pasture thistle]	*Cirsium discolor*		O-LC				1
Asterales	*Asteraceae* C Aster	bull thistle	*Cirsium vulgare*		R				1
Asterales	*Asteraceae* C Aster	horseweed [mule weed]	*Conyza canadensis*		LC				1
Asterales	*Asteraceae* C Aster	tall coreopsis	*Coreopsis tripteris*		O				1
Asterales	*Asteraceae* C Aster	yerba de tajo	*Eclipta prostrata*		O				1
Asterales	*Asteraceae* C Aster	elephant-s-foot	*Elephantopus carolinianum*		O				1
Asterales	*Asteraceae* C Aster	fire weed	*Erechtites hieracifolia*		O-LC				1
Asterales	*Asteraceae* C Aster	annual fleabane	*Erigeron annuus*		LC				1
Asterales	*Asteraceae* C Aster	marsh fleabane [Philadelphia fleabane]	*Erigeron philadelphicus*		C				1
Asterales	*Asteraceae* C Aster	daisy fleabane [rough fleabane, whitetop fleabane]	*Erigeron strigosus*		C				1
Asterales	*Asteraceae* C Aster	tall boneset [tall thoroughwort]	*Eupatorium altissimum*		R				1
Asterales	*Asteraceae* C Aster	blue boneset [mistflower, wild ageratum]	*Eupatorium coelestinum*		LC				1
Asterales	*Asteraceae* C Aster	hollow joe-pye weed [trumpet weed]	*Eupatorium fistulosum*		U				1
Asterales	*Asteraceae* C Aster	common boneset [thoroughwort]	*Eupatorium perfoliatum*		LC				1
Asterales	*Asteraceae* C Aster	white snakeroot	*Eupatorium rugosum*		C				1
Asterales	*Asteraceae* C Aster	late boneset	*Eupatorium serotinum*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Asterales	*Asteraceae* C Aster	grassleaf goldenrod	*Euthamia graminifolia*		U				1
Asterales	*Asteraceae* C Aster	catfoot [old-field balsam, sweet everlasting]	*Gnaphalium obtusifolium*		O				1
Asterales	*Asteraceae* C Aster	early cudweed [purple cudweed]	*Gnaphalium purpureum*		U				1
Asterales	*Asteraceae* C Aster	purple-headed sneezeweed	*Helenium flexuosum*		O				1
Asterales	*Asteraceae* C Aster	pale sunflower [ten-petal sunflower]	*Helianthus decapetalus*		R				1
Asterales	*Asteraceae* C Aster	divergent sunflower [woodland sunflower]	*Helianthus divaricatus*		C				1
Asterales	*Asteraceae* C Aster	small wood sunflower	*Helianthus microcephalus*		O-LC				1
Asterales	*Asteraceae* C Aster	Jerusalem artichoke	*Helianthus tuberosus var. subcanescens*		LC				1
Asterales	*Asteraceae* C Aster	false sunflower [sunflower heliopsis]	*Heliopsis helianthoides*		U				1
Asterales	*Asteraceae* C Aster	hairy hawkweed	*Hieracium gronovii*		C				1
Asterales	*Asteraceae* C Aster	marsh elder [sumpweed]	*Iva annua*		U				1
Asterales	*Asteraceae* C Aster	false dandelion	*Krigia biflora*		O				1
Asterales	*Asteraceae* C Aster	dwarf dandelion [potato dandelion]	*Krigia dandelion*		LC				1
Asterales	*Asteraceae* C Aster	Canada lettuce [horseweed, wild lettuce]	*Lactuca canadensis*		C				1
Asterales	*Asteraceae* C Aster	blue lettuce [woodland lettuce]	*Lactuca floridana*		O				1
Asterales	*Asteraceae* C Aster	willow-leaved lettuce	*Lactuca saligna*		LC				1
Asterales	*Asteraceae* C Aster	compass plant [prickly lettuce]	*Lactuca serriola*		C				1
Asterales	*Asteraceae* C Aster	common tansy [ox-eye daisy, white daisy]	*Leucanthemum vulgare*		C				1
Asterales	*Asteraceae* C Aster	blazing star	*Liatris scabra*		LC				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Asterales	*Asteraceae* C Aster	button snakeroot [marsh blazing star]	*Liatris spicata*		LC				1
Asterales	*Asteraceae* C Aster	pineapple weed	*Matricaria matricarioides*		LC				1
Asterales	*Asteraceae* C Aster	American feverfew [wild quinine]	*Parthenium integrifolium*		O				1
Asterales	*Asteraceae* C Aster	leafcup	*Polymnia canadensis*		O				1
Asterales	*Asteraceae* C Aster	bears foot [leafcup, yellowflower]	*Polymnia uvedalia*		U				1
Asterales	*Asteraceae* C Aster	tall white lettuce	*Prenanthes altissima*		LC				1
Asterales	*Asteraceae* C Aster	great white lettuce	*Prenanthes crepidinea*		LA				1
Asterales	*Asteraceae* C Aster	false dandelion	*Pyrrhopappus carolinianus*		O				1
Asterales	*Asteraceae* C Aster	black-eyed Susan	*Rudbeckia hirta*		C				1
Asterales	*Asteraceae* C Aster	cutleaf coneflower [wild golden glow]	*Rudbeckia laciniata*		O				1
Asterales	*Asteraceae* C Aster	golden ragwort [groundsel, squaw-weed]	*Senecio aureus*		LA				1
Asterales	*Asteraceae* C Aster	butterweed [groundsel, ragwort]	*Senecio glabellus*		LC				1
Asterales	*Asteraceae* C Aster	wholeleaf rosinweed	*Silphium integrifolium*						1
Asterales	*Asteraceae* C Aster	cup plant [cup rosinweed]	*Silphium perfoliatum*		O				1
Asterales	*Asteraceae* C Aster	tall goldenrod	*Solidago altissima*		A				1
Asterales	*Asteraceae* C Aster	Buckley-s goldenrod	*Solidago buckleyi*		U				1
Asterales	*Asteraceae* C Aster	bluestem goldenrod [woodland goldenrod]	*Solidago caesia*		C				1
Asterales	*Asteraceae* C Aster	early goldenrod	*Solidago juncea*		C				1
Asterales	*Asteraceae* C Aster	Dyersweed goldenrod [gray goldenrod]	*Solidago nemoralis*		C-O				1
Asterales	*Asteraceae* C Aster	elm-leaved goldenrod	*Solidago ulmifolia*		C				1

Vascular Plants of Crab Orchard NWR (Continued)

Order	Family	Common Name(s)	Scientific Name(s)	Growth Form	Frequency of Occurrence	Status		Native /Exotic	Ref.
						Fed.	State		
Asterales	*Asteraceae* C Aster	red-seeded dandelion [smooth dandelion]	*Taraxacum laevigatum*		R				1
Asterales	*Asteraceae* C Aster	common dandelion	*Taraxacum officinale*		LC				1
Asterales	*Asteraceae* C Aster	goat-s beard [sand goat-s beard]	*Tragopogon dubius*		O				1
Asterales	*Asteraceae* C Aster	wing stem [yellow iron weed]	*Verbesina alternifolia*		LA				1
Asterales	*Asteraceae* C Aster	yellow crownbeard	*Verbesina helianthoides*		O				1
Asterales	*Asteraceae* C Aster	tall iron weed	*Vernonia gigantea*		O				1
Asterales	*Asteraceae* C Aster	Missouri ironweed	*Vernonia missurica*		U				1
Asterales	*Asteraceae* C Aster	cocklebur	*Xanthium strumarium var. canadensis*		O-LA				1

Frequency of Occurrence Key

A = abundant

LA = locally abundant

C = common

LC = locally common

O = occasional

R = rare? = undocumented

Reference Key1 = Ulaszek, Eric F. 1988. The vascular flora of the Devils Kitchen Lake area, Williamson and Union counties, Illinois. M.S. thesis, Southern Illinois University, Carbondale. 98p.2 = Mohlenbrock, Robert H., and John W. Voigt. 1959. A flora of southern Illinois. Southern Illinois University Press, Carbondale and Edwardsville. 390 p.General ReferencesIverson, L.R., D. Ketzner, and J. Karnes. 1999. Illinois Plant Information Network. Database at http://www.fs.fed.us/ne/delaware/ilpin.html. Illinois Natural History Survey and USDA Forest Service.Mohlenbrock, Robert H., and John W. Voigt. 1959. A flora of southern Illinois. Southern Illinois University Press, Carbondale and Edwardsville. 390 p.Petrides, George A. 1986. A field guide to trees and shrubs. Peterson Field Guide Series. Houghton Mifflin Co., Boston. 428 p.Pohl, Richard W. 1968. How to know the grasses. William C. Brown Co. Publishers, Dubuque, Iowa. 200 p.

Appendix E: State-listed Species Potentially Found at Crab Orchard NWR

State-listed Species Potentially Found at Crab Orchard NWR

Birds	Status	Breeding Status
Birds		
Pied-billed Grebe *(Podilymbus podiceps)*	Threatened	Migrant
American Bittern *(Botaurus lentiginosus)*	Endangered	Migrant; former breeder
Least Bittern *(Ixobrychus exilis)*	Threatened	Migrant; former breeder
Snowy Egret *(Egretta thula)*	Endangered	Migrant
Little Blue Heron *(Egretta caerulea)*	Endangered	Migrant
Black-crowned Night Heron *(Nyctanassa nycitcorax)*	Endangered	Migrant
Yellow-crowned Night Heron *(Nyctanassa violacea)*	Endangered	Migrant
Northern Harrier *(Circus cyaneus)*	Endangered	Migrant
Mississippi kite *(Icitinia mississippiensis)*	Endangered	Migrant
Red-shouldered Hawk *(Buteo lineatus)*	Threatened	Breeder
Bald Eagle *(Haliaeetus leucocephalus)*	Threatened	Breeder
Osprey *(Pandion haliaetus)*	Endangered	Migrant; former breeder
Peregrine Falcon *(Falco peregrinus)*	Endangered	Migrant
Common Moorhen *(Gallinula chloropus)*	Threatened	Migrant
Sandhill Crane *(Grus Canadensis)*	Threatened	Migrant
Upland Sandpiper *(Bartramia longicauda)*	Endangered	Migrant; former breeder
Wilson's Phalarope *(Phalaropus tricolor)*	Endangered	Migrant
Forster's Tern *(Sterna forsteri)*	Endangered	Migrant
Least Tern *(Sterna antillarum)*	Endangered	Migrant
Black Tern *(Chlidonias niger)*	Endangered	Migrant
Barn Owl *(Tyto alba)*	Endangered	Migrant
Short-eared Owl *(Asio flammeus)*	Endangered	Migrant
Loggerhead Shrike *(Lanius ludovicianus)*	Threatened	Breeder
Brown Creeper *(Certhia americana)*	Threatened	Migrant
Bewick's Wren *(Thryomanes bewickii)*	Endangered	Migrant
Henslow's Sparrow *(Ammodramus henslowii)*	Endangered	Breeder
Mammals		
Indiana bat *(Myotis sodalis)*	Endangered	Status Unknown
Golden mouse *(Ochrotomys nuttalli)*	Threatened	Breeder
Marsh rice rat *(Oryzomys palustris)*	Threatened	Breeder
River otter *(Lontra canadensis)*	Threatened	Status Unknown
Plants		
Hairy synandra *(Synandra hispidula)*	Endangered	

Appendix F: Bibliography

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Appendix G: Public Law 80-361

Appendix G: Public Law 80-361

[Public Law 361 - 80th Congress]

[Chapter 489 - 1st Session]

[H.R. 3043]

AN ACT

To provide for the transfer of certain lands to the Secretary of the Interior, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to promote the orderly development and use of the lands and interests therein acquired by the United States in connection with the Crab Orchard Creek project and the Illinois Ordnance Plant in Williamson, Jackson, and Union Counties, Illinois, consistent with the needs of agriculture, industry, recreation, and wildlife conservation, all of the interests of the United States in and to such lands are hereby transferred to the Secretary of Interior for administration, development, and disposition, in accordance with the provisions of this Act.

Sec. 2. All of the lands transferred to the Secretary of the Interior, pursuant to the provisions of this Act, first shall be classified by him with a view to determining, in cooperation with Federal, State, and public or private agencies and organizations, the most beneficial use that may be made thereof to carry out the purposes of this Act, including the development of wildlife conservation, agricultural, recreational, industrial, and related purposes. Such lands as have been or may hereafter be determined to be chiefly valuable for industrial purposes shall be leased for such purposes at such times and under such terms and conditions as are consistent with the general purposes of Section 2 of the Surplus Property Act of 1944, as amended, and with the purposes of this Act. Except to the extent otherwise provided in this Act, all lands herein transferred shall be administered by the Secretary of the Interior through the Fish and Wildlife Service in accordance with the provisions of the Act of August 14, 1946 (Public Law 732, Seventy-ninth Congress), and Acts supplementary thereto and amendatory thereof for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes specified in this Act: Provided, that no jurisdiction shall be exercised by the Secretary of the Interior over that portion of such lands and the improvements thereon which are now utilized by the War Department directly or indirectly until such time as it is determined by the Secretary or War that utilization of such portions of such lands and the improvements thereon directly or indirectly by the War Department is no longer required: Provided further, That, subsequent to the determination referred to in the preceding proviso, the lands and improvements mentioned therein shall be administered by the Secretary of the Interior, and any lease or other disposition thereof shall be made subject to such terms, conditions, restrictions, and reservations imposed by the Secretary of War as will, in the opinion of the Secretary of War, be adequate to assure the continued availability for war production purposes of such lands and improvements.

Approved August 5, 1947.

Appendix H: Summary of Public Comment on Alternatives

Appendix H: Summary of Public Comment on Alternatives

Public input is a key element in comprehensive conservation planning. We have been and continue to be committed to involving Refuge visitors, neighbors, the business community, farmers, other government units, and others interested in the Refuge's future in this planning process. In September 2001, we mailed out 1,400 copies of a project update that described the planning process, the framework for developing the alternatives to be considered, and the four concepts that we were considering as preliminary management alternatives. Copies of the update were also available at the Refuge. People were invited to voice their thoughts on these alternatives either through e-mail or letters. We received approximately 39 messages through e-mail, and 62 individual letters and 527 form letters, some of which included individual comments. We also received a petition with 485 names.

