



# United States Department of the Interior

**FISH AND WILDLIFE SERVICE**  
Bishop Henry Whipple Federal Building  
1 Federal Drive  
Fort Snelling, MN 55111-4056

IN REPLY REFER TO:

FWS/NWRS-CP

SEP 14 2005

Dear Reviewer:

We are pleased to provide you with this copy of the Draft Environmental Impact Statement (EIS) and Comprehensive Conservation Plan (CCP) for Crab Orchard National Wildlife Refuge.

The Plan will guide management for the next 15 years and help the Refuge meet its original purpose and contribute to the mission of the National Wildlife Refuge System. The Plan will provide both broad and specific policy on various issues; set a vision, goals, and measurable objectives; and outline strategies for achieving those objectives.

We invite your review of the Draft EIS/CCP and, most importantly, we invite your comment and counsel to help ensure that the final document is both visionary and practical. During the review period for the Draft EIS/CCP we will host an open house where you will be able to ask questions, seek understanding, and voice concerns and suggestions. The date and location of the meeting will be announced through local media.

Written comments are welcome throughout the comment period and should be addressed to:

Crab Orchard National Wildlife Refuge  
CCP Comment  
8588 Route 148  
Marion, IL 62959

You may also submit comments at: <http://www.fws.gov/midwest/planning/craborchard/index.html>

**To be considered in the final EIS/CCP, we need to receive your comment by January 17, 2006.**

We look forward to continuing the dialogue on the future of the Refuge, and thank you for your interest in keeping this Refuge a special place for wildlife and people.

Sincerely,

Thomas J. Larson  
Chief, Division of Conservation Planning



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## Crab Orchard National Wildlife Refuge

### Draft 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

**For further information:**

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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 Draft 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.

**Comment deadline:** January 17, 2006



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# 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 Draft Comprehensive Conservation Plan and Environmental Impact Statement (Draft CCP/EIS). Following public review and comment, we will publish a Final EIS followed by a Record of Decision (ROD) that identifies the alternative selected as the CCP. 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.

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

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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, Compatibility Determinations, describes proposed uses, availability of resources for management, anticipated impacts, and stipulations necessary for a use to be compatible on the Refuge. The Service is required to prepare these Compatibility Determinations and make them available for public review.

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*

## Draft Environmental Impact Statement / Comprehensive Conservation Plan

### *Table of Contents*

|  |          |
|--|----------|
| <b>Executive Summary .....</b>   | <b>i</b> |
| <b>Chapter 1: Purpose of and Need for Action .....</b>                                   | <b>1</b> |
| 1.1 Introduction .....   | 1        |
| 1.2 Proposed Action .....  | 1        |
| 1.3 Purpose of Action .....  | 1        |
| 1.4 Need for Action .....  | 1        |
| 1.5 Decision to be Made .....  | 3        |
| 1.6 Overview of the Planning Process .....   | 4        |
| 1.7 Legal and Policy Guidelines .....  | 4        |
| 1.7.1 Wilderness Review .....  | 4        |
| 1.8 National Wildlife Refuge System Mission, Goals and Principles .....                  | 5        |
| 1.8.1 Mission of the National Wildlife Refuge System .....                               | 5        |
| 1.8.2 Goals of the National Wildlife Refuge System .....                                 | 5        |
| 1.8.3 Guiding Principles of the National Wildlife Refuge System .....                    | 5        |
| 1.9 Ecosystem Goals .....  | 6        |
| 1.9.1 Upper Mississippi River/Tallgrass Prairie Ecosystem .....                          | 6        |
| 1.9.2 Goals and Objectives for Other Landscape Level Plans .....                         | 6        |
| 1.9.2.1 Migratory Bird Conservation Initiatives .....                                    | 6        |
| 1.9.2.2 Region 3 Fish and Wildlife Resource Conservation Priorities (January 2002) ..... | 8        |
| 1.10 Brief History of Refuge Establishment, Acquisition, and Management .....            | 8        |
| 1.10.1 Recent Refuge Management Activities .....   | 9        |
| 1.10.1.1 Wildlife and Fish Habitat .....   | 9        |
| 1.10.1.2 Agriculture .....   | 10       |
| 1.10.1.3 Recreation .....  | 10       |
| 1.10.1.4 Industry .....  | 10       |
| 1.10.1.5 Wilderness .....  | 10       |
| 1.10.1.6 Contaminants .....  | 10       |
| 1.10.1.7 Archaeological and Cultural Resources .....                                     | 10       |
| 1.11 Refuge Purposes .....   | 11       |
| 1.12 Refuge Vision Statement .....   | 11       |
| 1.13 Refuge Goals .....  | 11       |
| 1.13.1 Wildlife Conservation Goals .....   | 11       |
| 1.13.2 Recreation/Public Use Goals .....   | 12       |
| 1.13.3 Agricultural Goal .....   | 12       |
| 1.13.4 Industrial Goal .....   | 12       |
| 1.13.5 Wilderness Goal .....   | 12       |
| 1.13.6 Protection Goal .....   | 12       |
| 1.13.7 Outreach Goal .....   | 12       |
| 1.14 Planning Issues .....   | 12       |
| 1.14.1 Issue 1: Recreation .....   | 13       |
| 1.14.2 Issue 2: Wildlife Conservation .....  | 13       |
| 1.14.3 Issue 3: Refuge Purposes .....  | 13       |
| 1.14.4 Issue: Recreational Boating .....   | 13       |

|  |    |
|--|----|
| 1.14.5 Issue 5: Role in Regional Economy .....                   | 14 |
| 1.14.6 Issue 6: Communication between Refuge and Community ..... | 14 |
| 1.15 Issues Eliminated from Detailed Study .....                 | 14 |

**Chapter 2: Alternatives, Objectives, and Strategies ..... 15**

|  |    |
|--|----|
| 2.1 Introduction .....   | 15 |
| 2.2 Formulation of Alternatives .....  | 15 |
| 2.3 Selecting the Preferred Alternative .....  | 15 |
| 2.4 Summary of Alternatives .....  | 16 |
| 2.4.1 Alternative A: Current Management/No Action .....  | 16 |
| 2.4.1.1 Background .....   | 16 |
| 2.4.1.2 Summary .....  | 16 |
| 2.4.2 Alternative B: Reduced Habitat Fragmentation, Wildlife-dependent Recreation Emphasis With Land Exchange .....  | 17 |
| 2.4.2.1 Background .....   | 17 |
| 2.4.2.2 Summary .....  | 17 |
| 2.4.3 Alternative C: Open Land Management, Consolidate and Improve Recreation .....                                  | 18 |
| 2.4.3.1 Background .....   | 18 |
| 2.4.3.2 Summary .....  | 18 |
| 2.4.4 Alternative D: Forest Land Management, Consolidate and Improve Recreation .....                                | 18 |
| 2.4.4.1 Background .....   | 18 |
| 2.4.4.2 Summary .....  | 19 |
| 2.4.5 Alternative E: Reduced Habitat Fragmentation, Consolidate and Improve Recreation (Preferred Alternative) ..... | 19 |
| 2.4.5.1 Background .....   | 19 |
| 2.4.5.2 Summary .....  | 19 |
| 2.5 Alternatives Considered but Not Analyzed in Detail .....   | 20 |
| 2.6 Detailed Description of Alternatives and Relationship to Goals, Objectives and Strategies .....                  | 21 |
| 2.6.1 Features Common to All Alternatives .....  | 21 |
| 2.6.1.1 Operational Policies .....   | 27 |
| 2.6.1.2 Fire .....   | 30 |
| 2.6.2 Alternative A: Current Management/No Action .....  | 32 |
| 2.6.2.1 Wildlife Conservation Goals .....  | 32 |
| 2.6.2.2 Recreation/Public Use Goals .....  | 36 |
| 2.6.2.3 Agricultural Goal .....  | 38 |
| 2.6.2.4 Industrial Goal .....  | 38 |
| 2.6.2.5 Boundary Modification .....  | 38 |
| 2.6.3 Alternative B: Reduced Habitat Fragmentation/Wildlife-dependent Recreation Emphasis With Land Exchange .....   | 39 |
| 2.6.3.1 Land Exchange .....  | 39 |
| 2.6.3.2 Wildlife Conservation Goals .....  | 39 |
| 2.6.3.3 Recreation/Public Use Goals .....  | 45 |
| 2.6.3.4 Agricultural Goal .....  | 53 |
| 2.6.3.5 Industrial Goal .....  | 54 |
| 2.6.3.6 Boundary Modification .....  | 54 |
| 2.6.4 Alternative C: Open Land Management/Consolidate and Improve Recreation .....                                   | 57 |
| 2.6.4.1 Wildlife Conservation Goals .....  | 57 |
| 2.6.4.2 Recreation/Public Use Goals .....  | 60 |
| 2.6.4.3 Agricultural Goal .....  | 64 |



|  |    |
|--|----|
| 2.6.4.4 Industrial Goal .....  | 64 |
| 2.6.4.5 Boundary Modification .....  | 65 |
| 2.6.5 Alternative D: Forest Land Management/Consolidate and Improve Recreation .....                                     | 65 |
| 2.6.5.1 Wildlife Conservation Goals .....  | 65 |
| 2.6.5.2 Recreation/Public Use Goals .....  | 68 |
| 2.6.5.3 Agricultural Goal .....  | 68 |
| 2.6.5.4 Industrial Goal .....  | 68 |
| 2.6.5.5 Boundary Modification .....  | 68 |
| 2.6.6 Alternative E: Reduced Habitat Fragmentation/Consolidate and Improve Recreation<br>(Preferred Alternative) .....   | 69 |
| 2.6.6.1 Wildlife Conservation Goals .....  | 69 |
| 2.6.6.2 Recreation/Public Use Goals .....  | 69 |
| 2.6.6.3 Agricultural Goal .....  | 70 |
| 2.6.6.4 Industrial Goal .....  | 70 |
| 2.6.6.5 Boundary Modification .....  | 70 |
| 2.7 Comparison of Alternatives .....   | 70 |
| 2.7.1 Comparison of Funding and Personnel Needs by Alternative .....   | 70 |
| 2.7.1.1 Alternative A: Current Management (No Action) .....  | 70 |
| 2.7.1.2 Alternative B: Reduced Habitat Fragmentation/ Wildlife-dependent Recreation<br>Emphasis With Land Exchange ..... | 70 |
| 2.7.1.3 Alternative C: Open Land Management/Consolidate and Improve Recreation .....                                     | 70 |
| 2.7.1.4 Alternative D: Forest Land Management/Consolidate and Improve Recreation .....                                   | 71 |
| 2.7.1.5 Alternative E: Reduced Habitat Fragmentation/Consolidate and Improve<br>Recreation (Preferred Alternative) ..... | 71 |

**Chapter 3: Affected Environment ..... 79**

|  |    |
|--|----|
| 3.1 Introduction .....   | 79 |
| 3.2 Physical Environment .....   | 79 |
| 3.2.1 Physiography .....   | 79 |
| 3.2.2 Geology .....  | 79 |
| 3.2.3 Soils .....  | 80 |
| 3.2.4 Climate .....  | 80 |
| 3.2.5 Hydrology and Water Quality .....  | 80 |
| 3.2.5.1 Crab Orchard Lake .....  | 80 |
| 3.2.5.2 Little Grassy Lake .....   | 81 |
| 3.2.5.3 Devils Kitchen Lake .....  | 81 |
| 3.2.6 Contaminants .....   | 82 |
| 3.2.6.1 Comprehensive Environmental Response Compensation and Liability Act (CERCLA) ..... | 82 |
| 3.2.7 Administrative Facilities .....  | 82 |
| 3.3 Habitat Overview .....   | 83 |
| 3.3.1 Background .....   | 83 |
| 3.3.2 Forests .....  | 84 |
| 3.3.3 Shrubland .....  | 84 |
| 3.3.4 Grassland .....  | 84 |
| 3.3.5 Wetlands .....   | 84 |
| 3.3.6 Open Water .....   | 84 |
| 3.3.7 Cropland .....   | 86 |
| 3.3.8 Developed Land .....   | 86 |
| 3.3.9 Invasive Species .....   | 86 |