We have Comments are summarized people's comments in the following paragraphs.

Comments in Support of Each Alternative

Alternative A

Many of the people who wrote letters or e-mail in support of Alternative A described themselves as supporting the original charter that established the Refuge in 1947. The relationship of the Refuge's four purposes – conservation of wildlife and development of agriculture, recreation, industrial and related purposes – was described as "symbiotic" by some writers. Some supporters said that the combined purposes are dependent upon one another and that decreasing any particular existing use would have ramifications for other uses. Several writers noted the importance of Crab Orchard Lake and industry on the Refuge to the local economy. Some supporters of Alternative A said that change is unnecessary because existing uses have not been detrimental to wildlife or water quality.

Some people said that they supported Alternative A because they had reservations about the ability of Southern Illinois University to manage the resource.

Personal history with Crab Orchard Lake's Lake Marion recreational amenities was a factor in much of the support for Alternative A. Some individuals described the Refuge as a "heritage" and "way of life." Memories of gathering with family and friends at the Crab Orchard Boat & Yacht Club were frequently cited by individuals supporting this alternative. Some people described camping and boating as contributing to their love for nature and appreciation for wildlife, and they expressed a desire for the same opportunities to be available to their children and grandchildren. Individuals who are retired said that the Refuge is an affordable destination that provides pleasant scenery, good fishing, and companionship with other retired people. Older people and women also noted that the Crab Orchard Boat & Yacht Club is a place where they feel safe camping. Other people said they appreciate the alcohol-free environment of the Club.

Some individuals said that their support of Alternative A was partly a response to past public use restrictions and their perception that this alternative would lead to fewer restrictions than the other alternatives. In the same vein, some people supported the alternative and the concept of opening areas that have been closed. One writer said that prairie restoration is not occurring and supports returning more fields to grain crops and grazing.

The events of September 11, 2001, were on the minds of some of the people who wrote in support of Alternative A. Some individuals said that in an uncertain world, the community needs jobs and security, and thus needs to retain industry and existing recreational facilities at the Refuge.

Variations on Alternative A:

Individuals who overall support Alternative A also described various changes in current management that they would like to see implemented. Some said that what they called "high impact recreation" such as personal watercraft, all-terrain vehicles and "excessively powered" engines should be banned from the Refuge. There was support for giving greater emphasis on low-impact recreation uses such as hiking, sightseeing and photography, and limiting hunting to specific areas to avoid conflict with other uses.

Some people said that facilities such as boat ramps, rest rooms, roads, and electrical services should be improved in church camps and campgrounds. It was suggested that the beach and facilities at Carterville Beach be restored; another writer said that beaches in general should be opened up

and maintained for public swimming. One individual suggested that the Refuge should increase the number of law enforcement and maintenance positions on the Refuge.

Some people who support Alternative A suggested that if the Service ultimately decides on the alternative involving a land exchange, the Crab Orchard Boat & Yacht Club should not be included in the exchange. Individuals espousing this opinion said that the club does not present a great deal of cost to the Service and provides funding through annual lease fees.

Another writer stated that new recreational opportunities should be allowed on Devil's Kitchen Lake, including scuba diving.

While they described Alternative A as most closely aligning to their preference in Refuge management if combined with an increase in support for public recreation, officials with the Illinois Department of Natural Resources offered several specific recommendations on the direction of Crab Orchard National Wildlife Refuge. Maintaining and improving existing recreational facilities should be one of the needs against which alternatives are measured, DNR officials said. Specific recommendations included:

Fish & Wildlife:

Consolidate block timber management for forest interior species around Devil's Kitchen and Little Grassy lakes in the areas south of Grassy Road.
Increase development of moist-soil wetland units where possible in pastures and/or marginal crop fields.
Control exotic vegetation and convert non-native pines to deciduous forest.
Continue warm, cool and cold-water fisheries management.
Expand public hunting opportunities where possible.

Recreation:

Consolidate marina services by private vendor to Playport area.
Upgrade Route 13 (Images Marina) to a large boat ramp with expanded parking and upgrade other boat ramps, campgrounds and beaches.
Allow regulated recreational power boating on Crab Orchard to continue with time and space zoning for water skiing and personal water craft.
Continue to authorize the use of small outboard motors on Devil's Kitchen Lake.
Maintain status of Refuge Youth Camps and, where possible, tie their mission to environmental education as an outreach effort.
Expand public hunting opportunities where possible.

Industry:

Maintain the status quo with existing tenants and encourage new prospects to locate in industrial parks associated with nearby cities.

Agriculture:

Maintain 4,000 to 5,000 acres of agriculture in crop fields, as winter food for Canada geese and other wildlife.
Evaluate cropfields and pastures for levels of goose use to determine suitability for conversion to wetlands, grasslands or woodlands.
Evaluate all pastures with low goose use levels for conversion from cool season grasses to native warm season grasses to benefit grassland birds.
Add warm season grass borders to many crop fields.

Alternative B

Some Alternative B supporters cited a desire to ensure the best interests of the land and wildlife while still valuing the area's importance to recreation, industry and agriculture. The Refuge's importance in drawing tourism to the area was cited as the reason other writers supported it. Some writers advocated bolstering recreational facilities in the northwest corner of the Refuge to make it a landmark destination facility. Supporters said that exchanging recreational land would allow the National Wildlife Refuge System to focus on its mission while a more appropriate institution focused on improving recreational amenities. The alternative was also seen as a means of decreasing habitat fragmentation. Other supporters suggested that a land exchange would result in the ability to charge higher rates, which would ultimately provide more money for improvement of recreational facilities.

Variations on Alternative B: Variations suggested on this alternative included allowing current boating activities on Crab Orchard Lake and Little Grassy Lake but eliminating the use of personal

watercraft. Increased dangers, liability, noise and water pollution were cited by one writer as reasons to eliminate personal watercraft.

One writer supports a land exchange with Southern Illinois University, but with or without an exchange would like to pursue leasing a marina for sailboats on Crab Orchard Lake.

Alternative C

Alternative C's supporters said that emphasizing open land habitats would satisfy the Refuge's recreation purpose as much as possible given the Service's budget and would expand wildlife-dependent recreation.

Variations on Alternative C: Interest was expressed in creating habitat to benefit wild turkeys, which was described as a patchwork of cropland, grassland and woodlands with timber in various stages of succession. Another writer identified Alternative C as his first choice, but suggested rolling alternatives A and C into one alternative.

Alternative D

Individuals supporting Alternative D said that enhancing forest habitat would benefit songbirds by reducing habitat fragmentation and would provide more recreational opportunities for hikers, bikers and horseback riders. Some people cited the length of time it takes to establish a forest and the difficulty in replacing forest.

Variation on Alternative D: Some individuals were in overall support of Alternative D, but voiced a preference for recreation as it now exists.

Comments About a Particular Aspect of Certain Alternatives

Phasing Out Group Camps

Four group camps – Camp Carew, Methodist Camp, Camp Cedar Point and Pine Ridge Camp – are operated on the Refuge. The camps include two church camps, a Boy Scout camp and Camp Cedar Point, which is operated by the Girl Scouts of America. Alternative C, Open Land Management, proposes to phase out the group camps. Alternative A would maintain group camping as it is currently allowed, and alternatives B and D would manage group camps with an emphasis on the National Wildlife Refuge System.

A number of people, including former and current Girl Scouts and Scout leaders, wrote in favor of maintaining the current management of group camps, specifically Camp Cedar Point. Some writers noted that the camp has been a positive partnership for the Refuge because it accomplishes Girl Scout goals for girls who participate in the program and it plants the seeds of a conservation ethic in young minds. In the same vein, some writers said that without exposing children and teenagers to nature, there won't be anyone who cares about the land in the future.

A camper noted that she has learned basic life skills at Camp Cedar Point that her non-camping classmates have not gained, and Scout leaders said that Camp Cedar Point is one of the best outdoor camps in the area. Another troop leader said that Camp Cedar Point is the only wildlife experience that some girls get as children.

The events of September 11 were also noted in letters supporting continuation of group camps. Youth are now facing more uncertainty than ever, one writer said, and they need the environment as an oasis and retreat.

Eliminating Motorboats from Devils Kitchen Lake

Alternatives B, C and D propose to eliminate the use of gas motors on Devil's Kitchen Lake.

Some writers suggested that eliminating motor boats on Devils Kitchen Lake is unnecessary because the existing 10-horse power limit and existing boat traffic do not discourage canoe use on the lake. Rather, submerged trees and stumps create more hazards for canoeists than existing boat use, some people said. Some people expressed concern that banning gas motors would effectively prohibit older people from fishing the lake. Some writers said that the lake is too big to fish in a non-motorized craft, and others shared stories of being stuck on a submerged tree and needing a motor to break free again. Some writers noted that they are paying fees to use Refuge lakes and said that they do not want to see any restrictions in public use. Some writers said that the lake's water quality belies the need to eliminate motors. On the other hand, the opinion was also expressed that the changes proposed would improve fishing on Devils Kitchen Lake.

Land Exchange

Alternative B proposes exchanging land in the developed northwest corner of the Refuge with Southern Illinois University. The area under consideration is directly adjacent to New Route 13 and includes two marinas, parking lots, picnic areas and a campground.

Some individuals expressed reservations about Southern Illinois University's ability to successfully manage recreation if a land exchange occurred. Others interpreted an exchange with SIU as a decrease in recreational facilities and activities, and opposed it on that basis. Individuals in favor of a land exchange said that recreational activities are not appropriate to the mission of the National Wildlife Refuge System and also constitute a drain on budgets and staff availability. Supporters of a land exchange said that developed uses would be more appropriately managed by local park districts and State of Illinois programs.

Restatement of Issues

Personal Watercraft: Some respondents expressed a desire to have personal watercraft prohibited on the Refuge, saying that they are loud, they pollute the lake, they interfere with other watercraft and they interfere with waterfowl. Boating should be restricted to canoes, kayaks, sailboats, pontoons and fishing boats, and a "somewhat lower" horse-power limit should be initiated, according to some writers. In addition to personal watercraft, some people said that all-terrain vehicles and "motorized thrill craft" in general damage streams, creeks, and thin soil areas, and they are hard to police. One writer described himself as liking personal watercraft, but said he does not support their use on Refuge lakes because the people using them are often "arrogant and reckless."

Sailboats: Some people wrote to voice their desire for increased sailboat access to Crab Orchard Lake. Some writers described enhancing accommodations for sailboats on Crab Orchard Lake as a significant issue. Sailing was advocated as a low-impact approach to expanding public use opportunities for wildlife observation and photography and environmental education in aquatic, shoreline, and nearshore flora and fauna. Other people advocated allowing sailing, saying that sail boats do not generate fuel and oil residue, are quiet, and do not contribute to shoreline erosion. Sailing was also advocated as a means of exposing people to the Refuge in a way that makes it a special and lasting experience.

Removal of Pines and Logging: Some people expressed an opinion against logging at Crab Orchard National Wildlife Refuge, saying that heavy equipment would damage sensitive soils and have a deleterious impact on water quality. The potential impact on wildlife was also cited by a writer opposing logging on the Refuge. Other people supported the existence of pine stands on the Refuge because they provide habitat for a variety of bird species but also supported planting hardwoods in areas where pines have already been removed. Other writers said they supported thinning pine stands and replacing them with hardwoods.

Fee Program: Some writers said that the fee program should be discontinued because people are already paying for the Refuge via taxes. The fee program was described as an "unfair system" that limited access to the Refuge for people with low incomes. Other people suggested that the Refuge recognize a current duck stamp as a valid pass for entering the Refuge. One writer said that the fee system has discouraged him from going to the Refuge and questioned whether it has reduced cost the Refuge in terms of public support for the Refuge.

Comments on Variations of Alternatives:

Some of the people who wrote letters or e-mail to support a specific alternative suggested significant variations to the management alternatives.

One writer who supported Alternative A suggested that the Fish and Wildlife Service work with the U.S. Park Service to "...coordinate something really 'great' in education, recreation and environmental needs" for Crab Orchard Lake and the entire Refuge.

Writers suggested a compromise on the issue of eliminating motors from Devil's Kitchen Lake by eliminating motors only on the southern half of the lake. People would still have the opportunity to boat and fish with motors on the northern half of the lake, while eliminating motors on the southern half would expand the wilderness area. It was also suggested that new public use activities such as scuba diving and snorkeling would introduce an innovative approach to wildlife observation in a fresh water community.

Some writers did not identify a specific alternative they would like to see pursued, but did discuss particular management concerns. Some people said that the Refuge over emphasizes game species at the expense of non-game species and native plants. Writers also encouraged the Refuge to increase efforts to inventory and assess the status of federal and state-listed threatened and endangered species within the Refuge and to encourage habitat supporting those species.

Appendix I: Letter Outlining the Exchange Proposal

SIU

SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE

July 9, 2002

Mr. Rick Frietsche
Refuge Manager
Crab Orchard National Wildlife Refuge
8588 Route 148
Marion, Illinois 62959

Dear Mr. Frietsche:

This letter will outline the use of the Fish and Wildlife properties at Crab Orchard National Wildlife Refuge currently being proposed for exchange with Southern Illinois University Carbondale. If the proposed exchange takes place, the following properties will be used accordingly:

1. Crab Orchard Boat and Yacht Club

   This property will continue to be used by the public as a recreational boating facility. No changes in the present administration of the club are anticipated with the possible exception of an expanded membership initiative.

2. The Haven

   Three possible uses of the Haven are anticipated:
   1. Conference Center
   2. Visitors Center
   3. Touch of Nature Headquarters building should the acquired property be combined with the present Touch of Nature properties. The Haven will continue to be a public use facility.

3. Crab Orchard Camp Grounds

   SIU will continue to improve this facility with the reopening of the Images Marina under a private vendor. Public use boating and camping will continue to be the sole use of this property.

Vice Chancellor for Administration, Mailcode 4314, Carbondale, Illinois 62901-4314, 618/453-2474, Fax: 618/453-3747

Mr. Freitsche
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July 9, 2002

4. Look Out Point

This area will continue as a major outdoor recreation area. The University will seek a private vendor to build a resort and/or hotel complex in the Look Out Point area. Bicycle and walking trails will accommodate the resort area. Other possible outdoor recreation facilities west of the spillway road include a water park and a par three golf course.

5. Playport Marina

This facility will continue to operate as the primary boating facility for Crab Orchard Lake and will continue with private vendorship under SIU management.

Sincerely,

Glenn Poshard
Vice Chancellor for Administration

GP:pp

Appendix J: Compatibility Determinations

In accordance with the Refuge Improvement Act of 1997, no uses for which the Service has authority to regulate may be allowed on a unit of Refuge System unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge. Managers must complete a written compatibility determination for each use, or collection of like-uses, that is signed by the manager and the Regional Chief of Refuges in the respective Service region.

Draft compatibility determinations were included in the Draft EIS/CCP to allow public review and comment.

Final compatibility determinations will be signed following release of the Record of Decision and will be available for viewing at Refuge headquarters. Below is a list of compatibility determinations included in the Draft EIS/CCP.

- # Biking/Jogging and Footraces
- # Boating
- # Camping, Swimming and Picnicking
- # Cemetery Operations
- # Collection of Wild Plant Foods for Personal Use
- # Cooperative Farming
- # Fire Department Training
- # Fishing (Competitive Events)
- # Fishing (Recreational)
- # Grazing of Livestock
- # The Haven Operations
- # Haying
- # Horseback Riding
- # Hunting of Fox
- # Hunting of Migratory Waterfowl and Game Birds, Resident Game and Furbearers (Recreational)
- # Industrial Operations
- # Installation of Nesting Structures by Public or Groups
- # Interpretation and Environmental Education
- # Priority Wildlife-dependent Recreational Uses on Lands Proposed to be Acquired
- # Sewage Collection System Replacement by the City of Marion
- # Trapping of Furbearers
- # Waterskiing
- # Wildlife Observation and Interpretation
- # Wood Cutting and Timber Harvest
- # Youth Camp Operations

Appendix K: Refuge Operating Needs System (RONS) and Maintenance Mangement System (MMS) Projects

Appendix K: Refuge Operating Needs System (RONS) and Maintenance Management System (MMS) Projects

Refuge Operating Needs System (RONS)

Project No.	Project Title and Description	Cost Estimate (1,000 of $)
97001	*Increase Pest Plant Control:* Use a combination of mechanical and chemical measures to eliminate autumn olive on the Crab Orchard National Wildlife Refuge. Natural plant succession is virtually impossible on areas of the refuge due to the existence and increasing amount of autumn olive. This exotic woody plant is an early invader and tends to out-compete native woody plants. The project will reduce and control invasion of autumn olive throughout the refuge.	$56.808
97003	*Conduct Nongame Bird Census:* Conduct a nongame bird census on the refuge to provide a better understanding of bird use of the refuge with emphasis on Midwest species of concern. Information will be used to help the refuge make management decisions relating to restoring fragmented forests and grasslands. A standardized census method will be used in cooperation with the Illinois Natural History Survey and Illinois Department of Natural Resources.	$34.56
97009	*Reduce Forest Fragmentation:*Forest habitat fragmentation will be reduced by restoring the native hardwood vegetative cover on selected parcels of open land. Restoration involves mechanical and chemical site preparation treatment, cover crop establishment, planting native seedlings, monitoring forest development, and follow-up silvicultural treatments. Providing large blocks of high quality habitat should increase nesting success of forest interior bird species and also help preserve biological diversity. This project will decrease habitat fragmentation and improve wildlife productivity.	$20.24
97008	*Enhance Timber Management:*Conduct forest habitat improvement treatments using various silvicultural practices including thinning, stand improvement cutting, and regeneration cutting. A priority project on the Refuge is the conversion of 3,500 acres of non-native pine plantations to an oak-hickory forest. An inventory of advanced hardwood seedlings and sprouts will be conducted on 600 acres of pine plantation per year to determine if an adequate number of trees are present before the overstory is converted to native hardwoods. Removal of pine trees will be done to improve habitat conditions for many species of migratory birds that depend on large tracts of native hardwood forest.	$181.6
98027	*Conduct Indiana Bat survey:* Conduct an Indiana bat survey on the Crab Orchard National Wildlife Refuge. In order to avoid adverse impacts to the federally endangered Indiana bat and to comply with endangered species laws and regulations, surveys will be conducted within refuge pine stands. Conversion of 3,500 acres of nonnative pine trees to native hardwood forest is a very high refuge priority.	$27
98036	*Provide Shoreline Stabilization for Crab Orchard Lake:* Stabilize the shoreline of Crab Orchard Lake with filter fabric and rock. Erosion is occurring along 14 miles of the shoreline of Crab Orchard Lake. Wind driven waves are the primary cause of the erosion and rock will slow the process, reducing siltation and improving water quality. Crab Orchard Lake provides habitat for waterfowl, herons, egrets, shorebirds and fish. The lake is also used for various forms of water recreation.	$418

Refuge Operating Needs System (RONS)

Project No.	Project Title and Description	Cost Estimate (1,000 of $)
	RONS Tier 2	
03001	Law Enforcement Position Increased Funding:	$5
04001	Fulltime Law Enforcement Officer	$136
02001	Thin non-native pine plantations to encourage growth of desirable hardwoods	$90
02002	Convert fescue pastures to native warm season grasses and better cool season non-native grasses	$58
02007	Increase technical oversight of Refuge agricultural program	$40
99801	Volunteer Program Enhancement	$50
99003	Improve Visitor Services	$630
02003	Convert hay fields from cool-season cover to warm-season cover	$16
02012	Protect visitors and provide officer safety	$31
02005	Maintain early succession habitat (shrubland) with burning and mowing	$46
02011	Educate Visitors and schoolchildren	$28
02008	Remove woody fence row and roadside vegetation to enhance Refuge grass-lands for breeding birds	$40
02004	Add 30-foot wide field borders of native warm season grasses to farm fields	$4
02010	Install water monitoring devices on the Refuge's 3 large reservoirs	$38
98029	Increase aquatic resources surveys and monitoring	$102
02009	Remove trees from 140 ammunition storage bunkers	$114
98010	Conduct archeological survey of the refuge	$595
00003	Protect Visitors and Refuge Resources from illegal activities	$160

Maintenance Management System (MMS) Projects

Project No.	Project Title	CostEstimate (1000's of $)
00432	Replace / Replace Deficient Heating System in the Headquarters Building	$153
00364	Devils Kitchen Dam – Phase I [d]	$500
03507	CN Construct Turning Lanes at Visitor Center on SR 148.	$600
00434	Replace West Gate Road Bridge.	$377
00364	Devils Kitchen Dam – Phase II [cc]	$1,700
98052	Shoreline habitat restoration and stabilization	$3,563
02003	Replace deteriorated 4 inch steel waterline at Crab Orchard Campground	$364
98333	CN Repair Devils Kitchen bridge.	$139
00130	Replace deteriorated water distribution lines in the SE quadrant.	$471
98022	Remove Sewage & Water Treatment Plant	$2,279
98042	Construct Visitor & Learning Center	17,092
02001	Repair Deficiencies on Pond A-41 as Outlined in Dam Safety Report	$485

Maintenance Management System (MMS) Projects

Project No.	Project Title	CostEstimate (1000's of $)
00130	Replace deteriorated water distribution lines in NW Quadrant.	$471
02504	Upgrade Line Roads at Devils Kitchen Area. FHWA Route No. 115	$4,500
02502	Repair Devils Kitchen Road. FHWA Route No. 017	$770
86015	Replace deteriorated Pond A-41 Water Control Structure.	157
03508	"PE Road, Parking Lot, and Bridge Rehabilitation"	$300
86004	Resurface Cambria Point Lane. FHWA Route No. 105	$153
00130	Replace deteriorated water distribution lines in the NE quadrant.	$472
98011	Remove unused warehouses in Area-7 of the industrial area	$294
00435	Repair deficient Wolf Creek Bridge at Causeway	$110
98020	Remove line roads at Devils Kitchen Lake	$281
01019	"John Deere 550B Dozer, 78hp, winch"	$152
01028	"Champion 710A Road Grader, 135hp, 12' blade"	$142
01047	"Caterpillar D4C III LGP Dozer, 87hp w/cab, 25"" track shoes"	$121
02502	Repair Surfacing on Headquarters Parking – FHWA Route No. 901	$180
02503	Repair Surfacing on Chamesstown School Trail Parking - FHWA Route No. 902	$215
02505	Repair Surfacing on Primex Stringtown Parking	$339
02506	Repair Surfacing on Images Marina Parking – FHWA Route No. 906	$393
02507	Repair Surfacing on SR 13 Boat Landing – FHWA Route No. 907	$168
02509	Repair Surfacing on Line 16 Parking – FHWA Route No. 914	$122
02510	Repair Surfacing on Wolf Creek Fishing Access Parking – FHWA Route No. 915	$115
02513	Repair Surfacing on Devil's Kitchen Campground Parking - FHWA Route No. 925	$139
02514	Repair Surfacing on Devil's Kitchen Boat Ramp Parking – FHWA Route No. 926	$146
02515	Repair Surfacing on Tacoma Lake Road Parking – FHWA Route No. 927	$105
02524	Repair Surfacing on Primex Warehouse Parking – FHWA Route No. 939	$201
02526	Repair Surfacing on Ensign-Bickford Parking – FHWA Route No. 941	$297
02527	Repair Surfacing on Diagraph Corporation Main Parking – FHWA Route No. 942	$166
02531	Repair Surfacing on Pigeon Creek Road – FHWA Route No. 010	$121

Maintenance Management System (MMS) Projects

Project No.	Project Title	CostEstimate (1000's of $)
02533	Repair Surfacing on Stringtown Road – FHWA Route No. 012	$884
02534	Repair Surfacing on Post Oak Road – FHWA Route No. 013	$184
02535	Repair Surfacing on Research Road – FHWA Route No. 014	$126
02536	Repair Surfacing on Wolf Creek Road – FHWA Route No. 015	$919
02537	Repair Surfacing on Tacoma Road – FHWA Route No. 016	$998
02539	Repair Surfacing on Odgen Road East – FHWA Route No. 018	$292
02539	Repair Surfacing on Odgen Road West – FHWA Route No. 019	$686
02541	Repair Surfacing on Old Highway 13 – FHWA Route No. 100	$359
02543	Repair Surfacing on Greenbriar Road – FHWA Route No. 102	$442
02544	Repair Surfacing on Crab Orchard Campground – FHWA Route No. 103	$2,111
02545	Repair Surfacing on Images Marina Road – FHWA Route	$310
02546	Repair Surfacing on Cambria Point Lane – FHWA Route	$152
02547	Repair Surfacing on Haven Access Loop – FHWA Route	$129
02550	Repair Surfacing on Spillway Landing Road - FHWA Route No. 109	$148
02551	Repair Surfacing on Propeller Road – FHWA Route No. 110	$413
02552	Repair Surfacing on Broken Handle Road – FHWA Route	$207
02553	Repair Surfacing on Bald Eagle Lane – FHWA Route	$562
02554	Repair Surfacing on Devils Kitchen Campground – FHWA Route No. 113	$412
02555	Repair Surfacing on Devils Kitchen Boat Ramp Access – FHWA Route No. 114	$114
02556	Repair Surfacing on Devil's Kitchen Line 11 Road – FHWA Route No. 115	$571
02558	Repair Surfacing on Devils Kitchen Line 13 Road – FHWA Route No. 117	$734
02559	Repair Surfacing on Devils Kitchen Line 16 Road – FHWA Route No. 118	$587
02561	Repair Surfacing on Cedar Point Youth Camp Road – FHWA Route No. 120	$285
02562	Repair Surfacing on Devil's Kitchen Line 3 Road – FHWA Route No. 121	$294

Maintenance Management System (MMS) Projects

Project No.	Project Title	CostEstimate (1000's of $)
02563	Repair Surfacing on Devil's Kitchen Line 5 Road – FHWA Route No. 122	$1,036
02565	Repair Surfacing on Devil's Kitchen Line 6 Road – FHWA Route No. 124	$177
02566	Repair Surfacing on Devils Kitchen Line 6 Loop Road – FHWA Route No. 125	$530
02567	Repair Surfacing on Devils Kitchen Line 6 Spur Road – FHWA Route No. 126	$106
02568	Repair Surfacing on Devils Kitchen Line 6 Loop Spur Road – FHWA Route No. 127	$163
02571	Repair Surfacing on Little Grassy Lake Campground Road – FHWA Route No. 130	$212
02004	"Freightliner Dump Truck, 52000 GVWR"	$100
00399	Visitor Center Dam Rehabilitation [d/cc]	$3,000
01NNN	Cleanup of Pesticide Contamination in Area 7 Buildings	$140
98033	Enhance environmental education and interpretation opportunities	$162
00001	"Develop interpretive, regulatory, and directional signing"	$112
99001	Improve access to house boat pumpout station	$130
98035	Provide adequate parking for the Playport Marina	$370
99003	Improve Visitor Services	$630
00003	Protect Visitors and Refuge Resources from illegal activities	$160
03001	Demolition and Disposal of an abandoned water tower a the south end.	$100
03002	Removal and Disposal of Wharehouse S-4-3.	$130
03004	Construct a Building Addition to the Headquarters Building	$350
03006	Construct and Office Addition to the Visitor Center.	$300
03007	Repair erosion on Little Grassy Dam.	$180
03008	Replace deteriorated cyclone fence around Area 6 Igloo Complex	$804
03009	Replace deteriorated cyclone fence around Area 13 Igloo Complex.	$917
03010	Upgrade Crab Orchard Campground Campsites.	$360

Appendix L: Land Protection Plan

Crab Orchard

National Wildlife Refuge

Boundary Modification Land Protection Plan

June 2004

1. Project Description

Crab Orchard National Wildlife Refuge (NWR) was established on August 5, 1947, by Public Law 80-361. This Act of Congress transferred 22,575 acres from the Department of War (Illinois Ordnance Plant) and 21,425 acres from the Soil Conservation Service (Crab Orchard Creek Project) to the Secretary of the Interior. Since the Refuge was established, the Service has acquired and divested several parcels of land. In 1959, the Refuge transferred 921 acres of land located in its southeast corner to the U.S. Department of Justice for construction of a maximum security prison. In 1969, the Refuge acquired several scattered tracts of land in exchange for 160 acres that is now the site of the John A. Logan College. In a 1974 exchange, the Refuge acquired 15 acres of State of Illinois land in the vicinity of Little Grassy Fish Hatchery. In a 1979 exchange, Southern Illinois University acquired the current site of Touch of Nature Environmental Center and the Refuge acquired land south of Little Grassy Lake. Through the years the Refuge has purchased a few scattered parcels. In 2000, the Refuge used Natural Resource Damage Assessment funds to purchase 216 acres on its western edge. The total acres reported for Crab Orchard NWR in the Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service as of September 30, 2002 was 43,888.52.