---

|  |     |
|--|-----|
| 3.3.10 Natural and Current Role of Fire .....                                | 88  |
| 3.4 Wildlife .....   | 88  |
| 3.4.1 Mammals .....  | 88  |
| 3.4.2 Birds .....  | 89  |
| 3.4.3 Amphibians and Reptiles .....  | 91  |
| 3.4.4 Fish .....   | 91  |
| 3.4.4.1 Crab Orchard Lake .....  | 91  |
| 3.4.4.2 Devils Kitchen Lake .....  | 93  |
| 3.4.4.3 Little Grassy Lake .....   | 93  |
| 3.4.4.4 Small Impoundments .....   | 93  |
| 3.4.5 Monitoring .....   | 94  |
| 3.5 Federal Threatened and Endangered Species .....                          | 95  |
| 3.5.1 Mammals .....  | 95  |
| 3.5.2 Birds .....  | 95  |
| 3.5.3 Plants .....   | 95  |
| 3.6 Public Use Resources and Trends .....                                    | 96  |
| 3.6.1 Hunting .....  | 96  |
| 3.6.2 Fishing .....  | 98  |
| 3.6.3 Camping .....  | 100 |
| 3.6.4 Wildlife Observation .....   | 100 |
| 3.6.5 Hiking Trails .....  | 101 |
| 3.6.6 Boating .....  | 103 |
| 3.6.6.1 Crab Orchard Lake .....  | 103 |
| 3.6.6.2 Devils Kitchen Lake .....  | 103 |
| 3.6.6.3 Little Grassy Lake .....   | 103 |
| 3.6.7 Swimming .....   | 105 |
| 3.6.8 Picnicking .....   | 105 |
| 3.6.9 Horseback Riding .....   | 105 |
| 3.6.10 Group Camps .....   | 107 |
| 3.6.11 Environmental Education .....   | 107 |
| 3.6.12 Interpretation .....  | 108 |
| 3.6.13 Visitor Center .....  | 108 |
| 3.6.14 Existing Transportation Patterns and Visitor Facilities .....         | 108 |
| 3.7 Special Management Areas .....   | 108 |
| 3.7.1 Wilderness .....   | 108 |
| 3.7.1.1 Inholdings and Lands Contiguous to the Crab Orchard Wilderness ..... | 109 |
| 3.7.2 Research Natural Areas .....   | 109 |
| 3.7.3 Conservation Easements .....   | 111 |
| 3.8 Industrial Use Status and Trends .....                                   | 111 |
| 3.9 Agriculture .....  | 112 |
| 3.10 Archaeological and Cultural Values .....                                | 114 |
| 3.11 Law Enforcement .....   | 116 |
| 3.12 Socioeconomic Environment .....   | 116 |
| 3.12.1 Economic Setting .....  | 116 |
| 3.12.1.1 Population .....  | 117 |
| 3.12.1.2 Employment .....  | 117 |
| 3.12.1.3 Employment Earnings and Personal Income .....                       | 119 |
| 3.12.2 Impact of the Refuge Budget .....                                     | 119 |
| 3.12.3 Economic Impacts of Refuge Recreation .....                           | 121 |
| 3.12.4 Tax Impacts of Refuge Recreation Spending .....                       | 123 |

---

|  |     |
|--|-----|
| 3.12.5 Economic Impacts of Refuge Agriculture, Grazing, Timber Harvesting and Commercial Use ..... | 123 |
| 3.12.6 Comparison of Refuge-Related Economic Impacts to Study Area Economy .....                   | 124 |
| 3.12.7 Current Staff and Budget .....  | 126 |
| 3.12.7.1 Staff .....   | 126 |
| 3.12.8 Budget .....  | 126 |
| 3.13 Partnerships .....  | 126 |

**Chapter 4: Environmental Consequences ..... 128**

|  |     |
|--|-----|
| 4.1 Introduction .....   | 128 |
| 4.1.1 Quantifying Effects of Alternatives on Wildlife Species .....  | 128 |
| 4.1.2 Effects on Archaeological and Cultural Values .....  | 129 |
| 4.2 Effects Common to All Action Alternatives .....  | 131 |
| 4.2.1 Threatened and Endangered Species .....  | 131 |
| 4.2.2 Cooperative Fishery Management .....   | 132 |
| 4.2.3 Canada Geese .....   | 132 |
| 4.2.4 Communication and Community Support .....  | 132 |
| 4.2.5 Wilderness .....   | 132 |
| 4.2.6 Climate Change Impacts .....   | 132 |
| 4.2.7 Prescribed Fire .....  | 132 |
| 4.2.7.1 Social Implications .....  | 132 |
| 4.2.7.2 Cultural and Archaeological Resources .....  | 133 |
| 4.2.7.3 Flora .....  | 133 |
| 4.2.7.4 Listed Species .....   | 133 |
| 4.2.7.5 Soils .....  | 133 |
| 4.2.7.6 Escaped Fire .....   | 134 |
| 4.3 Alternative A: Current Management/No Action .....  | 134 |
| 4.3.1 Impacts on Resources .....   | 134 |
| 4.3.1.1 Land cover .....   | 134 |
| 4.3.1.2 Threatened and Endangered Species .....  | 134 |
| 4.3.1.3 Area-sensitive Forest Bird Species .....   | 136 |
| 4.3.1.4 Waterfowl and Other Water Bird Species .....   | 136 |
| 4.3.1.5 Grassland Birds .....  | 136 |
| 4.3.1.6 Shrubland Birds .....  | 137 |
| 4.3.1.7 Water Quality .....  | 137 |
| 4.3.1.8 Wilderness .....   | 137 |
| 4.3.2 Impacts on Public Uses .....   | 137 |
| 4.3.2.1 Wildlife-dependent Recreational Uses .....   | 137 |
| 4.3.2.2 Other Land- and Water-based Recreation .....   | 137 |
| 4.3.3 Volunteers and Support Groups .....  | 138 |
| 4.3.4 Impacts on Industrial Use .....  | 138 |
| 4.3.5 Impacts on Agricultural Use .....  | 138 |
| 4.3.6 Impact on Archaeological and Cultural Values .....   | 138 |
| 4.3.7 Boundary Modification .....  | 138 |
| 4.4 Alternative B, Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis<br>With Land Exchange ..... | 138 |
| 4.4.1 Impacts on Resources .....   | 138 |
| 4.4.1.1 Land Cover .....   | 138 |
| 4.4.1.2 Threatened and Endangered Species .....  | 139 |

---

|         |   |     |
|---------|---|-----|
| 4.4.1.3 | Area-sensitive Forest Bird Species .....  | 139 |
| 4.4.1.4 | Waterfowl and Other Water Bird Species .....                                    | 139 |
| 4.4.1.5 | Grassland Birds .....   | 139 |
| 4.4.1.6 | Shrubland Birds .....   | 139 |
| 4.4.1.7 | Water Quality .....   | 139 |
| 4.4.1.8 | Wilderness .....  | 141 |
| 4.4.2   | Impacts on Public Uses .....  | 141 |
| 4.4.2.1 | Wildlife-dependent Recreational Uses .....                                      | 141 |
| 4.4.2.2 | Other Land- and Water-based Recreation .....                                    | 141 |
| 4.4.3   | Volunteer and Support Groups .....  | 142 |
| 4.4.4   | Impacts on Industrial Use .....   | 142 |
| 4.4.5   | Impacts on Agricultural Use .....   | 142 |
| 4.4.6   | Impacts on Archaeological and Cultural Values .....                             | 143 |
| 4.4.7   | Boundary Modification .....   | 143 |
| 4.5     | Alternative C: Open Land Management, Consolidate and Improve Recreation .....   | 144 |
| 4.5.1   | Impacts on Resources .....  | 144 |
| 4.5.1.1 | Land Cover .....  | 144 |
| 4.5.1.2 | Threatened and Endangered Species .....   | 144 |
| 4.5.1.3 | Area-sensitive Forest Bird Species .....  | 144 |
| 4.5.1.4 | Waterfowl and Other Water Bird Species .....                                    | 144 |
| 4.5.1.5 | Grassland Birds .....   | 144 |
| 4.5.1.6 | Shrubland Birds .....   | 146 |
| 4.5.1.7 | Water Quality .....   | 146 |
| 4.5.1.8 | Wilderness .....  | 146 |
| 4.5.2   | Impacts on Public Uses .....  | 146 |
| 4.5.2.1 | Wildlife-dependent Recreational Uses .....                                      | 146 |
| 4.5.2.2 | Other Land- and Water-based Recreation .....                                    | 146 |
| 4.5.3   | Volunteer and Support Groups .....  | 147 |
| 4.5.4   | Impacts on Industrial Use .....   | 147 |
| 4.5.5   | Impacts on Agricultural Use .....   | 147 |
| 4.5.6   | Impacts on Archaeological and Cultural Values .....                             | 147 |
| 4.5.7   | Boundary Modification .....   | 148 |
| 4.6     | Alternative D: Forest Land Management, Consolidate and Improve Recreation ..... | 148 |
| 4.6.1   | Impacts on Resources .....  | 148 |
| 4.6.1.1 | Land Cover .....  | 148 |
| 4.6.1.2 | Threatened and Endangered Species .....   | 148 |
| 4.6.1.3 | Area-sensitive Forest Bird Species .....  | 148 |
| 4.6.1.4 | Waterfowl and Other Water Bird Species .....                                    | 148 |
| 4.6.1.5 | Grassland Birds .....   | 148 |
| 4.6.1.6 | Shrubland Birds .....   | 148 |
| 4.6.1.7 | Water Quality .....   | 150 |
| 4.6.1.8 | Wilderness .....  | 150 |
| 4.6.2   | Impacts on Public Uses .....  | 150 |
| 4.6.2.1 | Wildlife-dependent Recreational Uses .....                                      | 150 |
| 4.6.2.2 | Other Land- and Water-based Recreation .....                                    | 150 |
| 4.6.3   | Volunteer and Support Groups .....  | 151 |
| 4.6.4   | Impacts on Industrial Use .....   | 151 |
| 4.6.5   | Impacts on Agricultural Use .....   | 151 |
| 4.6.6   | Archaeological and Cultural Values .....  | 151 |
| 4.6.7   | Boundary Modification .....   | 151 |

---

---

|   |            |
|---|------------|
| 4.7 Alternative E, Reduced Habitat Fragmentation, Consolidate and Improve Recreation<br>(Preferred Alternative) ..... | 151        |
| 4.7.1 Impacts on Resources .....  | 151        |
| 4.7.1.1 Land Cover .....  | 151        |
| 4.7.1.2 Threatened and Endangered Species .....   | 151        |
| 4.7.1.3 Area-sensitive Forest Bird Species .....  | 151        |
| 4.7.1.4 Waterfowl and Other Water Bird Species .....  | 151        |
| 4.7.1.5 Grassland Birds .....   | 152        |
| 4.7.1.6 Shrubland Birds .....   | 152        |
| 4.7.1.7 Water Quality .....   | 152        |
| 4.7.1.8 Wilderness .....  | 152        |
| 4.7.2 Impacts on Public Uses .....  | 153        |
| 4.7.2.1 Wildlife-dependent Recreational Uses .....  | 153        |
| 4.7.2.2 Other Land- and Water-based Recreation .....  | 153        |
| 4.7.3 Volunteer and Support Groups .....  | 154        |
| 4.7.4 Impacts on Industrial Use .....   | 154        |
| 4.7.5 Impacts on Agricultural Use .....   | 154        |
| 4.7.6 Impacts on Archaeological and Cultural Values .....   | 154        |
| 4.7.7 Boundary Modification .....   | 154        |
| 4.8 Summary of Economic Effects of Alternatives .....   | 155        |
| 4.8.1 Economic Effects of Recreation .....  | 155        |
| 4.8.1.1 Introduction .....  | 155        |
| 4.8.1.2 Hunting .....   | 155        |
| 4.8.1.3 Fishing .....   | 155        |
| 4.8.1.4 Wildlife Observation and Photography .....  | 155        |
| 4.8.1.5 Boating .....   | 157        |
| 4.8.1.6 Facilities and Marina Slips .....   | 157        |
| 4.8.1.7 Camping / Day Use .....   | 157        |
| 4.8.1.8 Summary of Recreation Economic Effects .....  | 158        |
| 4.8.2 Economic Effects of Commercial Use .....  | 158        |
| 4.8.2.1 Introduction .....  | 158        |
| 4.8.2.2 Agriculture .....   | 158        |
| 4.8.2.3 Grazing .....   | 159        |
| 4.8.2.4 Timber Harvesting .....   | 159        |
| 4.8.2.5 Industry .....  | 160        |
| 4.9 Summary of Impacts of Alternatives .....  | 161        |
| 4.10 Irreversible and Irrecoverable Commitment of Resources .....   | 161        |
| 4.11 Environmental Justice .....  | 161        |
| 4.12 Cumulative Impacts .....   | 161        |
| 4.12.1 Cumulative Effects Resulting from Habitat Management Actions .....   | 161        |
| 4.12.1.1 Forest .....   | 161        |
| 4.12.1.2 Grassland .....  | 162        |
| 4.12.2 Cumulative Effects Resulting from Recreation Changes .....   | 163        |
| 4.12.3 Cumulative Effects Resulting from Agricultural Management .....  | 163        |
| <b>Chapter 5: List of Preparers .....</b>   | <b>167</b> |
| <b>Chapter 6: Consultation and Coordination .....</b>   | <b>168</b> |
| 6.1 Summary of Public Involvement .....   | 168        |
| 6.2 List of Agencies, Organizations and Individuals Receiving a Draft Document .....                                  | 168        |

---

---

|   |            |
|---|------------|
| 6.2.1 Elected Officials .....   | 168        |
| 6.2.2 Organizations .....   | 169        |
| <b>Appendix A: Goals, Objectives, Strategies and Implementation .....</b>   | <b>173</b> |
| <b>Appendix B: Glossary .....</b>   | <b>187</b> |
| <b>Appendix C: Laws and Orders .....</b>  | <b>193</b> |
| <b>Appendix D: Species List .....</b>   | <b>211</b> |
| <b>Appendix E: State-listed Species Potentially Found at Crab Orchard NWR .....</b>                               | <b>265</b> |
| <b>Appendix F: Bibliography .....</b>   | <b>269</b> |
| <b>Appendix G: Public Law 80-361 .....</b>  | <b>279</b> |
| <b>Appendix H: Summary of Public Comment on Alternatives .....</b>  | <b>283</b> |
| <b>Appendix I: Letter Outlining the Exchange Proposal .....</b>   | <b>289</b> |
| <b>Appendix J: Compatibility Determinations .....</b>   | <b>293</b> |
| <b>Appendix K: Refuge Operating Needs System (RONS) and Maintenance Mangement System<br/>(MMS) Projects .....</b> | <b>345</b> |
| <b>Appendix L: Land Protection Plan .....</b>   | <b>353</b> |
| <b>Appendix M: Comparison of Objectives and Strategies by Alternative .....</b>                                   | <b>367</b> |
| <b>Appendix N: Wildlife and Habitat Matrix .....</b>  | <b>397</b> |
| <b>Index .....</b>  | <b>403</b> |

# Crab Orchard

## *National Wildlife Refuge*

### **Draft Environmental Impact Statement / Comprehensive Conservation Plan**

#### *List of Tables*

|   |     |
|---|-----|
| Table 1: Proposed Recreational Entrance Fees and Federal Passes That Will Permit Entry, Crab Orchard NWR .....                        | 29  |
| Table 2: Area of Food-producing Canada Goose Habitat by Alternative .....   | 41  |
| Table 3: Millions of Potential Goose-use-days of Food by Habitat and Alternative .....  | 41  |
| Table 4: Summary of Management Alternatives .....   | 72  |
| Table 5: Crab Orchard NWR Lake Details .....  | 81  |
| Table 6: Area and Percent Cover of Habitats on Crab Orchard NWR, 1807 and 2000 .....  | 86  |
| Table 7: Principal Invasive and Exotic Species, Crab Orchard NWR .....  | 87  |
| Table 8: Principal Weed Species in Agricultural Fields, Crab Orchard NWR .....  | 87  |
| Table 9: Number of Wildlife Species Found in Illinois and at Crab Orchard NWR .....   | 89  |
| Table 10: Nongame Species of Management Concern, Crab Orchard NWR .....   | 91  |
| Table 11: Crab Orchard NWR Fish Species List .....  | 92  |
| Table 12: Small Fishing Ponds on Crab Orchard NWR .....   | 93  |
| Table 13: Research Natural Areas on Crab Orchard NWR .....  | 111 |
| Table 14: Most Frequently Cited Offences on Crab Orchard NWR, 1997-2001 .....   | 116 |
| Table 15: Williamson County and Jackson County, Illinois and the United States Population, Percentage Change 1980, 1990, 2000 .....   | 117 |
| Table 16: Demographic Profile of Jackson County, Williamson County, Illinois and the United States .....                              | 117 |
| Table 17: Employment by Major Business Sector, Williamson County, 1980 and 2000 .....   | 118 |
| Table 18: Employment by Major Business Sector, Jackson County, 1980 and 2000 .....  | 118 |
| Table 19: Employment Earnings by Major Business Sector, Williamson County, 1980 and 2000 .....  | 119 |
| Table 20: Employment Earnings by Major Business Sector, Jackson County, 1980 and 2000 .....   | 120 |
| Table 21: Williamson County and Jackson County Per Capita Income, 1980, 1990 and 2000 .....   | 120 |
| Table 22: Annual Economic Impact of Refuge Budget Expenditures .....  | 120 |
| Table 23: Annual Tax Impacts of Refuge Expenditures .....   | 121 |
| Table 24: Economic Impacts of Refuge Recreation in Two-county Study Area .....  | 122 |
| Table 25: Recreation Expenditures and Economic Impacts for Non-resident Visitors to the Refuge .....                                  | 123 |
| Table 26: Federal, State and Local Tax Revenue Derived From Refuge-related Recreational Spending by Residents and Non-residents ..... | 123 |
| Table 27: Tax Revenue Generated by Non-resident Refuge Recreation Spending .....  | 124 |
| Table 28: Annual Concession Revenue and Fees Paid for Crab Orchard NWR Recreational Facilities .....                                  | 124 |
| Table 29: Recreation and Refuge Budget Expenditures Compared with Study Area .....  | 125 |
| Table 30: Annual Number of Refuge Acres Farmed and Production Value Compared with the Study Area .....                                | 125 |
| Table 31: Annual Refuge Grazing and Value Compared with the Study Area .....  | 125 |
| Table 32: Annual Amount of Timber Harvest on the Refuge Compared with the Study Area .....  | 125 |
| Table 33: Resource Conservation Priority Species Used to Assess the Broad Impacts of the Comprehensive Conservation Plan .....        | 130 |

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|  |     |
|--|-----|
| 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 .....  | 131 |
| 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) ..... | 135 |
| Table 36: Predicted Difference in Land Cover by Alternative for 2000, 2015 and 2100 .....  | 136 |
| Table 37: Comparison of Annual Economic Effects of Alternatives on Hunting in the Study Area .....   | 156 |
| Table 38: Comparison of Annual Economic Effects of Alternatives on Fishing in the Study Area .....   | 156 |
| Table 39: Comparison of Annual Economic Effects of Alternatives on Wildlife Observation .....  | 156 |
| Table 40: Comparison of Annual Economic Effects of Alternatives on Boating .....   | 157 |
| Table 41: Comparison of Annual Economic Effects of Alternatives on Camping and Picnicking .....  | 157 |
| Table 42: Summary of Economic Effects of Alternatives on Public Use .....  | 158 |
| Table 43: Comparison of Annual Average Crop Values in Study Area .....   | 159 |
| Table 44: Comparison of Economic Effects of Grazing at Crab Orchard NWR .....  | 160 |
| Table 45: Impacts of Each Alternative on Timber Harvesting and Pine and Hardwood Forest Cover .....  | 160 |
| Table 46: Impacts of the Alternatives on Industry .....  | 161 |
| Table 47: Summary of Effects of Alternatives Described in Chapter 4 .....  | 164 |
| Table 48: Step-down Management Plans .....   | 185 |



# Crab Orchard

*National Wildlife Refuge*

## **Draft Environmental Impact Statement / Comprehensive Conservation Plan**

### *List of Figures*

|  |     |
|--|-----|
| Figure 1: Crab Orchard National Wildlife Refuge .....  | 2   |
| Figure 2: Location of Crab Orchard NWR .....   | 3   |
| Figure 3: U.S. Fish & Wildlife Service Ecosystem Units .....   | 6   |
| Figure 4: Protected Lands in Southern Illinois .....   | 9   |
| Figure 5: Results of Crab Orchard NWR Wilderness Inventory .....   | 26  |
| Figure 6: Land Cover of Crab Orchard NWR, Alternative A, Current Management (No Action)<br>Projected Conditions 2015 .....   | 34  |
| Figure 7: Land Cover of Crab Orchard NWR, Alternative A, Current Management (No Action),<br>Projected Conditions, 2100 ..... | 35  |
| Figure 8: Lands Proposed for Exchange Between Crab Orchard NWR and Southern Illinois University .....                        | 40  |
| Figure 9: Land Covers of Crab Orchard NWR, Alternatives B and E, Projected Conditions 2015 .....                             | 42  |
| Figure 10: Land Covers of Crab Orchard NWR, Alternatives B and E, Projected Conditions 2100 .....                            | 43  |
| Figure 11: Crab Orchard Lake Watercraft Zoning Proposed Under Alternatives B, C, D and E .....                               | 51  |
| Figure 12: Devils Kitchen Lake Zoning, Crab Orchard NWR .....  | 52  |
| Figure 13: Proposed Horseback Riding Trails on Crab Orchard NWR Under Alternatives B, C and E .....                          | 53  |
| Figure 14: Crab Orchard NWR Inholdings, Boundary Modification, and Adjacent Protected Lands .....                            | 56  |
| Figure 15: Land Cover of Crab Orchard NWR, Alternative C, Projected Conditions 2015 .....                                    | 58  |
| Figure 16: Land Cover of Crab Orchard NWR, Alternative C, Projected Conditions 2100 .....                                    | 59  |
| Figure 17: Land Cover of Crab Orchard NWR, Alternative D, Projected Conditions 2015 .....                                    | 66  |
| Figure 18: Land Cover of Crab Orchard NWR, Alternative D, Projected Conditions 2100 .....                                    | 67  |
| Figure 19: Streams and Watersheds of Crab Orchard NWR .....  | 81  |
| Figure 20: Land Cover of Crab Orchard NWR .....  | 83  |
| Figure 21: Land Cover of Crab Orchard NWR, 2000 .....  | 85  |
| Figure 22: Peak Counts of Wintering Canada Geese on Crab Orchard NWR, 1947 to 2001 .....                                     | 90  |
| Figure 23: Canada Goose-use Days on Crab Orchard NWR, 1952 to 1999 .....   | 90  |
| Figure 24: Bald Eagle Survey Counts on Crab Orchard NWR, 1993-2002 .....   | 95  |
| Figure 25: Bald Eagle Fledgling Counts on Crab Orchard NWR, 1993-2000 .....  | 96  |
| Figure 26: 1948 Area Designations, Crab Orchard NWR .....  | 97  |
| Figure 27: Bank Fishing Sites on Crab Orchard NWR .....  | 99  |
| Figure 28: Crab Orchard NWR Campground Visits Per Year .....   | 101 |
| Figure 29: Observation Areas on Crab Orchard NWR .....   | 102 |
| Figure 30: Boat Launches on Crab Orchard NWR .....   | 104 |

---

|  |     |
|--|-----|
| Figure 31: Picnic Areas on Crab Orchard NWR .....  | 106 |
| Figure 32: Annual Group Camp Attendance at Crab Orchard NWR, 1997-2001 .....   | 107 |
| Figure 33: Research Natural Areas on Crab Orchard NWR .....  | 110 |
| Figure 34: Conservation Easements Administered by Crab Orchard NWR .....   | 112 |
| Figure 35: Number of Agricultural Cooperators at Crab Orchard NWR, 1953, 1979, and 2001 .....  | 113 |
| Figure 36: Total Area of Agricultural Fields on Crab Orchard NWR, 1947-2001 .....  | 114 |
| Figure 37: Area of Row Crop Fields, Pastures and Hay Fields in 1953, 1979, and 2001 .....  | 114 |
| Figure 38: Crab Orchard NWR Current Staffing Chart .....   | 127 |
| Figure 39: Differences in Land Cover, Crab Orchard NWR (Alternative A (No Action) / Alternative B<br>and Alternative E (Preferred Alternative), 2015 ..... | 140 |
| Figure 40: Predicted Difference in Land Cover, Alternative A (No Action) / Alternative C<br>(Open Land Management), 2015 .....                             | 145 |
| Figure 41: Predicted Difference in Land Cover, Alternative A (No Action) / Alternative D<br>(Forest Land Management), 2015 .....                           | 149 |