The Washington Office of the U.S. Fish and Wildlife Service approved the study of potential additional refuge lands in 1990. The refuge did not pursue the study of additional lands until the Comprehensive Conservation Plan (CCP) process. The CCP planning effort was the logical time to re-examine all management and land protection issues related to the refuge. So, during the CCP effort we again looked at the possible need to adjust the boundary of the refuge.

The preferred alternative within the environmental impact statement that accompanies the CCP contains a modification of the existing refuge boundary. This modification could result in the addition of approximately 4,242 acres to the Refuge. The boundary adjustment does not include and is independent of a possible land exchange with Southern Illinois University. The boundary modification would allow the acquisition of inholdings from willing sellers and moving segments of the boundary to roads that would better define the limits of the refuge. The boundary modification will increase the efficiency of management, reduce incompatible land uses, and enhance public use opportunities.

If acquired, the lands will contribute to the goals of the Refuge by reducing habitat fragmentation, removing disruptions to public access, reducing disturbance to wildlife, and reducing potential interference with management activities. If inholdings are acquired, there is the potential to restore habitats and further reduce fragmentation, particularly in the forested southwest portion of the Refuge. If inholdings are reduced, public access will be interrupted to a lessened extent by essentially reducing the boundaries with private property internal to the Refuge. Because developed property is often accompanied by increased human activity and pets, which can disturb wildlife, acquisition of inholdings and potentially developed property up to the well defined boundary of a road will lead to less disturbance of wildlife. Some refuge management activities, prescribed burning and hunting, for example, benefit from well defined boundaries. By bringing the refuge boundary to a road and acquiring inholdings, management, particularly burning and hunting programs, will be made more efficient and safer.

Currently, if a landowner wishes to sell or exchange land that is outside the authorized boundary of the refuge, the Service must complete an analysis for the individual parcel and complete environmental documents related to the transaction. This tract-by-tract analyses is inefficient and does not provide for an overall, cumulative analysis of the land transactions. The separate analysis also may delay a land transaction to the detriment of the seller.

The boundary modification is depicted in Figure 1.

Figure 1: Crab Orchard NWR Proposed Boundary Modification and Other Assorted Public Lands

2. Threats to and Status of the Resource

Habitat within the proposed modified boundary includes approximately 2,000 acres of farmland, some of which has reverted back to grasses, brush and hardwoods. The other land is composed of a combination of pasture, old field and mixed stands of oak, hickory, sycamore and tulip poplar. Without management, most areas will degrade due to their size, isolation, and absence of natural processes such as fire. The areas will continue to face residential development as population growth and housing developments continue. Development and incompatible uses in the proposed boundary modification area also places greater demands on the Refuge in safeguarding Refuge ecosystem structure and function for the benefit of Service trust resources.

3. Proposed Action and Objective

The Service is proposing to acquire approximately 4,242 acres that includes approximately 95 ownerships. We estimate that the cost of acquiring all of the land would be from $4.3 million to $8.6 million. The primary funding for acquisition would be from money appropriated from the Land and Water Conservation Fund. Since acquisition would only be from willing sellers, it is likely that if this acquisition were to occur, it would be over a period of decades. Because CCPs detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes, the CCP and this Land Protection Plan does not constitute a commitment for funding for future land acquisition.

Any acquired lands would become part of the Refuge. The annual costs for administration, operations and maintenance would be lower than acquiring non-adjacent lands. Operation costs will ultimately depend upon the amount of land purchased in fee and easement and habitat restoration requirements.

4. Protection Alternatives

This section outlines and evaluates two strategic alternatives for the restoration and preservation of approximately 4,242 acres of habitats surrounded by or adjacent to Crab Orchard NWR. The two protection alternatives discussed below are included in the alternatives considered in the Crab Orchard NWR Comprehensive Conservation Plan Environmental Impact Statement (EIS). Protection Alternative A is incorporated into Alternative A of the EIS. Protection Alternative B is incorporated into Alternatives B, C, D, and E of the EIS.

4.1. Alternative A (No Action):

Under Alternative A, the Service would not seek realty interests in land and water within or adjacent to the Refuge. The Refuge would continue to offer landowners support through the Refuge's Partners for Wildlife program. The plants and wildlife of the area would continue to be impacted by residential and agricultural development and the quality of wildlife dependent recreational and aesthetic experiences would decline. Public use opportunities would be limited to private landowners and others with permission from landowners. If landowners in the proposed boundary expansion area wished to sell their land to the Service, each parcel would be evaluated separately. If acquisition were pursued, the process would not be completed quickly – to the detriment of the seller.

4.2. Alternative B (Preferred):

The Service would facilitate the protection of approximately 250 acres per year from willing sellers using outreach and technical assistance, cooperative management agreements, conservation easements and fee-title purchase of land (and/or donations from private parties) or a combination of all methods, depending on site, circumstances, and landowner interests. The estimate of 250 acres per year is based upon historical land acquisition funding levels in the Service's Region 3, which includes Illinois. Any acquisition of lands would be from willing sellers only, regardless of the type of interest. The Service would only acquire the minimum interest necessary to reach management objectives for the area.

Areas acquired in fee-title through donation or purchase would be owned by the Service and managed as part of Crab Orchard National Wildlife Refuge. Tracts in which an easement or lease is negotiated would remain in private ownership. Under any acquisition scenario, administration and management of the tracts would be done by the staff at the Refuge. This alternative would be carried out on a tract-by-tract basis as land and funding become available over an undetermined period of time.

If acquired, the lands would contribute to the goals of the CCP by reducing habitat fragmentation, removing disruptions to public access, reducing dis-

turbance to wildlife, and reducing potential interference with management activities. If inholdings are acquired, there is the potential to restore habitats and further reduce fragmentation, particularly in the forested southwest portion of the Refuge. Public access would be interrupted to a lessened extent by reducing the boundaries with private property internal to the Refuge. Because developed property is often accompanied by increased human activity and pets, which can disturb wildlife, acquisition of inholdings and potentially developed property up to the well defined boundary of a road would lead to potentially less disturbance of wildlife. Some refuge management activities, prescribed burning and hunting, for example, benefit from well defined boundaries. By bringing the refuge boundary to a road and acquiring inholdings, management, particularly burning and hunting programs, would be made more efficient and safer.

5. Alternative Preservation Tools

The alternative preservation tools proposed for the boundary modification area are fee title acquisition, conservation easements, wildlife management agreements, and private lands extension agreements. Other acquisition methods that could be utilized by the Service include donations, partial donations, or transfers.

5.1. Wildlife Management Agreements

These agreements are negotiated between the Refuge Manager and a landowner that specify a particular management action the landowner will do, or not do, with his or her property. For example, a simple agreement would be for the landowner to agree to delay mowing hay until after a certain date to allow ground nesting birds to hatch their young. More comprehensive agreements are possible for such things as wetland or upland restoration, or public access. These agreements are strictly voluntary on the part of the landowner and are voided if the property is sold.

As long as a landowner abides by the terms of the agreement, this protection can be effective in meeting certain preservation objectives. Unfortunately, because these agreements are voluntary and temporary, there is no long-term assurance the terms will continue to be met.

Direct Service costs for this alternative are generally low, but can add up to near fee title or easement costs if the agreement is for several years. Staff time and administrative costs are relatively high since agreements must be monitored yearly and renegotiated when land ownership changes.

5.2. Leases

Under a lease agreement, the Service would negotiate with a landowner to receive use of the land or for some maintenance of the land in a given condition. Generally, the landowner would receive an annual lease payment. For example, the Service could lease 40 acres of grassland habitat to provide safe nesting for ground nesting birds. The landowner would not be able to hay or otherwise disturb the ground during the lease period.

Cost effectiveness of leases would vary depending on the length and payment terms of the lease. In many cases, the cost of a lease rapidly approaches the cost of outright purchase in a few years. Also, leases do not offer the long-term protection of habitat, and are more complex for the Service to administer than fee title or easement because of the monitoring, coordination, and administration requirements.

5.3. Conservation Easements

With a conservation easement, the Service in effect purchases a specific interest from a private landowner. For example, the Service may purchase a wetland easement that protects a wetland from draining, filling, and burning. The landowner gives up the right to drain, fill, and burn, but no other land rights. The wetland may still be cropped, or hayed, as natural conditions allow.

An easement that is commonly used on refuges is a conservation or non-development easement. Typically, a landowner would agree to refrain from commercial, industrial, or residential development or other major alteration of habitat. The landowner would continue to use the land as before the easement and retain rights such as hunting and control of trespass, for instance.

Easements are voluntary and purchased only from willing sellers. Payments for conservation easements are generally based on a percentage of the appraised value of the land and varies according to the use restrictions imposed. Easements are most often perpetual and compensation is a one-time, up-front payment.

Easements can be useful when existing land use of a tract is partially compatible with refuge purposes, and when the landowner desires to use the

land for some compatible purpose. Examples of land uses that are normally restricted under terms of a conservation easement include:

- # Development rights, agricultural, commercial and residential.
- # Alteration of natural topography.
- # Uses negatively affecting the maintenance of plant and wildlife communities.
- # Excessive public access and use; and
- # Alteration of natural water level.

Depending on the type of easement, this option may be cost effective in meeting certain Refuge management purposes. Some easements, however, may cost the Service more than 75 percent of fee value and cost efficiency is compromised. If the easement is not perpetual, long term resource protection is not guaranteed.

Easements are more difficult to manage than fee title transactions because of the monitoring, coordination, and administrative requirements. If a landowner fails to honor the easement contract, the Service must take steps to re-establish the terms of the contract.

In the short run, easements have more impact on the tax base of local municipalities than cooperative management agreements and leases, but less impact than fee-title acquisition. In the long run, Service acquisition of interest in lands may be beneficial to the tax base of local municipalities because of increased desirability of land and increased recreational opportunities.

5.4. Fee-Title Acquisition

Fee-title acquisition of land assures permanent protection of resources. All rights of ownership are transferred to the Service in fee title acquisition. Land is purchased only from willing sellers with offers based on fair market value appraisals. Some fee title acquisitions are accomplished through donation or exchange. Although initially the most costly for the Service, in the long run lands in fee-title are easier to manage and plan for because the Service has complete control. Staff time is saved by not having to renegotiate terms for less-than-fee title arrangements.

In the short run, fee-title acquisition will have the greatest impact on the tax base of local municipalities of any alternative preservation tools. The impact from reduced tax revenues to local government is partially offset by revenue sharing payments from the Service. In the long run, Service acquisition of interest in lands may be beneficial to the tax base of local municipalities because of increased desirability of land and increased recreational opportunities.

6. Coordination

In the past the Service has coordinated with public agencies that manage adjacent lands. The primary agencies include Illinois Department of Natural Resources, Southern Illinois University, USDA Forest Service, and the U.S. Department of Justice. The Service expects to continue its coordination and cooperation with these agencies. In the past the Service has responded favorably to private landowner enquiries about possible sales and exchanges when the sale or exchange would benefit both parties. In the action that we are proposing here, we are making known to private landowners in the proposed boundary modification area the Service's desire to consider the Service as a possible buyer, if they should ever want to sell.

7. Sociocultural Impacts

Restoration, preservation, and management of additional lands by the Service will have little negative effect on the current lifestyles of individuals and communities in and around the Refuge. Landowners who choose to sell their land to the Service will be most affected. Owners of homes or farms who relocate will be reimbursed for moving expenses. Renters also receive certain relocation benefits, including assistance in finding suitable alternate housing that is affordable. Under certain conditions, some homeowners may be able to reserve a “life estate” on their homes, meaning they could remain in their homes for the rest of their lives after selling to the Service. This type of reservation does, however, reduce the amount paid for their homes. Other landowners who negotiate easements or other less-than-fee transactions may have to change certain land management practices to comply with conditions of the easement.

All land transactions will be purely voluntary in keeping with Service policy to purchase lands or rights only from willing sellers. The property rights of landowners who choose not to sell their land will not be directly affected by purchases around them since they will retain all right of landownership. The Service will always take into account the interests of adjacent landowners when managing acquired land.

Lands in which the Service acquires a fee interest will be open to public hunting, fishing, hiking, photography and other compatible refuge uses. Public use of the Refuge will probably not increase markedly over current levels, although the quality of experience that visitors have may be improved.

8. Summary Of Proposed Action

The priority for acquisition of parcels will be determined by refuge purposes; goals and objectives in the CCP; the potential to contribute to an unfragmented landscape component of forest or grassland; and pending development.

The following is a ranked list of priorities for protecting lands surrounded by and adjacent to the Refuge. This list will guide the Service in choosing when and where to use the various available protection tools. The list includes criteria that would rank the priority of a parcel of land considered for fee title purchase, although other protection tools would always be considered first.

This list will help assure that the limited resources available to the Service are used efficiently and effectively.

High Priority Land:

Habitat that immediately contributes to increasing an unfragmented block of forest or grassland.
Habitat that immediately contributes to the support of a threatened or endangered species.
Land with a clear likelihood of being developed for non-compatible uses.

Medium Priority Land:

Restorable habitat that will eventually contribute to a larger unfragmented block of forest or grassland.
Restorable habitat that will eventually contribute to the support of a threatened or endangered species.

Low Priority Land:

Habitat blocks that are dependent on other acquisitions to contribute to a larger unfragmented block of forest or grassland.
Other fish and wildlife habitats.
Lands that improve the management efficiency of existing Service lands.
Lands with significant development that require extensive restoration.

Preservation of any tract would first be sought by working with the landowners to achieve conservation goals they are interested in and that are consistent with Service interests. If a landowner is interested in other options, such as an easement or in selling fee rights to the property, the Service would base its decision of whether to acquire an interest in the land upon the availability of funds and the priority of the tract for preservation. Assistance to landowners for conservation work on their property will be provided through the Service's Partners for Fish and Wildlife Program and through any other programs which may be available in the future. Figure 2 illustrates proposed boundary modification tracts and their priority. Figure 3 and Table 1 depict and summarize the proposed action by tract.