# 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 recom-



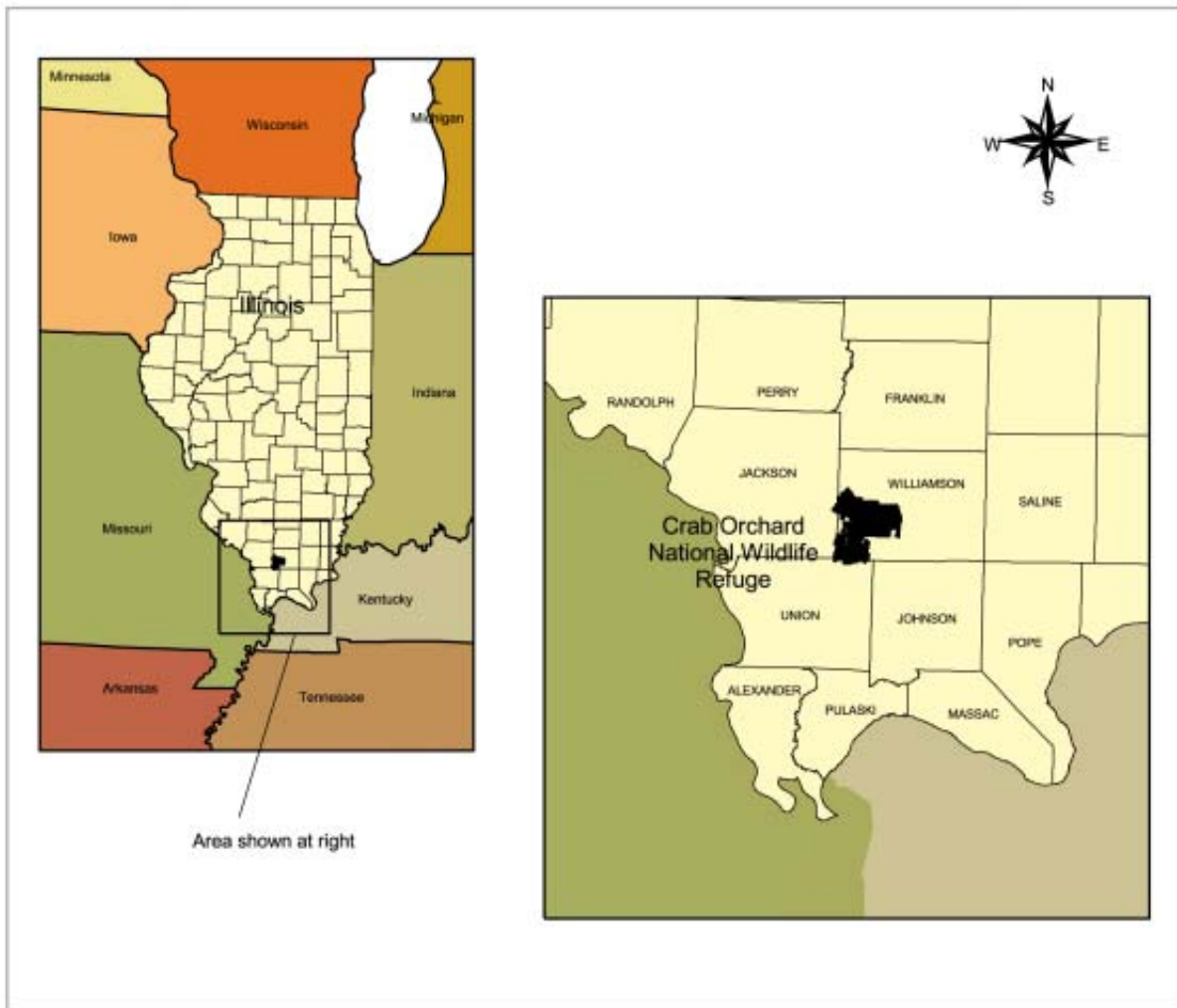
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mended management plan for the next 15 years. The highlights of our proposed plan are:

- # 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 Draft 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 2000. 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 Draft 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 Draft 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 Draft Environmental Impact Statement. We wrote the Draft Environmental Impact Statement and Comprehensive Conservation Plan during 2002-04.

In preparing our document, members of the planning team prepared an initial draft that was reviewed by regional office subject experts and administrators who suggested changes. The refined draft was given to staff in the Washington office of the Fish and Wildlife Service and the Illinois Department of Natural Resources for review. The

draft document is now available for review and comment by the public. The public will have the opportunity to comment in a public meeting and through written comments. We will consider the comments we receive as we prepare the Final Environmental Impact Statement and Comprehensive Conservation Plan for Crab Orchard National Wildlife Refuge.

## 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 provid-

ing 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,



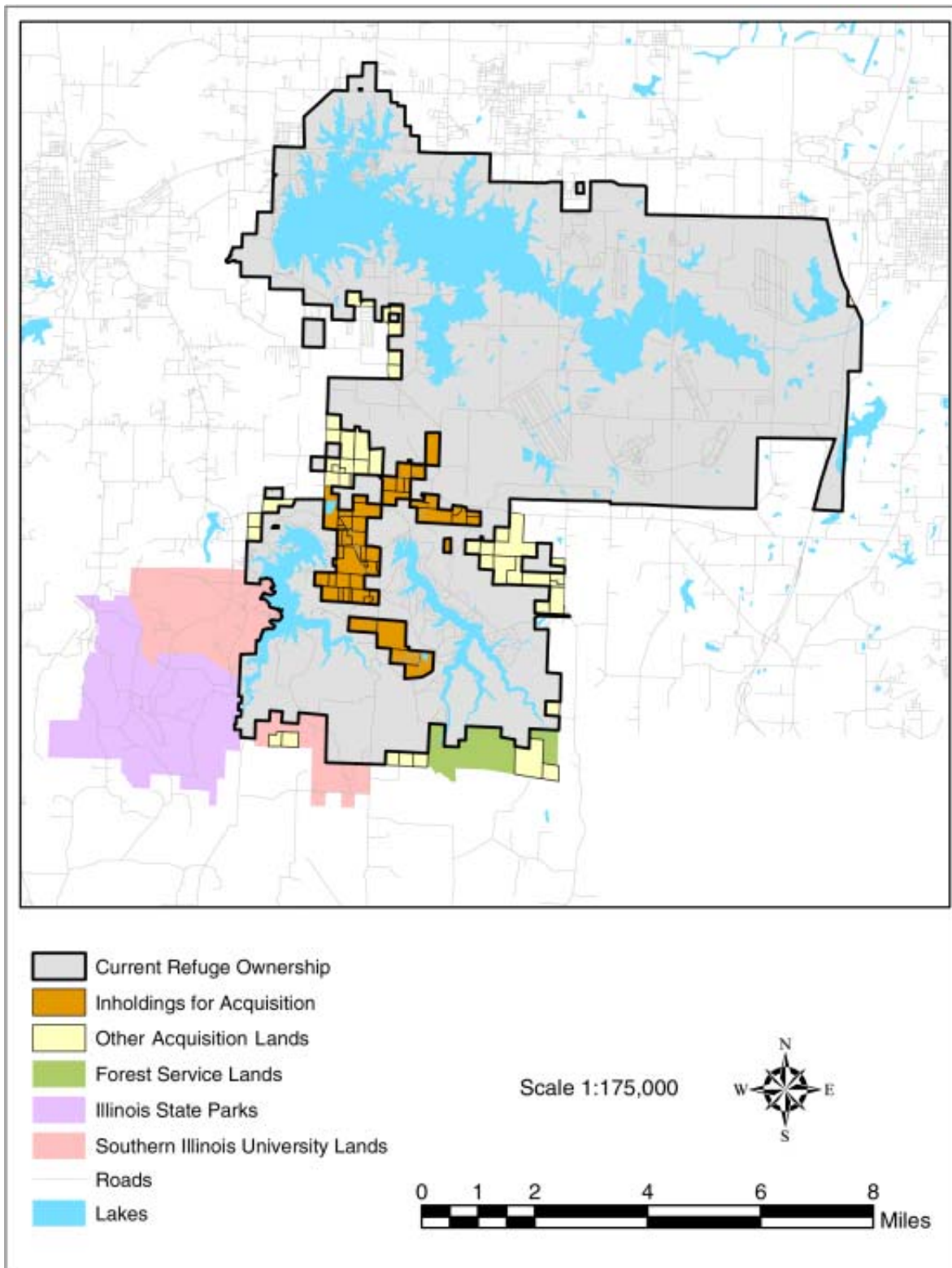
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cumulative analysis of possible land transactions. We propose in our plan to acquire interests, from willing sellers only, in approximately 4,242 acres of land either completely surrounded by or adjacent to the Refuge as part of a boundary modification. 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 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

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



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 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 expect to close the campground at Devils Kitchen Lake, because the current site is too steep and there are no better alternatives at the lake. In order to reduce conflicts among recreational boaters, we propose to 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 implement a new recreational fee system that will be more convenient for visitors. We propose to charge only one fee rather than multiple fees for cars and boats. We have not explicitly addressed rock climbing in past regulations, and some visitors who engage in this activity have been unsure of its legality. Because rock climbing is available in nearby Giant City State Park, we propose to prohibit it on the Refuge.

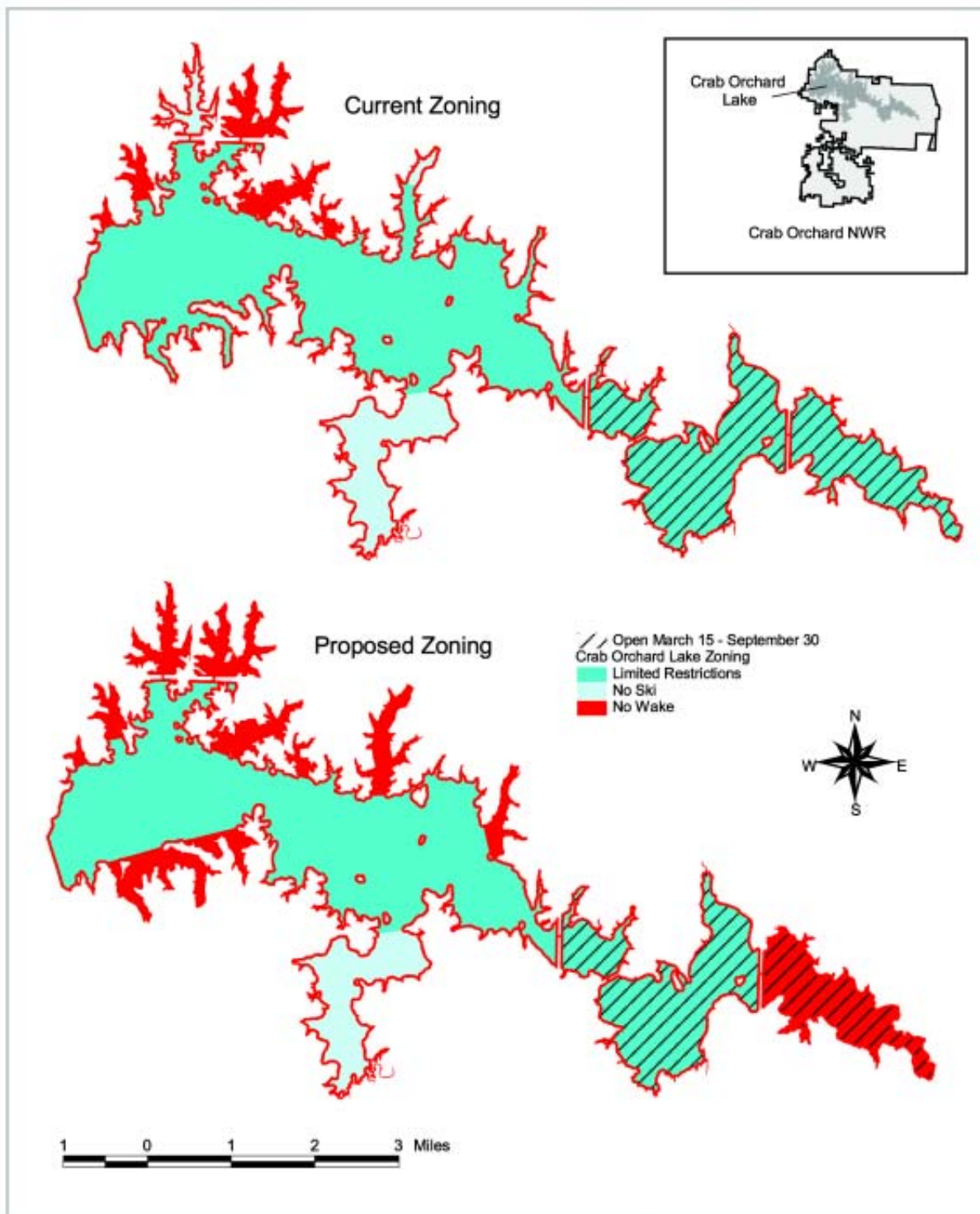
The Haven and the Crab Orchard Boat & Yacht Club are available only to a limited segment of the general population. The facilities and activities at these clubs amount to private use of public land. Our long-term goal is to make these areas available to a broader portion of the public. During the length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



Glenn Smart



**Figure 3: Recreational Use Zoning, Crab Orchard Lake**



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.

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 this view, we propose to prohibit gas motors on the lake south of the southernmost boat ramp. 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



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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 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



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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.



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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 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.

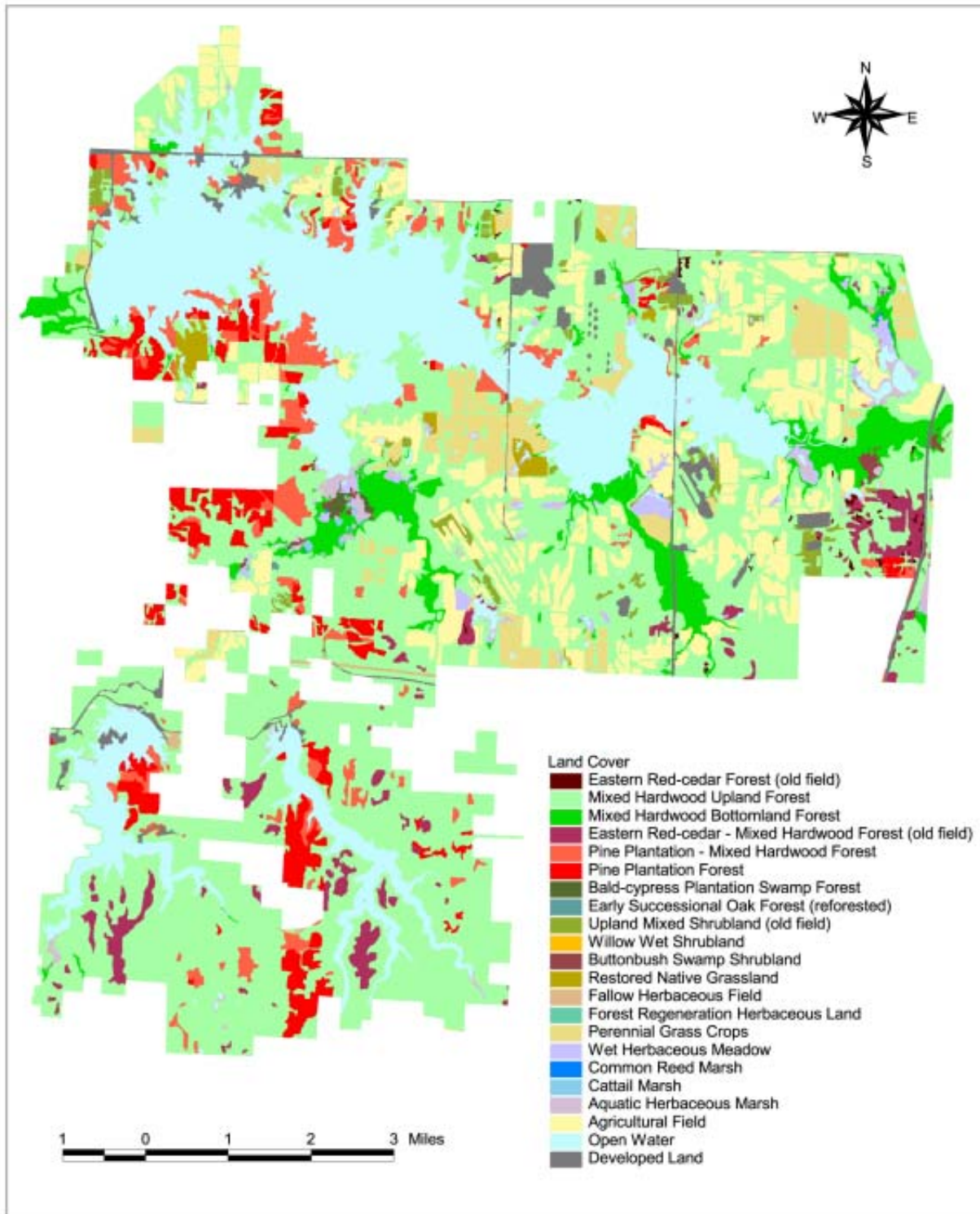
Tallgrass prairie has been established on several areas on the Refuge. Prescribed fire stimulates growth of the grasses, increases seed germination and growth of forbs, creates open ground for wildlife, retards encroachment of woody vegetation, and reduces the fuel load.

## Wildlife

Forty-three species of mammals have been recorded in or near the Refuge. Whitetailed deer;



**Figure 4: Current Land Cover Type, Crab Orchard NWR**



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, Canada 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 sur-

vey 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 56 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.

## 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.



*Glenn Smart*

## 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. 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 existing 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



*Glenn Smart*

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 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 devel-

oped 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 Draft 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.

## **Where you Can Find the Draft EIS/CCP**

You can see the complete Draft Environmental Impact Statement in a number of places. If you have access to the Internet, you can find a link to the document at the following address:

<http://www.fws.gov/midwest/planning/craborchard/index.html>.

Paper copies of the document are also available in a limited supply. Please call the Refuge at 618-997-3344 to request a copy. Copies are also available at local libraries:

- # Carbondale Public Library in Carbondale, Illinois
- # Carterville Public Library in Carterville, Illinois
- # Chester Public Library in Chester, Illinois

- # Du Quoin Public Library in Du Quoin, Illinois
- # Herrin City Library in Herrin, Illinois
- # Johnston City Public Library in Johnston City, Illinois
- # Jonesboro Public Library in Jonesboro, Illinois
- # Marion Carnegie Library in Marion, Illinois
- # Mitchell Carnegie Library in Harrisburg, Illinois
- # Sallie Logan Public Library in Murphysboro, Illinois
- # Stinson Memorial Library in Anna, Illinois
- # Vienna Public Library in Vienna, Illinois
- # West Frankfort Public Library in West Frankfort, Illinois

## **Tell Us What You Think**

Public participation is the cornerstone of comprehensive conservation planning. By letting us know what you think of the Draft Environmental Impact Statement, you can help the Refuge develop a plan that accomplishes the purposes of the Refuge as well as the purposes of the National Wildlife Refuge System.

We want to know if you feel we have addressed the key issues facing the Refuge. In reviewing the alternatives, do you agree with our selection of the preferred alternative? A public review period follows the release of the Draft Environmental Impact Statement. You are invited to submit comments electronically through our web site (<http://www.fws.gov/planning/craborchard/index.html>) or in writing.

In order for us to consider your comments as we prepare the Final Environmental Impact Statement and Comprehensive Conservation Plan, we need to hear from you by January 17, 2006.

Correspondence should be mailed to:  
U.S. Fish & Wildlife Service  
Crab Orchard National Wildlife Refuge  
Attention: Draft EIS Comment  
8588 Route 148  
Marion, IL 62959

**Key Elements of Alternatives Considered Described in Terms of Change from Current Conditions:**

| Issues Raised During Scoping:  | How Were the Issues Addressed?   |   |  |  |  |
|--|--|---|--|--|--|
|  | <u>Alternative A</u><br>Current Management (No Action)   | <u>Alternative B</u><br>Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis   | <u>Alternative C</u><br>Open Land Management: Consolidate and Improve Recreation   | <u>Alternative D</u><br>Forest Land Management: Consolidate and Improve Recreation | <u>Alternative E</u><br>Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative) |
| <p><i>Recreation</i><br/> <i>Loss of non-wildlife dependent recreation opportunities.</i><br/> <i>Poor condition of existing facilities.</i><br/> <i>Desire for more nature walks and environmental education.</i></p> | <p>Non-wildlife dependent recreation opportunities would gradually decrease and quality would gradually improve. Wildlife-dependent recreation opportunities on the Refuge would remain the same. Campers would have increased opportunity because of 14-day stay limit.</p> | <p>A portion of Refuge with concentration of recreation facilities would be exchanged for undeveloped land of Southern Illinois University. Increased opportunities for higher quality, non-wildlife dependent recreation in the area. Number and quality of wildlife-dependent recreation opportunities on the Refuge would increase. Campers would have increased opportunity because of 14 day stay limit.</p> | <p>Non-wildlife dependent recreation opportunities would decrease and quality would improve as facilities are consolidated. Wildlife-dependent recreation opportunities on the Refuge would gradually improve. Campers would have increased opportunity because of 14-day stay limit. The Boat &amp; Yacht Club would be operated under a concession contract after 2 years.</p> | <p>Same as Alternative C.</p>  | <p>Same as Alternative C.</p>  |

**Key Elements of Alternatives Considered Described in Terms of Change from Current Conditions:**

| <b>Issues Raised During Scoping:</b>   | <b>How Were the Issues Addressed?</b>  |   |  |  |  |
|--|--|---|--|--|--|
|  | <u>Alternative A</u><br>Current Management (No Action)                                     | <u>Alternative B</u><br>Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis   | <u>Alternative C</u><br>Open Land Management: Consolidate and Improve Recreation       | <u>Alternative D</u><br>Forest Land Management: Consolidate and Improve Recreation   | <u>Alternative E</u><br>Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative) |
| <i>Wildlife Conservation</i><br><i>Protect game, non-game, threatened, and endangered species, preserve and restore habitat. Maintain adequate habitat for wintering Canada geese.</i> | T&E species, geese, and resident fish and game managed the same in all alternatives.       | Management activities would protect the Bald Eagles and Indiana bat. Provide food for 6.4 million goose-use-days annually. Manage mixed-species, warm-water sport fish population. Manage resident wildlife species at levels that allow hunting opportunities. | T&E species, geese, and resident fish and game managed the same in all alternatives.   | T&E species, geese, and resident fish and game managed the same in all alternatives. | T&E species, geese, and resident fish and game managed the same in all alternatives.                             |
|  | Reforest 240 acres. Prescribed burning and thinning on about 3,300 acres pine plantations. | Reforest 490 acres. Prescribed burning and thinning on about 3,300 acres pine plantations.  | Reforest 52 acres. Prescribed burning and thinning on about 650 acres pine plantations | Reforest same as Alternative B   | Reforest same as Alternative B.  |
|  | All early successional habitat matures.  | Maintain about 300 acres of early successional habitat.   | Successional habitat same as Alternative B.  | Successional habitat same as Alternative B.  | Successional habitat same as Alternative B.  |

### Key Elements of Alternatives Considered Described in Terms of Change from Current Conditions:

| Issues Raised During Scoping:  | How Were the Issues Addressed?  |  |  |  |  |
|--|---|--|--|--|--|
|  | <u>Alternative A</u><br>Current Management (No Action)  | <u>Alternative B</u><br>Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis  | <u>Alternative C</u><br>Open Land Management: Consolidate and Improve Recreation                     | <u>Alternative D</u><br>Forest Land Management: Consolidate and Improve Recreation   | <u>Alternative E</u><br>Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative) |
|  | 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. | Manage grasslands same as Alternative 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. | Manage grasslands same as Alternative B.   |
|  | Manage 450 acres of moist soil units.   | Manage 500 acres of moist soil units by constructing 50 to 70 acres of new units.  | Manage moist soil units same as Alternative B.   | Manage moist soil units same as Alternative B.   | Manage moist soil units same as Alternative B.   |
| <i>Refuge Purposes Management has not properly emphasized or supported the four original purposes; concern that the refuge purposes may now be considered incompatible with mission of the Refuge System</i> | Non-wildlife dependent recreation facilities gradually improved.  | Portion of Refuge with major non-wildlife dependent recreational facilities exchanged to Southern Illinois University who intend to develop the facilities and better meet the demand. Refuge would devote more of its resources to wildlife-dependent recreation.               | Non-wildlife dependent recreation facilities consolidated and improved faster than in Alternative A. | For non-wildlife dependent recreation, same as Alternative C.  | For non-wildlife dependent recreation, same as Alternative C.  |