Figure 2: Crab Orchard NWR Boundary Modification Tracts and Their Priority

Figure 3: Crab Orchard NWR Boundary Modification Numbered Tracts

Table 1: Crab Orchard NWR Boundary Modification Tracts Identification Number, Approximate Acreage, Acquisition Priority, Possible Acquisition

Tract #	Acreage	Priority	Owner	Possible Acquisition
1725	51	Medium	Private	Easement/Fee
1726	39	High	Private	Easement/Fee
1727	21	Medium	Private	Easement/Fee
1728	40	High	Private	Easement/Fee
1729	42	High	Private	Easement/Fee
1730	8	Medium	Private	Easement/Fee
1731	12	Medium	Private	Easement/Fee
1732	19	Medium	Private	Easement/Fee
1733	23	Low	Private	Easement/Fee
1734	10	Medium	Private	Easement/Fee
1735	6	Low	Private	Easement/Fee
1736	34	Medium	Private	Easement/Fee
1737	2	Medium	Private	Easement/Fee
1738	4	Low	Private	Easement/Fee
1739	3	Low	Private	Easement/Fee
1740	18	High	Private	Easement/Fee
1741	114	Medium	Private	Easement/Fee
1742	2	Medium	Private	Easement/Fee
1743	13	High	Private	Easement/Fee
1744	14	High	Private	Easement/Fee
1745	82	Medium	Private	Easement/Fee
1746	18	High	Private	Easement/Fee
1747	42	High	Private	Easement/Fee
1748	15	High	Private	Easement/Fee
1749	46	Medium	Private	Easement/Fee
1750	22	High	Private	Easement/Fee
1751	6	High	Private	Easement/Fee
1752	5	High	Private	Easement/Fee
1753	114	Medium	Private	Easement/Fee
1754	42	Medium	Private	Easement/Fee
1755	30	Medium	Private	Easement/Fee
1756	11	Medium	Private	Easement/Fee
1757	30	Medium	Private	Easement/Fee
1758	11	Medium	Private	Easement/Fee
1759	43	Medium	Private	Easement/Fee
1760	5	Medium	Private	Easement/Fee
1761	37	Medium	Private	Easement/Fee
1762	88	Medium	Private	Easement/Fee
1763	82	Medium	Private	Easement/Fee
1764	42	Medium	Private	Easement/Fee
1765	41	Medium	Private	Easement/Fee
1773	42	High	Private	Easement/Fee

Table 1: Crab Orchard NWR Boundary Modification Tracts Identification Number, Approximate Acreage, Acquisition Priority, Possible Acquisition (Continued)

1774	2	High	Private	Easement/Fee
1775	42	High	Private	Easement/Fee
1776	39	High	Private	Easement/Fee
1777	42	High	Private	Easement/Fee
1778	62	Medium	Private	Easement/Fee
1779	105	Medium	Private	Easement/Fee
1780	39	High	Private	Easement/Fee
1781	25	High	Private	Easement/Fee
1782	39	High	Private	Easement/Fee
1783	42	High	Private	Easement/Fee
1784	7	Medium	Private	Easement/Fee
1785	19	Low	Private	Easement/Fee
1786	41	Medium	Private	Easement/Fee
1787	37	High	Private	Easement/Fee
1788	5	High	Private	Easement/Fee
1789	60	High	Private	Easement/Fee
1790	22	High	Private	Easement/Fee
1791	19	Medium	Private	Easement/Fee
1792	76	Medium	Private	Easement/Fee
1793	2	High	Private	Easement/Fee
1794	41	Medium	Private	Easement/Fee
1795	39	Medium	Private	Easement/Fee
1796	190	Medium	Private	Easement/Fee
1797	44	Medium	Private	Easement/Fee
1798	5	High	Private	Easement/Fee
1799	3	Medium	Private	Easement/Fee
1800	2	Medium	Private	Easement/Fee
1801	2	High	Private	Easement/Fee
1802	1	Low	Private	Easement/Fee
1803	44	Medium	Private	Easement/Fee
1804	21	Medium	Private	Easement/Fee
1811	25	Medium	Private	Easement/Fee
1812	15	Medium	Private	Easement/Fee
1813	16	High	Private	Easement/Fee
1814	42	High	Private	Easement/Fee
1815	11	Low	Private	Easement/Fee
1817	8	Low	Private	Easement/Fee
1818	40	Low	Private	Easement/Fee
1819	40	Low	Private	Easement/Fee
1820	40	Low	Private	Easement/Fee
1821	2	High	Private	Easement/Fee
1822	52	Medium	Private	Easement/Fee
1823	38	Medium	Private	Easement/Fee
1824	41	High	Private	Easement/Fee

Table 1: Crab Orchard NWR Boundary Modification Tracts Identification Number, Approximate Acreage, Acquisition Priority, Possible Acquisition (Continued)

1825	70	High	Private	Easement/Fee
1826	21	Low	Private	Easement/Fee
1827	1	Low	Private	Easement/Fee
1828	22	High	Private	Easement/Fee
1829	80	Medium	Private	Easement/Fee
1830	82	High	Private	Easement/Fee
1831	21	High	Private	Easement/Fee
1832	103	Medium	Private	Easement/Fee
1833	167	Medium	Private	Easement/Fee
1834	92	Medium	Private	Easement/Fee
1835	21	High	Private	Easement/Fee
1836	65	Low	Private	Easement/Fee
1837	3	High	Private	Easement/Fee
1838	27	High	Private	Easement/Fee
1839	16	Low	Private	Easement/Fee
1840	85	High	Private	Easement/Fee
1841	208	High	Private	Easement/Fee
1842	77	Medium	Private	Easement/Fee
1843	12	Medium	Private	Easement/Fee
1844	29	High	Private	Easement/Fee
1845	42	Low	Private	Easement/Fee
1846	17	Medium	Private	Easement/Fee
1847	41	High	Private	Easement/Fee
1848	42	High	Private	Easement/Fee
1849	49	High	Private	Easement/Fee
1850	34	High	Private	Easement/Fee

Appendix M: Comparison of Objectives and Strategies by Alternative

Appendix M: Comparison of Objectives and Strategies by Alternative

	Alternatives				
	A	**B**	**C**	**D**	**E**
Goal: Maintain or enhance populations of federal and, where compatible,state threatened and endangered species that occur at or near Crab Orchard National Wildlife Refuge.					
Objectives					
Assure that federally listed species and state-listed species and federally proposed species and their habitats are protected.	X	X	X	X	X
Strategies					
No disturbance of Bald Eagles will take place during critical periods within protective zones as described in the 1983 Northern States Bald Eagle Recovery Plan, Appendix E. Areas are designated closed through signing and brochures.	X	X	X	X	X
Forest management activities, such as thinning and prescribed burning, will require close coordination with U.S. Fish and Wildlife Service, Ecological Services personnel. These activities will require standard surveys to determine whether Indiana bats are present in a given forest unit and/or forest management activities will be scheduled outside of the season when Indiana bats are likely to use Refuge forests.	X	X	X	X	X
Goal: Maintain or enhance resident fish and wildlife populations consistent with management activities for federal trust resources in cooperation with the Illinois DNR.					
Objectives					
Manage Refuge fisheries with emphasis on mixed-species, warmwater sport fishing.	X	X	X	X	X
Manage Refuge resident wildlife populations at levels that allow opportunities for sport hunting of game species.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Strategies					
Continue cooperative management of Refuge fisheries with Illinois DNR. Continue managing fish populations and habitat through activities such as: setting length and creel limits, seasonal closures of spawning bed areas, habitat enhancements, annual surveys, and fish stocking.	X	X	X	X	X
Continue managing the Refuge agriculture program with methods that benefit resident game species, such as: leave 25 percent of the corn crop unharvested, plant winter wheat in soy bean fields each fall, use low tillage planting techniques, keep fields in clover 2 years out of the 5-year rotation, delay mowing until after August 1, and use no insecticides.	X	X	X	X	X
Incorporate beneficial practices such as those suggested in the Northern Bobwhite Conservation Initiative: convert cool-season to warm-season grasses and burn and thin pine plantations.	X	X	X	X	X
Allow controlled hunting for turkey and deer in the restricted use portion of the Refuge.	X	X	X	X	X
Goal: Visitors, cooperators, tenants, and local residents will understand Refuge goals, issues and activities. Service personnel will understand the expectations and concerns of the general public by being receptive to their feedback.					
Objectives					
The positive attitude toward Refuge management will increase among visitors, cooperators, tenants, and local residents throughout the life of the plan.	X	X	X	X	X
Strategies					
Issue press releases, hold Refuge open houses and hold regularly scheduled forums.	X	X	X	X	X
Within 2 years of the Plan's approval, create and maintain a "listening log" of written and verbalpublic input submitted to the Refuge. Review this log quarterly and address voiced community concerns.	X	X	X	X	X
Provide annual reports on the "State of the Refuge." Distribute these reports upon request at the Visitor Center and by mail and post the current year's report on the Refuge website.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Continue to permit selected annual and special events that are sponsored by nonprofit organizations, provided they do not damage Refuge resources or interfere with wildlife-dependent recreation.	X	X	X	X	X
Goal:Protect the integrity of Refuge biological and cultural resources and the health and safety of visitors, industrial workers, farmers and the Refuge staff.					
Objectives					
Refuge lands and waters are safe for fish, wildlife, plants, and people.	X	X	X	X	X
Visitors will feel safe on the Refuge and illegal harvest of fish and wildlife will be reduced.	X	X	X	X	X
Manage or eliminate invasive species on the Refuge.	X	X	X	X	X
Protect the cultural, historic, and pre-historic resources of federally-owned lands within the Refuge.	X	X	X	X	X
Meet Service policy guidelines ("Administration and Enforcement Procedures for Conservation Easement") for 12 conservation easements by 2007, for all easements by 2010.	X	X	X	X	X
Strategies					
Work with USEPA, Illinois EPA, Departments of Interior and Justice, and responsible parties to remediate contaminated sites.	X	X	X	X	X
Maintain full-time law enforcement staff.	X	X	X	X	X
Write and implement an Integrated Pest Management Plan following guidance developed by the Service's "Promises Invasive Species Team."	X	X	X	X	X
Implement the Cultural Resource Management Plan for Cultural Resources within the Crab Orchard National Wildlife Refuge (Godfrey and Stubbs 2001).	X	X	X	X	X
Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings. Notify the Regional Historic Preservation Officer early in project planning or upon receipt of a request for permitted activities.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program.	X	X	X	X	X
Complete accessioning, cataloging, inventorying, and preserving the museum collection at the Refuge in accordance with "Survey of Collections at Crab Orchard NWR" by Mayda S. Jensen.	X	X	X	X	X
Complete legal surveys on 50 percent (12 tracts) of all conservation easements by 2007 through contracted services. Complete contracted surves on the remaining tracts by 2010.	X	X	X	X	X
Conduct annual inspections of all conservation easements.	X	X	X	X	X
Develop land use plans for 50 percent (12 tracts) of the conservation easements and restore grassland and wetland habitats on 25 percent of these tracts by 2009.	X	X	X	X	X
Hire a permanent 6-month law enforcement officer to conduct annual inspections, develop land use plans, and restore wetland and grassland habitat projects.	X	X	X	X	X
Goal: Protect the ecological integrity, preserve the wilderness character, restore natural conditions to the extent practicable, and provide opportunities for solitude and primitive recreation within the Crab Orchard Wilderness.					
Objectives					
Recommend the designation of two parcels (120 acres) as Wilderness within two years of approval of the CCP.	X	X	X	X	X
Revise and implement the Crab Orchard Wilderness Management Plan within 5 years of approval of the CCP.	X	X	X	X	X
Restore native hardwood forest on 325 acres of pine and pine-hardwood forest in the Crab Orchard Wilderness within 15 years of approval of the CCP.	X	X	X	X	X
Control or eradicate invasive species (especially autumn-olive, multiflora rose, Amur honeysuckle, white poplar, and Oriental bittersweet) over the 15-year life of the CCP.	X	X	X	X	X
Explore ways to increase cooperation with the U.S. Forest Service on management of the Crab Orchard Wilderness and the adjoining Panther Den Wilderness within two years of approval of the CCP.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Provide opportunities for primitive recreation, such as hiking, hunting, nature study and wild food collection, over the 15-year life of the CCP.	X	X	X	X	X
Within 5 years of approval of the CCP, determine an appropriate level of opportunities to offer equestrians based on an evaluation of the current level and extent of horseback riding use and its effects on the Wilderness.	X	X	X	X	X
Strategies					
Prepare and submit a Wilderness Study Report according to policy in Part 610 Chapter 7 of the Fish and Wildlife Service Manual.	X	X	X	X	X
Prepare and implement a Wilderness Management Plan according to policy in Part 610 Chapter 6 of the Fish and Wildlife Service Manual.	X	X	X	X	X
Thin the pine plantations (229 acres) and pine-hardwood stands (96 acres) in the Wilderness to promote establishment and growth of native hardwoods. Thinning would be conducted in several phases over a 10- to 15-year period to mimic the natural process of succession where pines are gradually replaced by hardwoods. Individual pines would be killed by cutting, girdling or injecting herbicide. No trees would be removed from the site. Treatments would be conducted so that the results would appear natural as much as possible. However, trees along heavily used trails may need to be felled to avoid personal injury to visitors, in which case this zone may appear unnatural for several years. Eventual removal of all the non-native pines would restore the natural vegetative cover of the area and enhance wilderness characteristics.	X	X	X	X	X
Prescribed burn the pine and pine-hardwood stands during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration. Control lines would be established by hand tools where necessary, using natural firebreaks as much as possible.	X	X	X	X	X
Prepare and implement an Integrated Pest Management Plan following guidance developed by the Service's "Promises Invasive Species Team."	X	X	X	X	X
Contact the Forest Supervisor of the Shawnee National Forest and discuss ways our agencies could work together in managing the adjoining wildernesses.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Continue current primitive recreational opportunities.	X	X	X	X	X
Prepare and distribute a wilderness brochure and conduct interpretive programs to inform the public about primitive recreational opportunities available.	X	X	X	X	X
Evaluate the current, unauthorized River to River route. Cooperate with partners to plan, construct, and maintain an authorized River to River trail route through the Refuge.	X	X	X	X	X
Goal: Volunteers and Refuge support groups will be stewardship partners and strong advocates for the Refuge.					
Objectives					
Improve Refuge support for volunteer and Friends of Crab Orchard activities to a point where at least 95 percent of volunteers and Friends members feel like valued contributors to the success of Refuge programs and endeavors.	X	X	X	X	X
Strategies					
Continue to manage volunteer and support programs in accordance with Service guidelines detailed in "A Guidebook for Working with Volunteers." Maintain an active liaison with support groups and partners.	X	X	X	X	X
Provide in-depth initial training to Refuge volunteers that will enable them to effectively and efficiently complete projects and responsibilities. Encourage involvement in diverse volunteer activities that match volunteer interests.	X	X	X	X	X
Continue demonstrating Refuge appreciation for volunteer contributions and Friends support annually through a Volunteer Appreciation Banquet. Present awards for service hours in accordance with Service guidelines.	X	X	X	X	X
Goal: Provide habitat for wintering Canada geese in support of the Mississippi Valley Population Canada Goose Management Plan.					
Objectives					
Provide enough food for wintering Canada geese to support 6.4 million goose-use-days.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Cropland Strategies					
Maintain 4,500 acres of cropland in agricultural production. Manage 1,000 acres of pasture and 700 acres of hay fields.	X				
Maintain 4,400 acres of cropland in agricultural production.		X			X
Maintain 4,800 acres of cropland in agricultural production.			X		
Maintain 4,300 acres of cropland in agricultural production.				X	
Continue managing the Refuge agriculture program with methods that benefit Canada Geese, such as: leave 25 percent of the corn crop unharvested, plant winter wheat in soybean fields each fall, use low tillage planting techniques, keep fields in clover 2 years out of the 5-year rotation.	X	X	X	X	X
Moist-soil Units Strategies					
Manage 450 acres of moist-soil units.	X			X	
Manage 500 acres of moist-soil units.		X	X		X
Other Management Strategies					
Continue fall mowing around selected ponds.	X	X	X	X	X
Maintain seasonal closure to boating on the east end of Crab Orchard Lake.	X	X	X	X	X
Goal: Maintain or enhance populations of forest, early successional and grassland birds, with emphasis on priority species, as identified in Partners in Flight Physiographic Area Bird Conservation Plans.					
Forests					
Objectives					
Complete about 240 acres of reforestation as outlined under the existing Refuge reforestation plan to benefit forest wildlife species.	X				
Manage forest land to favor oak-hickory forest types on suitable sites with all age classes from seedling stage to old-growth represented. Manage native, shade-tolerant tree species (such as sugar maple) to prevent wide-spread succession to climax forest cover types.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Manage two portions of the Refuge as large forest blocks to benefit area-sensitive forest birds. The first area (about 13,000 acres) extends from the southern end of Grassy Bay east to Caney Creek, and south including the wilderness area. The second area (about 1,700 acres) extends from the federal prison north and includes the Crab Orchard Creek bottomlands. This will include about 490 acres of reforestation of open habitat to consolidate large blocks of forest habitat.		X		X	X
Manage the southern portion of the Refuge as a large forest block to benefit area-sensitive forest birds. This area (about 9,500 acres) extends south from Grassy Road and includes the wilderness area.			X		
Strategies					
Conduct reforestation activities which may include site preparation (mechanical clearing and/or applying herbicides to unwanted vegetation), planting hardwood tree seedlings, and follow-up mechanical or chemical treatments.	X	X	X	X	X
Write and implement a Habitat Management Plan	X	X	X	X	X
Apply appropriate silvicultural treatments to manage forest health, species composition and age structure.	X	X	X	X	X
Reforest available open sites located outside of the two large forest blocks.	X	X	X	X	X
Control exotic invasive plants through integrated pest management practices.	X	X	X	X	X
Reforest about 290 acres of crop fields, 130 acres of fallow fields, and 90 acres of perennial grasslands. This may include site preparation planting a cover crop, planting tree seedlings, and weed control treatments.		X		X	X
Reforest 1 fallow field (52 acres) south of Grassy Road. This may include site preparation, planting a cover crop, planting tree seedlings, and weed control treatments.			X		
Pine Plantations					
Objectives					
Accelerate succession of all (about 3,300 acres) pine plantations to hardwood forest.	X	X		X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Accelerate succession of pine plantations south of Grassy Road and outside the wilderness area (about 650 acres) to native hardwood forest.			X		
Strategies					
Thin pine plantations to promote establishment and growth of native hardwoods. Most thinning treatments will be conducted under contract by commercial timber harvesting firms.	X	X	X	X	X
Conduct prescribed burning during the dormant season (November through March) on a 3 to 5 year cycle to enhance habitat conditions and promote desirable hardwood regeneration.	X	X	X	X	X
In some cases, remove pine overstory to release young hardwoods.		X		X	X
Early Successional Habitat					
Objective					
Maintain about 300 acres in early successional habitat.		X	X	X	X
Strategies					
Use prescribed fire or mechanical treatment (mowing, discing) to disturb about 200 acres every 3 to 5 years. Add about 100 acres of 30-foot-wide borders of native warm-season grasses in row crop fields in the open portion of the Refuge.		X	X	X	X
Grasslands					
Objectives					
Maintain 240 acres of native warm-season grassland to benefit grassland birds, such as northern bobwhite, eastern meadowlark, and Henslow's sparrow.	X				
Maintain 260 acres of native warm-season grassland.		X	X	X	X
Strategies					
Prescribed burn all native warm-season grasslands on a 2 to 3 year cycle to favor grassland vegetation and control undesirable plants. Apply mechanical or herbicide treatments to control vegetation, when needed.	X	X	X	X	X