**Key Elements of Alternatives Considered Described in Terms of Change from Current Conditions:**

| Issues Raised During Scoping:   | How Were the Issues Addressed?   |   |  |  |  |
|---|--|---|--|--|--|
|   | <u>Alternative A</u><br>Current Management (No Action)   | <u>Alternative B</u><br>Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis   | <u>Alternative C</u><br>Open Land Management: Consolidate and Improve Recreation   | <u>Alternative D</u><br>Forest Land Management: Consolidate and Improve Recreation     | <u>Alternative E</u><br>Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative) |
|   | For industry, accommodate tenants as long as facilities meet health and safety standards. Special recognition to munitions manufacturing | For industry, accommodate tenants as long as facilities meet health and safety standards. Special recognition to munitions manufacturing.             | For industry, non-munitions tenants would not be replaced as they leave the Refuge. Emphasis on munitions manufacturing. | For industry, same as Alternative C.   | For industry, same as Alternative B.   |
|   | For agriculture, slight loss in acreage from buffer strips.  | For agriculture, maintain the approximate level that exists on the Refuge. Reduce row crop acreage about 2 percent; hayfield acreage about 14 percent | For agriculture, increase row crop acreage about 7 percent; no change in hayfield acreage.                               | For agriculture, reduce row crop acreage 4 percent; hayfield acreage about 29 percent. | For agriculture, same as Alternative B.  |
| <u>Recreational Boating</u><br><i>Support for continuation and encouragement of boating, recognition of conflicts among boaters and between boaters and other recreationists, opposition to personal watercraft and the need for more restrictive regulations</i> | Minimal changes  | Minor restrictions in use (zoning) to motor boats.  | Restrictions in use (zoning) to motor boats.   | Minimal changes.   | Same as Alternative C.   |



**Key Elements of Alternatives Considered Described in Terms of Change from Current Conditions:**

| Issues Raised During Scoping:   | How Were the Issues Addressed?   |   |  |  |  |
|---|--|---|--|--|--|
|   | <u>Alternative A</u><br>Current Management (No Action)                               | <u>Alternative B</u><br>Reduced Habitat Fragmentation: Wildlife-dependent Recreation Emphasis | <u>Alternative C</u><br>Open Land Management: Consolidate and Improve Recreation | <u>Alternative D</u><br>Forest Land Management: Consolidate and Improve Recreation | <u>Alternative E</u><br>Reduce Habitat Fragmentation: Consolidate and Improve Recreation (Preferred Alternative) |
| <u>Role in Regional Economy</u><br><i>Refuge benefits local economy through tourism, agriculture, and industry and concern that reduction in Refuge programs will have negative impact on economy</i> | Annual Change in Economic Effect compared to Alt. A:                                 |   |  |  |  |
|   | Recreational Use Economic Effect: Econ output \$24.7 M Employment 495 jobs           | Recreational Use Employment +29 jobs Economic output+\$1.44 M                                 | Recreational Use Employment +3 jobs Econ output+\$0.16 M                         | Recreational Use Employment +3 jobs Econ output+\$0.16 M                           | Recreational Use Employment +3 jobs Econ output+\$0.16 M   |
|   | Annual value of Ag. Products: \$1.12 M   | Annual change in value of Ag. products: -\$.047 M   | Annual change in value of Ag. products: +\$.048 M                                | Annual change in value of Ag. products: -\$.083 M                                  | Annual change in value of Ag. products: -\$.047 M  |
| <i>Communication between Refuge and Community Refuge is not informing the local community about current issues, need for better communication</i>   | Develop a positive attitude toward the Refuge through increased outreach activities. | Same as Alt. A  | Same as Alt. A   | Same as Alt. A   | Same as Alt. A   |

**Summary of the Potential Environmental Impacts Associated with Each Alternative**

|                                 | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b>                        | <b>Alternative B<br/>Reduced Habitat<br/>Fragmentation:<br/>Wildlife-dependent<br/>Recreation<br/>Emphasis</b> | <b>Alternative C<br/>Open Land<br/>Management:<br/>Consolidate and<br/>Improve Recreation</b>                        | <b>Alternative D<br/>Forest Land<br/>Management:<br/>Consolidate and<br/>Improve Recreation</b>                             | <b>Alternative E<br/>Reduce Habitat<br/>Fragmentation:<br/>Consolidate and<br/>Improve Recreation<br/>(Preferred<br/>Alternative)</b> |
|---------------------------------|--|--|--|---|---|
| Threatened & Endangered Species |  |  |  |   |   |
| <i>Bald Eagle:</i>              | 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   |
| <i>Indiana bat:</i>             | 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)

|  | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b> | <b>Alternative B<br/>Reduced Habitat<br/>Fragmentation:<br/>Wildlife-dependent<br/>Recreation<br/>Emphasis</b> | <b>Alternative C<br/>Open Land<br/>Management:<br/>Consolidate and<br/>Improve Recreation</b> | <b>Alternative D<br/>Forest Land<br/>Management:<br/>Consolidate and<br/>Improve Recreation</b> | <b>Alternative E<br/>Reduce Habitat<br/>Fragmentation:<br/>Consolidate and<br/>Improve Recreation<br/>(Preferred<br/>Alternative)</b> |
|--|---|--|---|---|---|
| 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)  |
| 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  |

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

|                       | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b>    | <b>Alternative B<br/>Reduced Habitat<br/>Fragmentation:<br/>Wildlife-dependent<br/>Recreation<br/>Emphasis</b> | <b>Alternative C<br/>Open Land<br/>Management:<br/>Consolidate and<br/>Improve Recreation</b>  | <b>Alternative D<br/>Forest Land<br/>Management:<br/>Consolidate and<br/>Improve Recreation</b>                                      | <b>Alternative E<br/>Reduce Habitat<br/>Fragmentation:<br/>Consolidate and<br/>Improve Recreation<br/>(Preferred<br/>Alternative)</b> |
|-----------------------|--|--|--|--|---|
| 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.

## 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 and Land Protection Plan.

## 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,

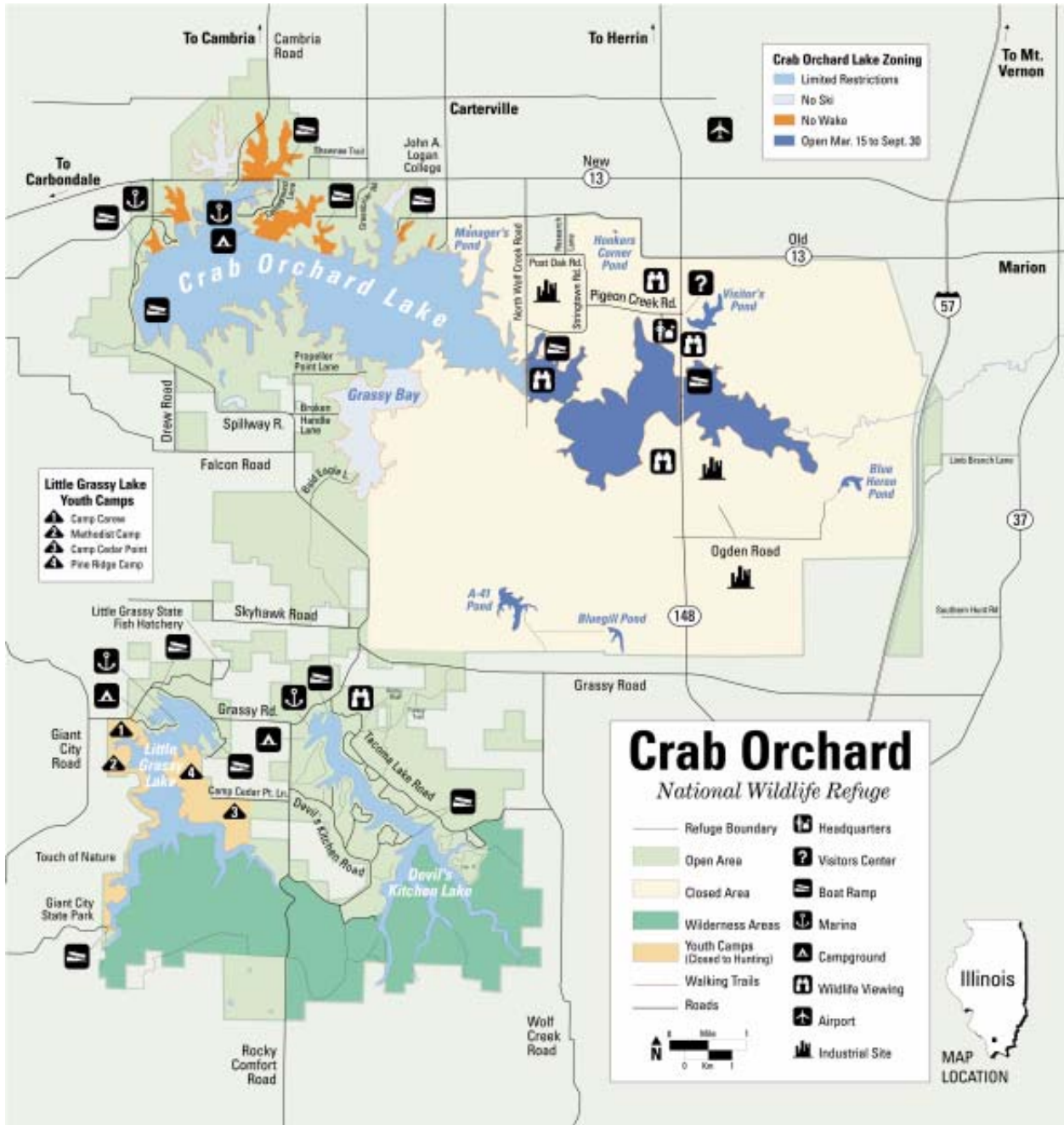


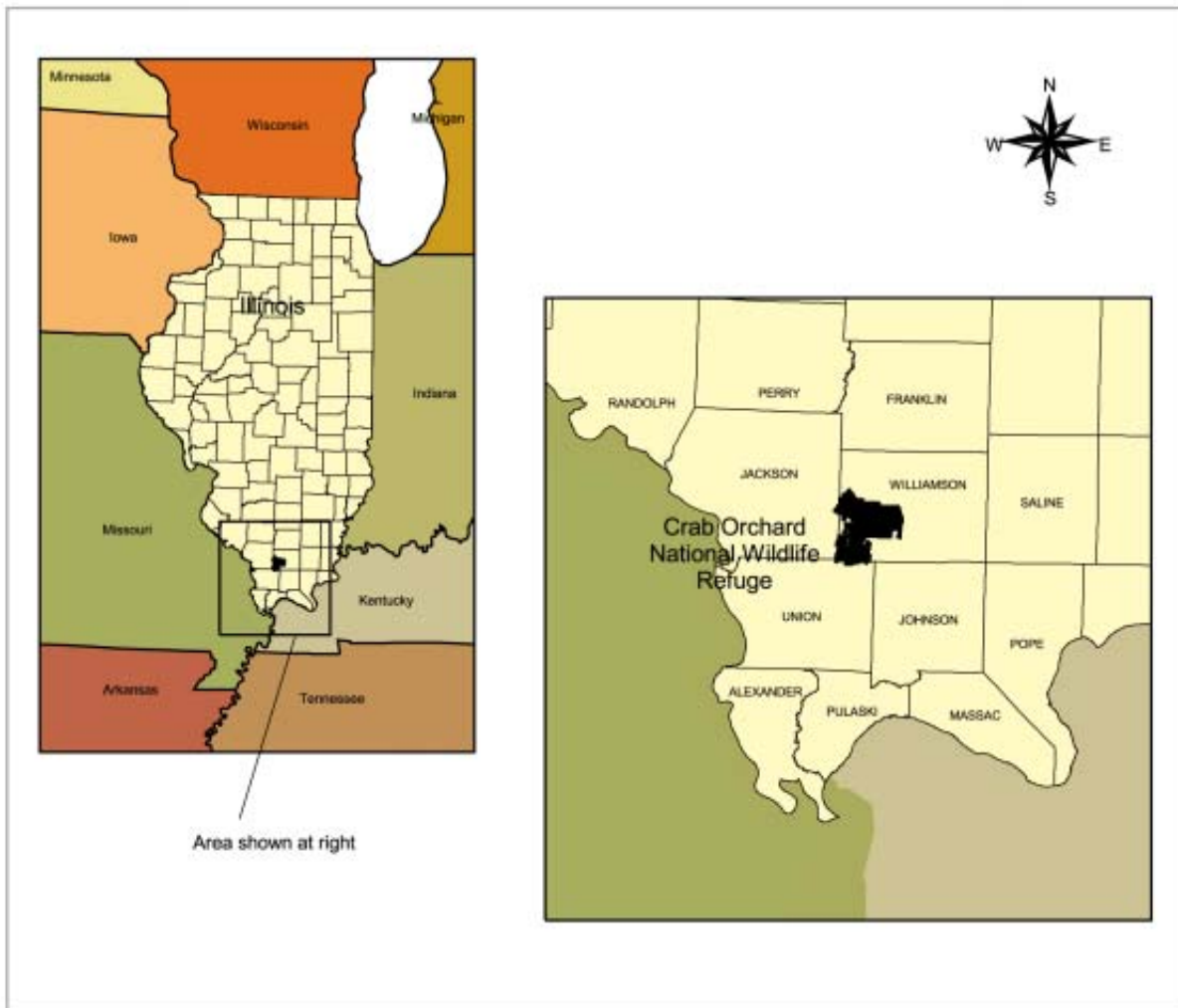
and addresses relevant mandates and major issues developed during scoping. An additional purpose is to fully document the Refuge's recent Fire Management Plan in compliance with the National Environmental Policy Act (NEPA). Through this Environmental Impact Statement (EIS), we are presenting the Fire 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 recognize the recreational demands of the public,

**Figure 1: Crab Orchard National Wildlife Refuge**



**Figure 2: Location of Crab Orchard NWR**

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:

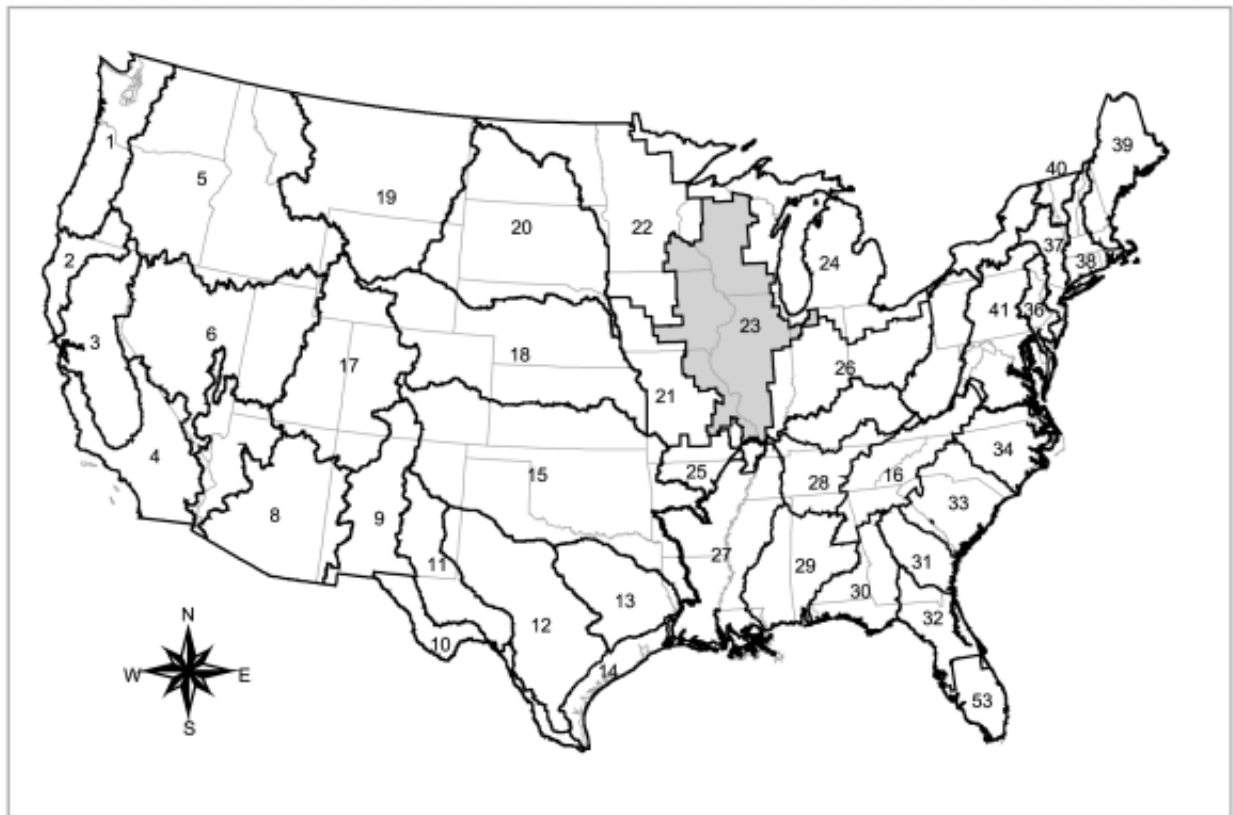
- # To fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.
- # To conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.

- # 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 species 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.

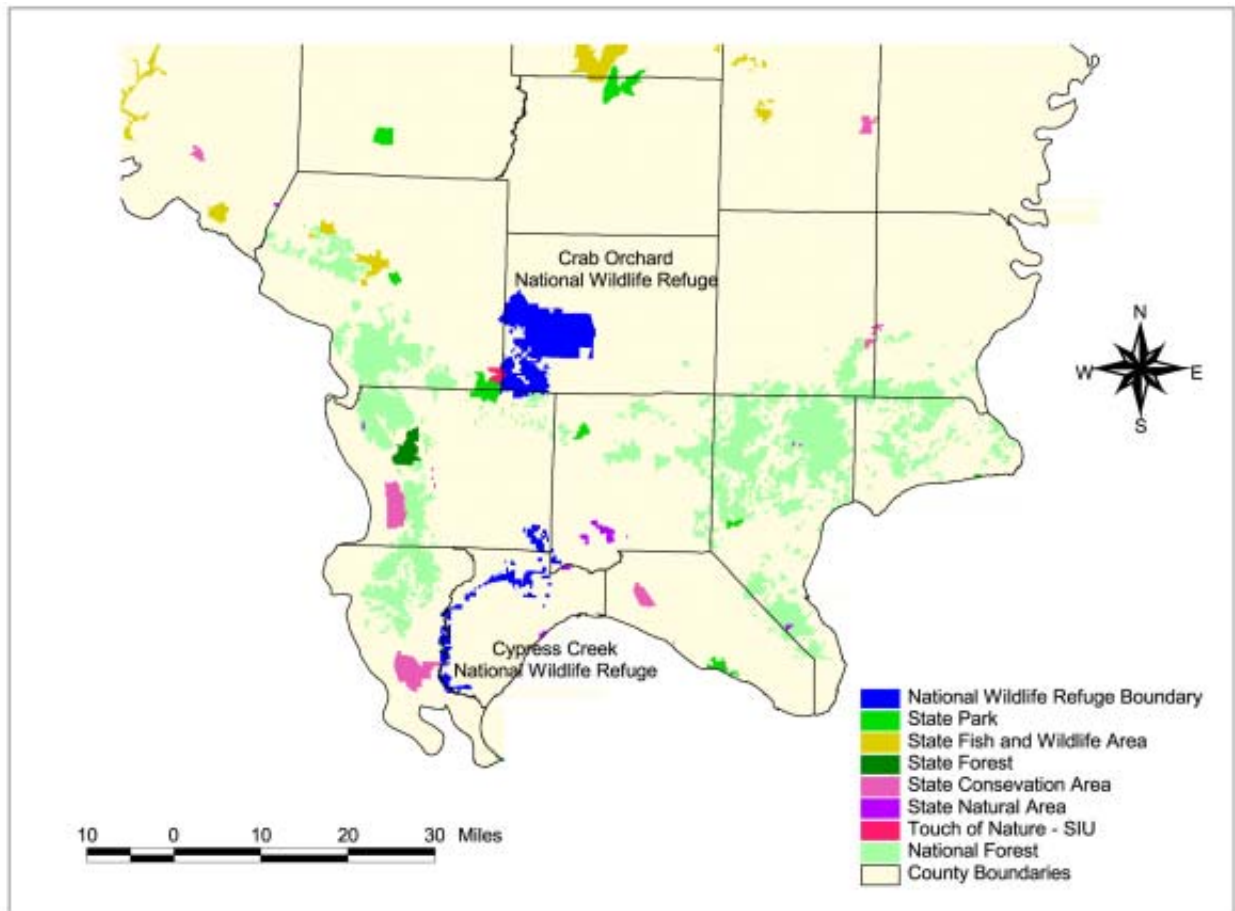
## **1.10 Brief History of Refuge Establishment, Acquisition, and Management**

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 Meth-



odist 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 Archeological 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.

### 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



*Bob Etzel*

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.

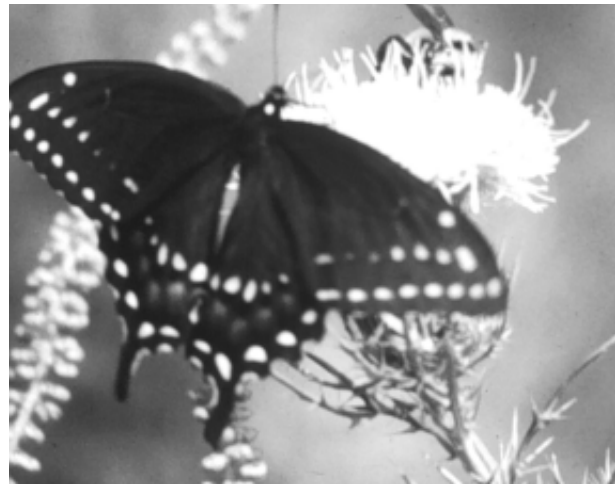
# Chapter 2: Alternatives, Objectives, and Strategies

## 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 72).

## 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.

## 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.



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 hay-field 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 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. The Refuge would study the possibility of adding primitive campsites to Devils Kitchen Lake, where gas motors would be prohibited on the most southern portion of Devils Kitchen 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.

### 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 are conducting a “Section 7” review concurrent with the review of the draft 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.

**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.

**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 according to policy in Part 610 Chapter 7 of the Fish and Wildlife Service Manual.

#### **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 according to policy in Part 610 Chapter 6 of the Fish and Wildlife Service Manual.

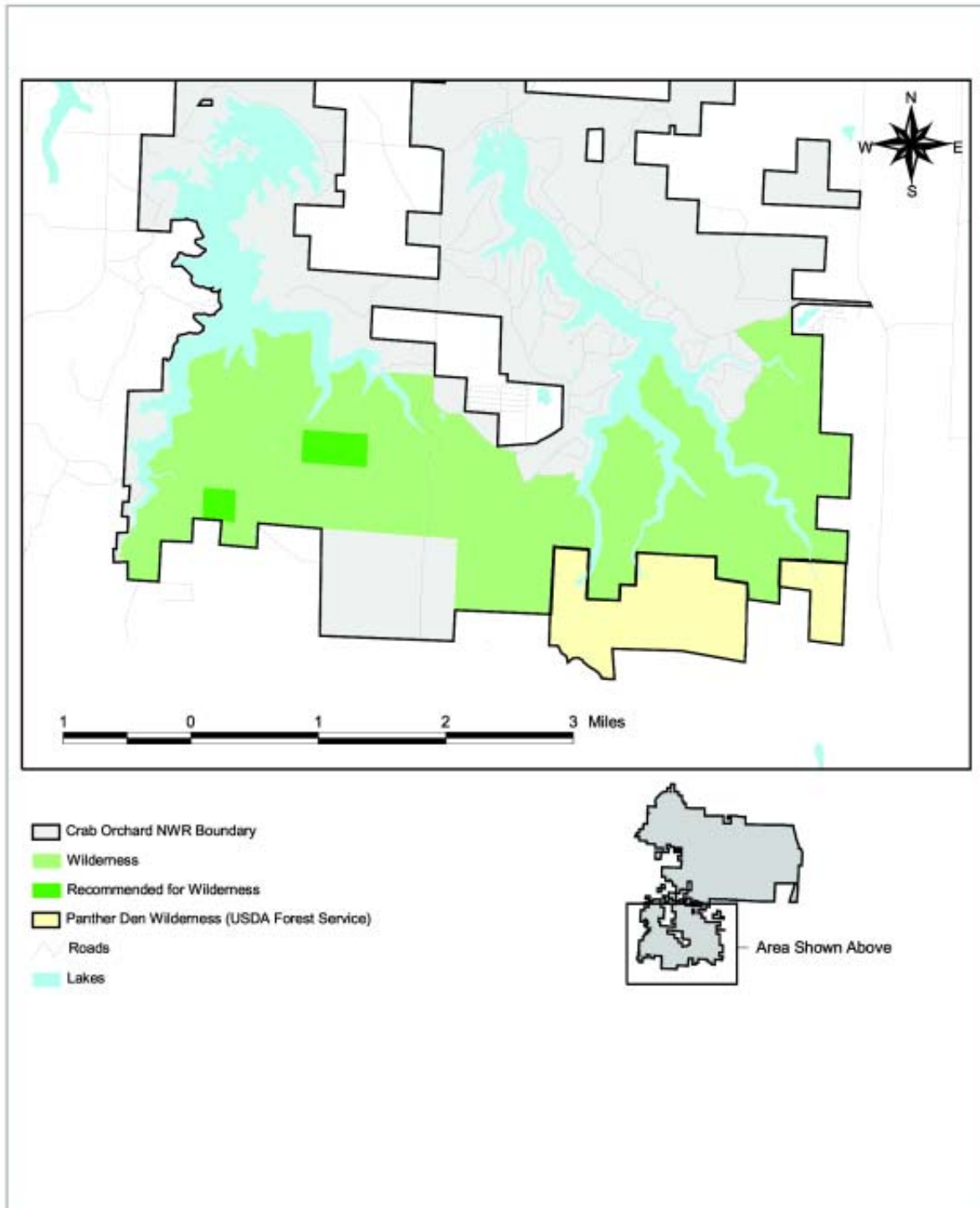
#### **Objective 3**

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 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.