Pasture, Hay and Clover Fields	Alternatives A	B	C	D	E
Objectives					
Maintain 1,000 acres of pasture, 700 acres of hay fields, and about 1,600 acres of clover fields with increased emphasis on habitat quality for grassland birds.	X	X	X		X
Maintain 1,000 acres of pasture, 500 acres of hay fields, and about 1,500 acres of clover fields with increased emphasis on habitat quality for grassland birds, along with an emphasis on cattle production on pastures.				X	
Strategies					
All mowing of pastures, hay fields, and clover fields will take place after August 1.	X				
Remove 124 acres of linear forest habitat and 8 miles of hedge rows. Install fences to create paddocks within pastures to enable greater control of grazing intensity. Convert fescue pastures to other coolseason and native warm-season grasses by preparing the site and reseeding. The typical Refuge pasture would become three or four paddocks with a paddock of cool-season grass and two or three paddocks of native warm-season grasses. Cattle would enter the cool season grass paddock in the spring, switch to the warm season grasses in the summer, and move back to the cool season grass in the fall. The native warm season grass will provide the grassland birds with nesting, migration, and winter habitat. Vegetation structure will be managed by the amount of grazing applied to each paddock. Most of the pasture grass would not require fall mowing and would be taller than 6 inches during the winter. All mowing of hay fields, pastures, and clover fields will take place after August 1.		X	X		X
Remove 15 acres of linear forest habitat and 2 miles of hedge rows. Increase forage diversity in fescue pastures by adding legumes, other cool-season or warm-season grasses by reseeding or interseeding. Subdivide larger pastures for rotational grazing to increase cattle production. All mowing of hay fields, pastures, and clover fields will take place after July 15.				X	

	Alternatives				
	A	**B**	**C**	**D**	**E**
Goal: Maintain or enhance populations of ducks, shorebirds, and other waterbirds, with emphasis on priority species, as identified in the North American Waterfowl Management Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan.					
Objectives					
Provide 350 to 450 acres of moist soil habitat during fall, winter and spring for migrating shorebirds, waterfowl, and other waterbirds.	X			X	
Provide 450 to 500 acres of moist-soil habitat during fall, winter and spring for migrating shorebirds, waterfowl, and other waterbirds.		X	X		X
Strategies					
Maintain dikes and water control structures. Manipulate water levels and vegetation to encourage production of food.	X			X	
Construct 50 to 70 acres of new moist-soil habitat. Maintain dikes and water control structures. Manipulate water levels and vegetation to encourage production of waterfowl foods.		X	X		X
Goal: Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.					
Objectives					
Keep Refuge soil erosion and chemical inputs at low levels.	X		X	X	
Improve the quality of water within the watershed of the Refuge.		X			X
Strategies					
Work with farmers to establish buffer strips and keep stock away from water. Continue using current soil and water protection measures in the Refuge farm program: use no insecticides, use only Service-approved herbicides, use minimum tillage practices, and use winter cover crops.	X	X	X	X	X
Continue cleanup of contaminated industrial sites. Ensure Refuge industrial operations conform to prescribed environmental standards.	X	X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Cooperate with Illinois Environmental Protection Agency to monitor water quality. Identify landowners and land uses in the watershed. Provide education and technical assistance to landowners with particularly sensitive riparian areas. Work with municipalities and developers to enhance on-site storm water retention.		X			X
Goal: Hunters, anglers, viewers and photographers of wildlife, general visitors, and students enjoy high-quality experiences through a variety of opportunities that promote an understanding and appreciation of the Refuge's natural and cultural resources and their management.					
Hunting					
Objectives					
Provide hunting opportunities at the levels offered in 2001.	X				
Increase the quality of hunting opportunities to a level where at least 90 percent of hunters experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. Instill a sense of awareness among hunters of Crab Orchard as a component of the National Wildlife Refuge System and of hunting as a wildlife management tool.		X			
Increase the quality of hunting opportunities to a level where 75 percent of hunters experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. Instill a sense of awareness among hunters of the Refuge as a component of a National Wildlife Refuge System and of hunting as a wildlife management tool.			X	X	X
Strategies					
In the open area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.	X				
In the restricted use area of the Refuge, maintain current hunting opportunities by permit during shotgun deer and shotgun spring turkey seasons. Maintain shotgun deer season hunting opportunities for youth and persons with disabilities.	X				
Continue providing waterfowl hunting opportunities in the controlled area through an agreement with a partner organization.	X				

	Alternatives				
	A	**B**	**C**	**D**	**E**
In the public hunting area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.		X	X	X	X
In the restricted use area of the Refuge, maintain current hunting opportunities by permit during shotgun deer and shotgun spring turkey seasons. Maintain shotgun deer season hunting opportunities for youth and persons with disabilities and, within 3 years of the plan's approval, provide these groups with opportunities for shotgun spring turkey season hunting when populations warrant.		X	X	X	X
Within 6 years of the plan's approval, establish additional special hunts to encourage participation in the Refuge hunting program by non-traditional segments of the public such as youth, persons with disabilities and women.		X			
Administer goose hunts in the controlled area through an agreement with a partner organization.		X	X	X	X
Over the life of the plan, continue to promote conservation practices and increase hunter adherence to federal and state regulations through effective informational brochures and signs. Increase the visibility of Refuge law enforcement.		X	X	X	X
Over the life of the plan, enhance public understanding of Refuge hunting opportunities, ethical behaviors, the role of hunting in wildlife management, and Crab Orchard Refuge as a component of a National Wildlife Refuge System by increasing the quality of maps, signs, and wording within brochures.		X	X	X	X
Fishing					
Objectives					
Provide fishing opportunities at the levels offered in 2001.	X				
Increase the quality of fishing opportunities to a level where at least 90 percent of anglers experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. Enhance angler understanding of the issues, strategies, and policies involved in Refuge fisheries management and conservation. Instill anglers with a sense of awareness of Crab Orchard Refuge as a component of a National Wildlife Refuge System.		X			

	Alternatives				
	A	**B**	**C**	**D**	**E**
Increase the quality of fishing opportunities to a level where 75 percent of anglers experience uncrowded conditions, no conflicts with other users, a reasonable harvest opportunity, and satisfaction with their overall experience. At least 75 percent of anglers understand the issues, strategies, and policies involved in Refuge fisheries management and conservation.			X	X	X
Strategies					
In the public fishing areas, continue the policy of providing fishing opportunities based on state and federal regulations.	X	X	X	X	X
Continue to provide bank and boat fishing opportunities in accordance with state and federal regulations. Maintain existing Refuge boat ramps, fishing piers, and parking facilities.	X				
Within 5 years of the plan's approval and in cooperation with other partners, promote current and develop additional fishing opportunities and programs to encourage participation by non-traditional segments of the public such as youth, persons with disabilities, and women.		X			
Continue to provide bank and boat fishing opportunities in accordance with state and federal regulations. Maintain existing Refuge boat ramps, fishing piers, and parking facilities. Study the feasibility for constructing accessible fishing facilities at Little Grassy Lake and Devils Kitchen Lake within 4 years of the plan's approval.		X	X	X	X
Over the life of the plan, promote Refuge fishing opportunities and encourage conservation practices such as catch-and-release fishing through the development and maintenance of high-quality maps, signs, and the Refuge web page.		X	X	X	X
Ensure that the fishing public clearly understands the fish consumption advisories for Crab Orchard Lake through signs and brochures within 2 years of the plan's approval.		X	X	X	X
Over the life of the plan, provide insight to anglers regarding Refuge strategies, issues, and policies for fisheries management and conservation by redesigning and developing more effective informational signs and brochures. Increase angler awareness of the Refuge as a component of a National Wildlife Refuge System by improving the quality and content of maps, signs, and brochures.		X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Wildlife Observation and Photography					
Objectives					
Provide wildlife observation and photography opportunities at the levels offered in 2001.	X				
Ensure that viewing and photography opportunities meet the needs of 95 percent of participants. Establish and maintain viewing and photography opportunities for all major Refuge habitat types and optimum seasons.		X	X	X	X
Strategies					
Continue popular, established programs and tours like the October Discovery Auto Tours, January Eagle Tours, and Spring Wildflower Walks that enhance visitor experience, bring visitors in closer proximity to resources, and provide optimum seasonal opportunities for observation and photography.	X				
Continue popular, established programs and tours like the October Discovery Auto Tours, January Eagle Tours, and Spring Wildflower Walks that enhance visitor experience, bring visitors in closer proximity to resources, and provide optimum seasonal opportunities for observation and photography., and continually evaluate these programs for effectiveness.		X	X	X	X
Maintain existing photo blinds, observation blinds, and identified observation areas.	X				
Within 2 years of the plan's approval, develop an annual observation/photography fact sheet for the Refuge that will include a calendar of established tours, programs, and events; information on identified and recommended viewing and photography areas; guidelines to enhance viewing enjoyment; and a Refuge map delineating trails, blinds, platforms, and identified viewing areas.		X	X	X	X
Within 2 years of the plan's approval, improve the existing photography/observation blinds and platform by adding camouflage as needed to enhance viewing opportunities. Evaluate location of existing blinds and platforms and move as needed. Position interpretive and identification panels in or near blinds and platform to promote understanding and appreciation of Refuge resources. Enhance panels to promote awareness of the Refuge as a component of the National Wildlife Refuge System.		X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Within 5 years of the plan's approval, evaluate need for and add additional blinds/platforms, including interpretive and identification panels, where and if needed to ensure observation and photography opportunities in all major Refuge habitat types. Maintain all identified viewing and photography sites.		X	X	X	X
Over the life of the plan and in cooperation with other partners, encourage utilization of the Refuge for birding and other wildlife observation through development of informational materials, programs, tours, and special events. Promote Crab Orchard as a site for quality wildlife and cultural observation and photography through participation in selected community and regional birding, nature, and photography festivals and events.		X	X	X	X
Within 8 years of the plan's approval, identify and create a Refuge birding trail that may include enhancement and coordination of existing trails, viewing areas, and signs, and creation of a birding trail brochure and map.		X	X	X	X
Over the life of the plan, expand the Refuge web site to promote wildlife observation and photography. Include updates on Refuge and area sightings of rare birds and other wildlife; profiles of selected seasonally-occurring and resident species; suggested optimal viewing times and locations; and current Refuge programs, facilities, tours, and other opportunities for observation and photography.		X	X	X	X
Interpretation					
Objectives					
Provide interpretive opportunities and materials at the levels offered in 2001.	X				
Increase the effectiveness of the Refuge interpretive program such that 85 percent of visitors gain a better understanding of three primary concepts: (1) the value and unique purposes of the Refuge, (2) the Refuge as a component of a national network of refuges, and (3) the significance and mission of the National Wildlife Refuge System. Heighten awareness of conservation and stewardship concepts. Encourage visitors to adopt ethical behaviors and to take positive actions that support Refuge goals and the Refuge System mission.		X			

	Alternatives				
	A	**B**	**C**	**D**	**E**
Increase the effectiveness of the Refuge interpretive program so that 70 percent of visitors gain a better understanding of three primary concepts: (1) the value and unique purposes of the Refuge, (2) the Refuge as a component of a national network of refuges, and (3) the significance and mission of the National Wildlife Refuge System. Heighten awareness of conservation and stewardship concepts. Encourage visitors to adopt ethical behaviors and to take positive actions that support Refuge goals and the Refuge System mission.			X	X	X
Strategies					
Continue to maintain and replace damaged and outdated interpretive and information panels on Refuge kiosks, wayside exhibits, trails, ramps, and other facilities. Ensure all panels comply with Service standards.	X				
In cooperation with Refuge volunteers and other partners, conduct a variety of quality interpretive programs annually. Continue popular and established interpretive programs and special events, such as the Families Understanding Nature program and National Wildlife Refuge Week.	X				
Continue to plan interpretive auto tour route, using existing roads, that will facilitate opportunities for wildlife and cultural resource observation and provide visitors with an overview of the Refuge, its resources, and its management.	X				
Within 3 years of the plan's approval, develop the interpretive portion of the Refuge Visitor Services Plan outlining a comprehensive, multifaceted approach emphasizing selected themes and key Refuge resources. Themes will be selected based on importance to Refuge and System goals and relevance to surrounding communities. All interpretive materials, tours, and programs will focus on one or more of these Refuge themes, along with the three basic concepts of the Refuge and Refuge System. Refuge interpretive themes may be in a storyline form that includes three or more themes. Themes may include: Exploring the Diversity of Wildlife, Understanding the Past, Protecting the Balance, and Communicating Visitor Opportunities.		X	X	X	X
Within 4 years of the plan's approval, renovate and replace damaged and outdated interpretive and information panels on Refuge kiosks, wayside exhibits, trails, ramps, and other facilities. Ensure that all panels comply with Service standards.		X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
In cooperation with Refuge volunteers and other partners, conduct a variety of high-quality interpretive programs annually. Continue popular and established interpretive programs and special events, such as the Families Understanding Nature program and National Wildlife Refuge Week. Ensure interpretive programming remains current and dynamic by continually creating new programs, incorporating new ideas, updating information, and revitalizing ongoing programs. Focus each interpretive program on one or more Refuge themes.		X	X	X	X
In cooperation with other partners, continue publication of a quarterly newsletter that includes interpretive articles, information on Refuge management activities, and a calendar of events. Distribute this newsletter at the Visitor Center, as well as a separate events calendar for the year. Post this newsletter on the Refuge web site.		X	X	X	X
Within 2 years of the plan's approval, redesign and remodel Visitor Center exhibits to create professional displays that effectively illustrate one or more Refuge themes while incorporating the three basic concepts of the Refuge and Refuge System. Exhibits will be well maintained and designed for easy repair and replacement as needed.		X	X	X	X
Over the life of the plan and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, revise Refuge interpretive brochures, handouts, and other written materials as needed to improve consistency and to meet Service standards.		X	X	X	X
Within 1 year of the plan's approval, create a custom audiovisual program that provides visitors with orientation information about the Refuge. Ensure this program and a variety of other wildlife-related audiovisual programs are made available for view at the Visitor Center and for use in interpretive programs.		X	X	X	X
Within 3 years of the plan's approval, establish and maintain an interpretive auto tour route, using existing roads, that will facilitate opportunities for wildlife and cultural resource observation and provide visitors with an overview of the Refuge, its resources, and its management. Include identified stations with interpretive panels.	X				

	Alternatives				
	A	**B**	**C**	**D**	**E**
Within 3 years of the plan's approval, establish and maintain an interpretive auto tour route, using existing roads, that will facilitate opportunities for wildlife and cultural resource observation and provide visitors with an overview of the Refuge, its resources, and its management. Include identified stations with interpretive panels and corresponding, radio-broadcasted interpretive messages.		X	X	X	X
Environmental Education					
Objectives					
Provide environmental education programs and materials at the levels offered in 2001.	X				
Increase the effectiveness of the Refuge environmental education program so that 90 percent of participants gain a better understanding and appreciation of the resources, purposes, and value of the Refuge and the Refuge System. Heighten awareness of conservation and stewardship concepts and encourage participants to take positive actions on the Refuge and in their community that support Refuge goals and the Refuge System mission.		X			
Increase the effectiveness of the Refuge environmental education program so that 75 percent of participants gain a better understanding and appreciation of the resources, purposes, and value of the Refuge and the Refuge System. Heighten awareness of conservation and stewardship concepts and encourage participants to take positive actions on the Refuge and in their community that support Refuge goals and the Refuge System mission.			X	X	X
Strategies					
Continue currently-offered environmental education programs done by request, including on-site and off-site programs, special educational events, group camp programs, and special interest group programs.	X			X	
Continue the development and maintenance of a multi-faceted environmental education resource library, available for use by educators and in Refuge educational programs, comprised of books, videos, posters, audio tapes, written materials, and environmental education kits.	X				
Conduct an annual review of the Refuge environmental education program. Invite feedback from area educators. Revise as necessary.	X		X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Within 1 year of the plan's approval, select primary Refuge concepts and key resources that will be emphasized as central themes in the environmental education and interpretive programs. Themes will be selected based on importance to Refuge and System goals and relevance to surrounding communities. All educational materials and programs will focus on one or more of these Refuge themes.		X	X	X	X
Within 2 years of the plan's approval, develop the environmental education portion of the Visitor Services Plan outlining a comprehensive, curriculum-based approach structured to be compatible with state learning standards.	X				
Within 2 years of the plan's approval, develop the environmental education portion of the Visitor Services Plan, outlining a comprehensive, curriculum-based approach structured to be compatible with state learning standards and national environmental education guidelines. Emphasize key Refuge resources, the Refuge, the National Wildlife Refuge System, and selected Refuge themes. These themes will be based on importance to Refuge and System goals and relevance to surrounding communities. All environmental education materials, facilities, and programs will focus on one or more of these Refuge themes, along with the basic concepts of the Refuge and the Refuge System. Refuge themes may be in a storyline form that incudes three or more themes. Themes may include: exploring the diversity of wildlife, understanding the past, protecting the balance, and communicating visitor opportunities.		X	X	X	X
Within 3 years of the plan's approval and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other partners, create an array of environmental education kits, each focusing on one or more aspects of Refuge themes. Educational kits will include interactive materials and a detailed instructional and activity guide designed with a clear, consistent format and coordinated with state learning standards. Develop and maintain a multi-faceted environmental education resource library, available for use by educators and in Refuge educational programs, comprised of books, videos, posters, audio tapes, written materials, and environmental education kits.		X	X	X	X
Within 4 years of the plan's approval and in cooperation with other partners, establish an environmental education complex that incorporates an outdoor amphitheater with educational displays, a set of associated trails, the Refuge Visitor Center, and an educator's trail specifically designed to facilitate environmental education activities and function as an outdoor classroom.		X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Within 4 years of the plan's approval and in cooperation with other partners, create an Educator's Guide to Crab Orchard National Wildlife Refuge that provides an orientation, guidelines, grade-level and state learning standards information, maps, and site-specific activities that focus on one or more Refuge themes. Incorporate input from area educators to ensure that the Refuge guide meets area teachers' needs.		X	X	X	X
In cooperation with other partners, conduct or host bi-annual teacher workshops that encourage area educators to incorporate environmental education into their curriculum and to utilize Refuge materials, staff, and resources, both in the classroom and during field trips. Within 5 years of the plan's approval, develop a Refuge-specific teacher workshop to demonstrate methods for combining use of the Educator's Guide, environmental education kits, and the educator's trail. Explore continuing education credit options for all teacher workshops.		X			
Over the life of the plan, establish a positive, cooperative relationship with educators and schools in surrounding communities. Promote use of the Refuge, environmental education resources, and staff through e-mail newsletters to educators, the Refuge web page, informational fliers and materials, targeted special events, and involvement in area parent-teacher and other organizations.		X			
Continue currently-offered environmental education programs done by request, including on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Over the life of the plan, expand the environmental education program to include additional on-site and off-site programs, special educational events, group camp programs, and special interest group programs. Develop pre- and post-visit activities in addition to on-site activities.		X	X	X	X
Over the life of the plan, establish partnerships with selected local schools, agencies, and nonprofit organizations to more effectively develop and expand environmental education programs. Involve volunteers in educational programs and explore the potential for environmental education interns through Southern Illinois University and John A. Logan College. Explore the potential for creating a grant program to help area schools with field trip expenses.		X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Conduct a biannual review of the Refuge environmental education program. Invite feedback from area educators. Revise as necessary.		X			
Promote the use of the Refuge as an outdoor classroom and incorporate national environmental education guidelines and state learning standards into programs and materials.		X			
Manage the envrionmental education program as described in Service policy.		X			
In cooperation with other partners, conduct or host annual teacher workshops that encourage area educators to incorporate environmental education into their curriculum and to utilize Refuge materials, staff, and resources, both in the classroom and during field trips.			X	X	X
Goal: Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge.					
Objectives					
Maintain and gradually improve the quality of boat launches, marinas, beaches, picnic areas, and campgrounds at levels offered in 2001.	X				
Maintain the quality of non wildlife-dependent recreation facilities and activities at the levels offered in 2001 until facilities are transferred in a land exchange. Improve the quality of facilities not a part of the exchange to industry standards within 5 years of completion of exchange.		X			
Improve the quality of boat launches, marinas, beaches, picnic areas, and campground to industry standards within the life of the CCP.			X	X	X
Strategies					
Use recreation fee funds and compete for Maintenance Management System funds to improve facilities. Follow guideline for evacuating concession operations.	X				
Maintain picnicking at Greenbriar, Wolf Creek, Harmony Trail, and Visitor Center recreation areas. Within 2 years of the land exchange convert the Cambria Neck recreational area to foot traffic only.		X			
Explore the potential for a bicycle route within the restricted area of the Refuge. The route would run along old railroad beds.		X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Continue current policies on swimming at Devils Kitchen, Little Grassy, and Crab Orchard Lakes.		X	X	X	X
With in 5 years of the plan's approval, upgrade boat ramps and associated parking at Devils Kitchen, Little Grassy and Crab Orchard Lakes.		X			
Continue current policies on lake zoning on Crab Orchard Lake with the additional zoning of no-wake east of Highway 148.		X			
Camping at Devils Kitchen would be discontinued to allow the Service to upgrade Little Grassy Campground to standards comparable to others in the area.		X			
Camping at Devils Kitchen would be reduced to primitive sites only.			X	X	X
Maintain picnicking at the Refuge recreational areas of Greenbriar, Wolf Creek and Harmony Trail, and allocate picnic facilities from Cambria Neck and Playport Marina to Images Marina site. Explore the option of concession-operated picnic shelters at Little Grassy and Crab Orchard Campgrounds.			X	X	X
With in 10 years of the plan's approval, upgrade boat ramps and associated parking at Devils Kitchen, Little Grassy and Crab Orchard lakes.			X	X	X
Continue current policies on lake zoning on Crab Orchard Lake with the additional zoning of no-wake zones.			X	X	X
Within 2 years of the plan's approval, consolidate Playport and Image marinas on Crab Orchard Lake. Image marina slips will be moved to Playport marina. Within 5 years of the plan's approval, remove the building at Image Marina and develop the area into a large access area to the lake with a comfort station.			X	X	X
Gas Motors on Devils Kitchen Lake					
Implement the zoning of motorized boating at Devils Kitchen Lake. Gas motors would be prohibited south of the southernmost boat ramps on Devils Kitchen Lake and ponds within the open area of the Refuge.		X			

	Alternatives				
	A	**B**	**C**	**D**	**E**
Gas motors would be prohibited at Devils Kitchen Lake.			X		
Gas motors would be permitted on Devils Kitchen Lake.				X	
Implement the zoning of motorized boating at Devils Kitchen Lake. Gas motors would be prohibited in the most southeastern arm of Devils Kitchen Lake, from the mouth of Grassy Creek south to the Refuge boundary, and in ponds within the open area.					X
Horseback Use					
Horseback use on the Refuge would be confined to designated trails only (see map) and erosion due to trail use would be actively controlled through maintenance and/or seasonal closures.		X	X		X
Horseback use would be prohibited on the Refuge.				X	
Goal: Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.					
Objectives					
Meet Service standards for signs, information sources, facilities, and opportunities for visitor feedback at the levels offered in 2001.	X				
Provide visitors with a safe and enjoyable visit and a feeling of security.	X				
Improve Refuge signs, kiosks, and facilities so 90 percent of visitors feel welcome and secure, enjoy their visit, and recognize the area as a national wildlife refuge.		X	X	X	X
Strategies					
Maintain and gradually improve kiosks, rest rooms, boundary signing, and opportunities for visitor feedback as time and resources permit.	X				
Conduct annual safety inspections of all Refuge facilities and reaffirm compliance with Service standards.	X				
Maintain recognizable, consistent signs that clearly identify public hunting areas.	X				

	Alternatives				
	A	**B**	**C**	**D**	**E**
Respond to notification of safety problems and unsafe situations promptly and in accordance with Service standards.	X				
Within 5 years of the plan's approval, develop and install distinct and consistent identification markers that allow visitors to recognize and distinguish between each type of Refuge facility, including trails, observation platforms, photography blinds, bank fishing areas, public hunting areas, and other similar locations. Design all such markers in accordance with Service standards.		X			
Within 3 years of the plan's approval, revise information on existing kiosks, trailhead and other identification markers, boundary signs, and other such signs as necessary to meet Service standards.		X	X	X	X
Within 5 years of the plan's approval, create and install additional kiosks where needed at Refuge access points to ensure all visitors are greeted and informed that they are entering a national wildlife refuge. Ensure that all structures comply with Service standards.		X	X	X	X
Verify annually that visitors are welcomed and treated courteously by staff and volunteers. Confirm customer service standards during employee and volunteer orientations. Provide visitors with opportunities for feedback through suggestion cards, verbal reports, written mail, and e-mail through the Refuge web page. Address customer service issues promptly and professionally according to Service standards.		X	X	X	X
Within 2 years of the plan's approval, develop a Refuge brochure with detailed information on accessible facilities, trails, programs, and recreational opportunities at the Refuge.		X	X	X	X
Conduct semi-annual safety inspections of all Refuge facilities and reaffirm compliance with Service standards.		X	X	X	X
Maintain recognizable, consistent signs that clearly identify public hunting areas. Increase awareness among non-hunting visitors of hunting areas and seasons through effective signs and brochures.		X	X	X	X
Respond to notification of safety problems and unsafe situations promptly and in accordance with Service standards. Increase visibility of Refuge law enforcement, particularly during periods of heavy visitation.		X	X	X	X

	Alternatives				
	A	**B**	**C**	**D**	**E**
Goal: Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.					
Objectives					
Continue farming operations on about 4,500 acres of row crops.	X				
Continue farming operations on about 4,400 acres of row crops with greater emphasis on conservation practices.		X			X
Continue farming operations on about 4,500 acres of row crops, and reclaim and farm about 300 acres of former fields with greater emphasis on conservation practices.			X		
Continue farming operations on about 4,300 acres of row crops with greater emphasis on conservation practices, along with reasonable allowances to cooperators.				X	
Continue grazing operations on about 1,000 acres of pastures	X				
Continue grazing operations on about 1,000 acres of pasture with greater emphasis on conservation practices and reasonable allowances to cooperators.				X	
Continue operations on about 700 acres of hay fields.	X				
Continue farming operations on about 700 acres of hay fields with greater emphasis on conservation practices.		X			X
Continue farming operations on about 500 acres of hay fields with greater emphasis on conservation practices.			X		
Continue farming operations on about 500 acres of hay fields with greater emphasis on conservation practices.				X	
Enhance nesting habitat for grassland birds while maintaining or increasing the value for grazing on about 1,000 acres of pastures.		X	X		X
Strategies					
Maintain infrastructure (roads, fences) in support of agricultural operations. Address erosion with buffer strips. Enlist technical oversight from Natural Resource Conservation Service and the University of Illinois Extension.	X				

	Alternatives				
	A	**B**	**C**	**D**	**E**
Maintain infrastructure (roads, fences) in support of agricultural operations. Address erosion with buffer strips. Identify and drop farmed wetlands from the farm program. Permit cooperator to harvest corn remaining in the field in the spring. Emphasize Johnsongrass control. Prohibit mowing of clover in the crop rotation until after August 1. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.		X	X		X
Prohibit mowing of hay until after August 1. Maintain an updated rate charge for hay.		X	X		X
Convert fescue pastures to other cool-season grasses and native warm season grasses with higher wildlife value. Divide existing pastures into three or four paddocks with a paddock of cool season grass and two or three paddocks of native warm season grasses. Rotate grazing cattle among the paddocks during the season. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.		X	X		X
Maintain infrastructure (roads, fences) in support of agricultural operations. Address erosion with buffer strips. Drop small, less profitable fields (less than 5 acres) from row cropping and convert to other cover (about 15 fields totaling 52 acres). Identify and drop farmed wetlands from the farm program. Permit cooperator to harvest corn remaining in the field in the spring. Emphasize Johnsongrass control, for example: allow cooperators adjust rotation by planting soybeans in two successive years in one field annually. Prohibit mowing of clover in the crop rotation until after August 1. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.				X	
Prohibit mowing of hay until after August 1. Maintain an updated rate charge for hay.				X	
Remove 15 acres of linear forest habitat and 2 miles of hedge rows. Increase forage diversity in fescue pastures by adding legumes, other cool-season or warm-season grasses by reseeding or inter-seeding. Subdivide larger pastures for rotational grazing to increase cattle production. All mowing of hay fields, pastures, and clover fields will take place after August 1. Enlist technical oversight from Natural Resource Conservation Service and University of Illinois Extension.				X	

	Alternatives				
	A	**B**	**C**	**D**	**E**
Goal: Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards.					
Objectives					
Meet the guidelines of the Industrial Policy established December 1981.	X				
Consolidate the areas occupied by industry.		X	X	X	X
Strategies					
Maintain roads, as well as water and sewer lines, in industrial areas as appropriations become available. Building and grounds maintenance responsibility of lessee in accordance with lease requirements.	X				
Update Industrial Policy. Maintain the current infrastructure to support existing facilities.		X			X
Remove buildings that are no longer suitable for occupancy for reasons of contamination, safety or lack of structural integrity and restore to natural habitats.		X	X	X	X
Non-munitions-related tenants would not be replaced as they leave the Refuge.			X	X	

Appendix N: Wildlife and Habitat Matrix

Appendix N: Wildlife and Habitat Matrix

Numbers in the matrix represent the habitat potential for the wildlife for each land cover type. The potential ranks are: 0=no; 2=medium; 3=high. Habitat potential rankings were based on the integrated life cycle of each species as determined by Fish & Wildlife Service biologists.

Scientific Name	Refuge Breeder	Crab Orchard Abundance	Eastern Red-cedar Forest (old field)	Mixed Hardwood Upland Forest	Mixed Hardwood Bottomland Forest	Eastern Red-cedar - Mixed Hardwood Forest (old field)	Pine Plantation - Mixed Hardwood Forest	Pine Plantation Forest
Double-crested Cormorant	N	Common	0	0	0	0	0	0
Canada Goose (Resident)	Y	Common	0	0	0	0	0	0
Canada Goose (Migrant)	N	Abundant	0	0	0	0	0	0
Wood Duck	Y	Common	0	1	3	1	1	0
American Black Duck	N	Uncommon	0	0	1	0	0	0
Mallard	Y	Common	0	0	2	0	0	0
Blue-winged Teal	N	Common	0	0	1	0	0	0
Northern Pintail	N	Uncommon	0	0	0	0	0	0
Canvasback	N	Uncommon	0	0	0	0	0	0
Bald Eagle	Y	Uncommon	0	0	1	0	0	0
Red-shouldered Hawk	Y	Uncommon	1	2	3	1	1	1
American Woodcock	Y	Uncommon	1	1	1	1	1	1
Chuck-will's-widow	Y	Uncommon	1	2	2	1	1	0
Whip-poor-will	Y	Uncommon	1	2	2	1	1	0
Red-headed Woodpecker	Y	Uncommon	1	2	2	1	2	1
Northern Flicker	Y	Uncommon	1	1	1	1	1	1
Acadian Flycatcher	Y	Uncommon	1	3	2	2	2	1
Loggerhead Shrike (migrans)	N	Occasional	0	0	0	0	0	0
Bell's Vireo	Y	Occasional	0	0	0	0	0	0
Wood Thrush	Y	Uncommon	1	3	3	2	2	1
Blue-winged Warbler	Y	Occasional	1	1	1	1	1	1
Prairie Warbler	Y	Uncommon	1	0	0	0	0	0
Cerulean Warbler	Y	Rare	1	3	3	2	2	1

Scientific Name	Refuge Breeder	Crab Orchard Abundance	Eastern Red-cedar Forest (old field)	Mixed Hardwood Upland Forest	Mixed Hardwood Bottomland Forest	Eastern Red-cedar - Mixed Hardwood Forest (old field)	Pine Plantation - Mixed Hardwood Forest	Pine Plantation Forest
Worm-eating Warbler	Y	Uncommon	1	3	3	2	2	1
Louisiana Waterthrush	Y	Uncommon	1	3	3	2	2	1
Kentucky Warbler	Y	Uncommon	1	3	3	2	2	1
Field Sparrow	Y	Uncommon	1	0	0	0	0	0
Grasshopper Sparrow	N	Occasional	0	0	0	0	0	0
Dickcissel	Y	Common	0	0	0	0	0	0
Eastern Meadowlark	Y	Common	0	0	0	0	0	0
Indiana Bat	N	Unknown	0	1	2	1	1	0

Scientific Name	Bald-cypress Plantation Swamp Forest	Early Successional Oak Forest (reforested)	Upland Mixed Shrubland (old field)	Willow Wet Shrubland	Buttonbush Swamp Shrubland	Restored Native Grassland	Fallow Herbaceous Field	Forest Regeneration Herbaceous Land
Double-crested Cormorant	0	0	0	0	0	0	0	0
Canada Goose (Resident)	0	0	0	0	0	0	1	0
Canada Goose (Migrant)	0	0	0	0	0	0	1	0
Wood Duck	1	0	0	1	2	0	0	0
American Black Duck	1	0	0	1	1	0	1	0
Mallard	1	0	0	1	1	1	1	0
Blue-winged Teal	1	0	0	1	1	1	1	0
Northern Pintail	1	0	0	1	1	0	0	0
Canvasback	1	0	0	1	1	0	0	0
Bald Eagle	1	0	0	0	0	0	0	0
Red-shouldered Hawk	1	1	1	1	1	1	1	1
American Woodcock	1	3	2	3	2	1	1	1
Chuck-will's-widow	0	0	1	0	0	0	0	0
Whip-poor-will	0	0	1	0	0	0	0	0
Red-headed Woodpecker	1	1	1	1	0	0	0	0
Northern Flicker	1	2	2	1	1	1	2	2
Acadian Flycatcher	1	1	0	0	0	0	0	0
Loggerhead Shrike (migrans)	0	1	2	1	1	2	1	1
Bell's Vireo	0	1	2	1	1	1	1	1
Wood Thrush	0	0	0	0	0	0	0	0
Blue-winged Warbler	1	2	2	1	1	0	1	0
Prairie Warbler	0	2	2	1	0	1	2	2
Cerulean Warbler	1	0	0	0	0	0	0	0
Worm-eating Warbler	0	1	0	0	0	0	0	0
Louisiana Waterthrush	1	1	1	0	0	0	0	0
Kentucky Warbler	1	1	1	0	0	0	0	0
Field Sparrow	0	1	2	1	1	2	2	2
Grasshopper Sparrow	0	0	0	0	0	3	1	1
Dickcissel	0	0	0	0	0	3	1	1
Eastern Meadowlark	0	0	0	0	0	3	1	1
Indiana Bat	1	1	0	1	1	0	0	0

Scientific Name	Perennial Grass Crops	Wet Herbaceous Meadow	Common Reed Marsh	Cattail Marsh	Aquatic Herbaceous Marsh	Agricultural Field	Open Water	Developed Land
Double-crested Cormorant	0	0	0	0	1	0	2	0
Canada Goose (Resident)	2	1	1	1	1	2	1	1
Canada Goose (Migrant)	2	1	1	1	1	2	1	1
Wood Duck	0	0	1	1	1	0	1	0
American Black Duck	0	1	2	2	2	1	2	0
Mallard	0	1	2	2	2	1	2	0
Blue-winged Teal	0	1	2	2	2	1	2	0
Northern Pintail	0	1	2	2	2	1	2	0
Canvasback	0	1	2	2	2	0	2	0
Bald Eagle	0	1	1	1	1	1	2	0
Red-shouldered Hawk	1	1	1	1	1	1	0	1
American Woodcock	1	1	1	1	1	1	0	0
Chuck-will's-widow	0	0	0	0	0	0	0	0
Whip-poor-will	0	0	0	0	0	0	0	0
Red-headed Woodpecker	0	0	0	0	0	0	0	0
Northern Flicker	1	0	0	0	0	1	0	1
Acadian Flycatcher	0	0	0	0	0	0	0	0
Loggerhead Shrike (migrans)	1	0	0	0	0	0	0	0
Bell's Vireo	0	0	0	0	0	0	0	0
Wood Thrush	0	0	0	0	0	0	0	0
Blue-winged Warbler	0	0	0	0	0	0	0	0
Prairie Warbler	1	0	0	0	0	0	0	0
Cerulean Warbler	0	0	0	0	0	0	0	0
Worm-eating Warbler	0	0	0	0	0	0	0	0
Louisiana Waterthrush	0	0	0	0	0	0	0	0
Kentucky Warbler	0	0	0	0	0	0	0	0
Field Sparrow	1	0	0	0	0	0	0	0
Grasshopper Sparrow	1	1	0	0	0	0	0	0
Dickcissel	2	1	0	0	0	0	0	0
Eastern Meadowlark	2	1	0	0	0	0	0	0
Indiana Bat	0	1	1	1	1	0	0	0

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