**Figure 5: Results of Crab Orchard NWR Wilderness Inventory**



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. Strategy: 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. Map the existing network of trails in the Wilderness; assess the condition of trails; determine whether trails meet design standards; evaluate the proposed River to River Trail route; cooperate with partners to plan, construct and maintain a sustainable trail system.

#### **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 pub-

lished 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. As Refuge campsites are upgraded, we would institute a regulation that limits the length of stay to 14 consecutive nights. 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.

#### **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.



**Table 1: Proposed Recreational Entrance Fees and Federal Passes That Will Permit Entry, Crab Orchard NWR**

| 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 Annual <sup>1</sup>             | \$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 <sup>2</sup>                  | \$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                         |
| Weekly boat launch fee                 | \$5/boat     | Anyone                              | Crab Orchard NWR             | 7 consecutive days            |
| Refuge annual boat launch <sup>3</sup> | \$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.

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. Rather than charge multiple fees, our intent will be to charge only one entrance fee.

*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 eliminated 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 club events called "fish-offs." A fish-off is defined as an organized club fishing event having 20 boats or fewer.

*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. 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.

#### **2.6.1.2. Fire**

The following section contains detail about the prescribed fire and wildlife suppression procedures used on the Refuge. We have included detail here to fully document the Refuge's recent 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. Fire also encourages the growth of desirable species such as native, warm-season grasses.

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

How often we burn established grassland and forest units depends on management objectives, historic fire frequency, and funding. The interval

between burns may be 2 to 5 years or longer. As part of the prescribed fire program, we will conduct a literature search to determine the effects of fire on various plant and animal species, and we will begin a monitoring program to verify that objectives are being achieved.

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

Spot fires and escapes may occur on any prescribed fire. The spot fires and escapes may result from factors that cannot be anticipated during planning. A few small spot fires and escapes on a prescribed burn can usually be controlled by the burn crew. If so, they do not constitute a wildland fire. The burn boss is responsible for evaluating the frequency and severity of spot fires and escapes and, if necessary, slowing down or stopping the burn operation, getting additional help from the Refuge staff, or extinguishing the prescribed burn. If the existing crew cannot control an escaped fire and it is necessary to get help from 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 may conduct prescribed burns at any time of year. However, the normal prescribed fire season begins November 15 and ends March 31.

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

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

#### **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 in Murphysboro, Illinois (618-687-1731), 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 “Land Cover of Crab Orchard NWR, Alternative A, Current Management (No Action) Projected Conditions 2015” on page 40). 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 34.

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 131. 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 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*

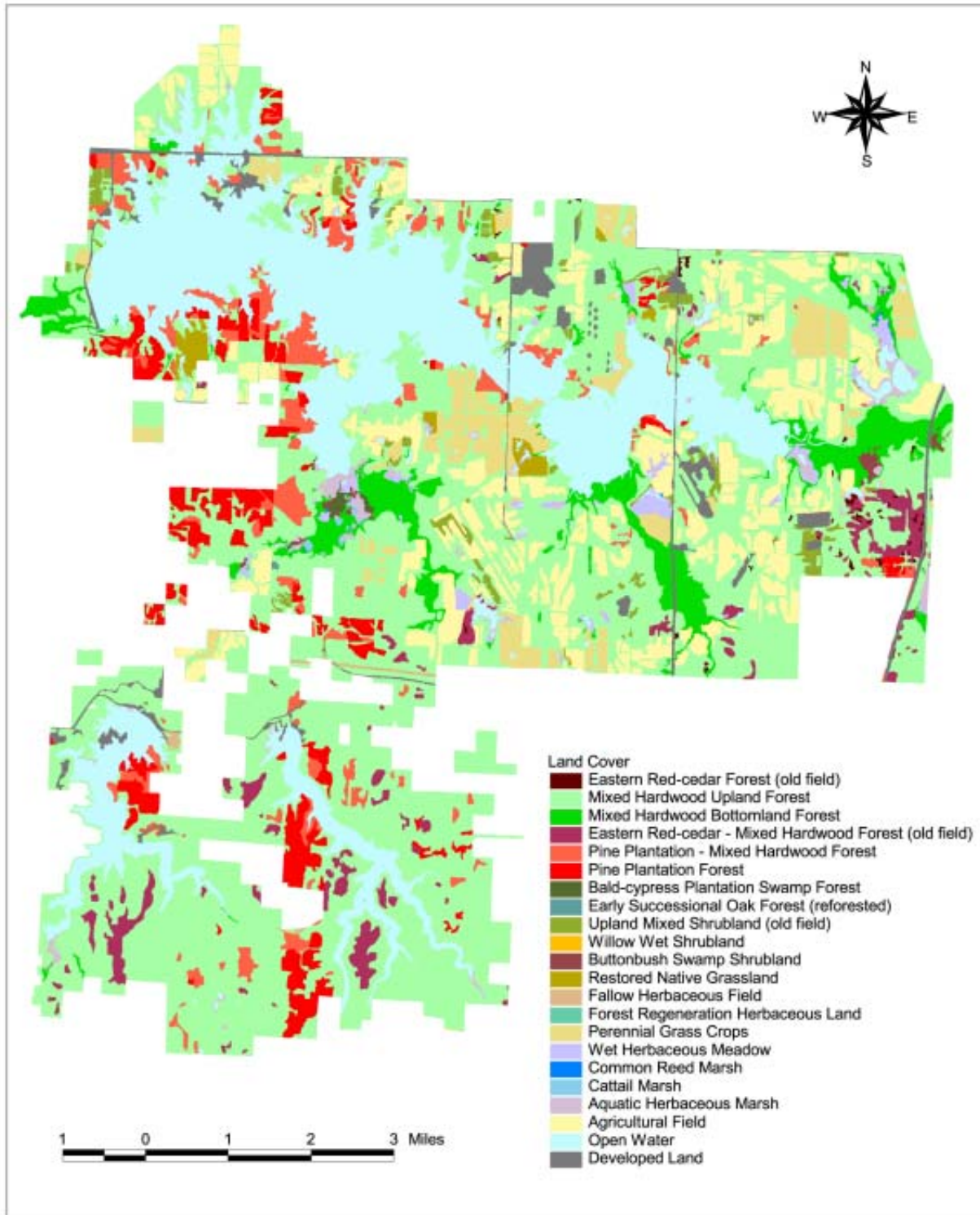
1. Prescribed burn all native warm-season grasslands on a 2- to 3-year cycle to favor grassland vegetation and control undesirable plants. Apply mechanical or herbicide treatments to control vegetation, when needed.

**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.

Alternative A: Current Management (No Action)

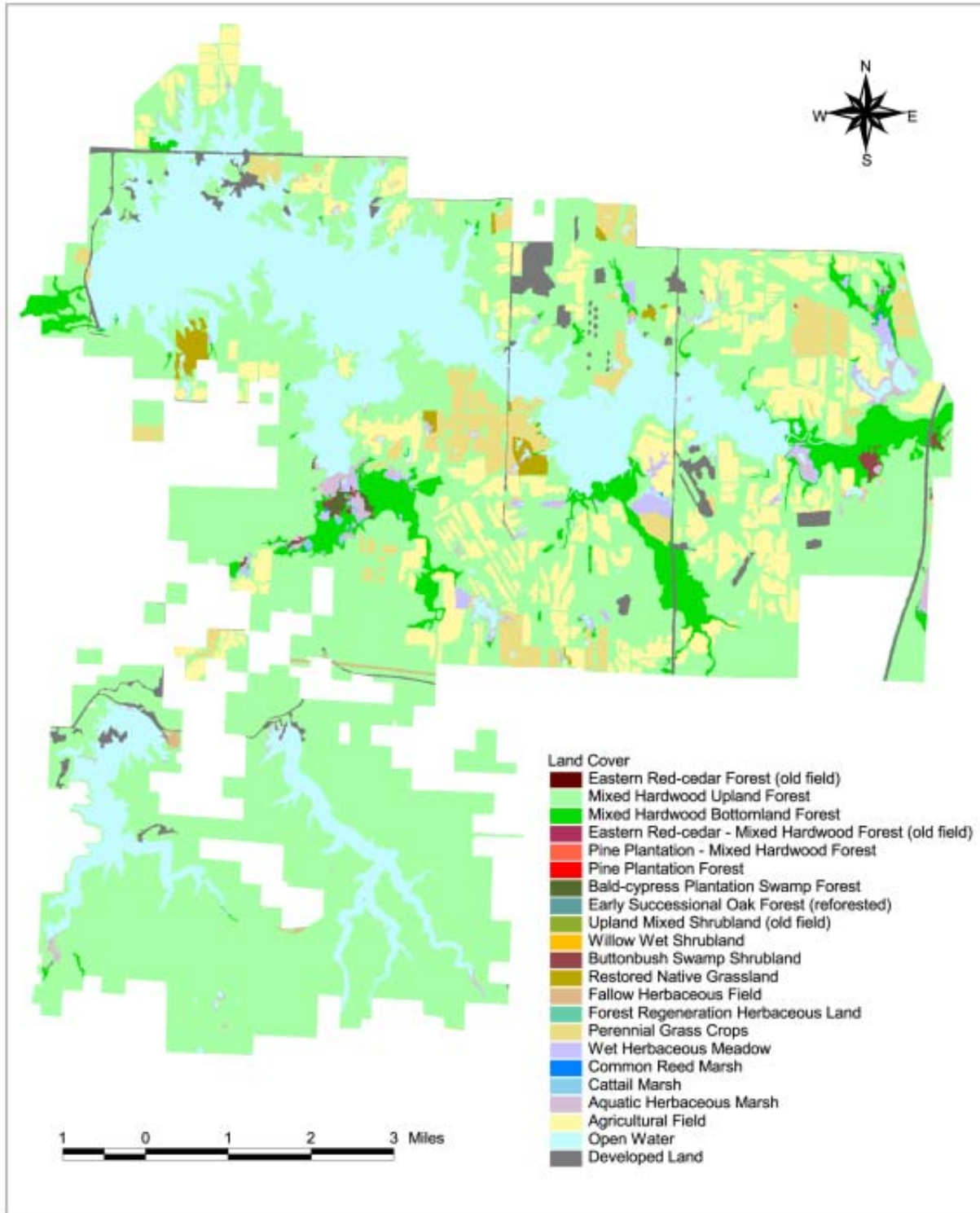
**Figure 6: Land Cover of Crab Orchard NWR, Alternative A, Current Management (No Action) Projected Conditions 2015**





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

Alternative A: Current Management (No Action)



*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 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 and Figure 14 on page 56).
- # 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 289.)
- # 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 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).

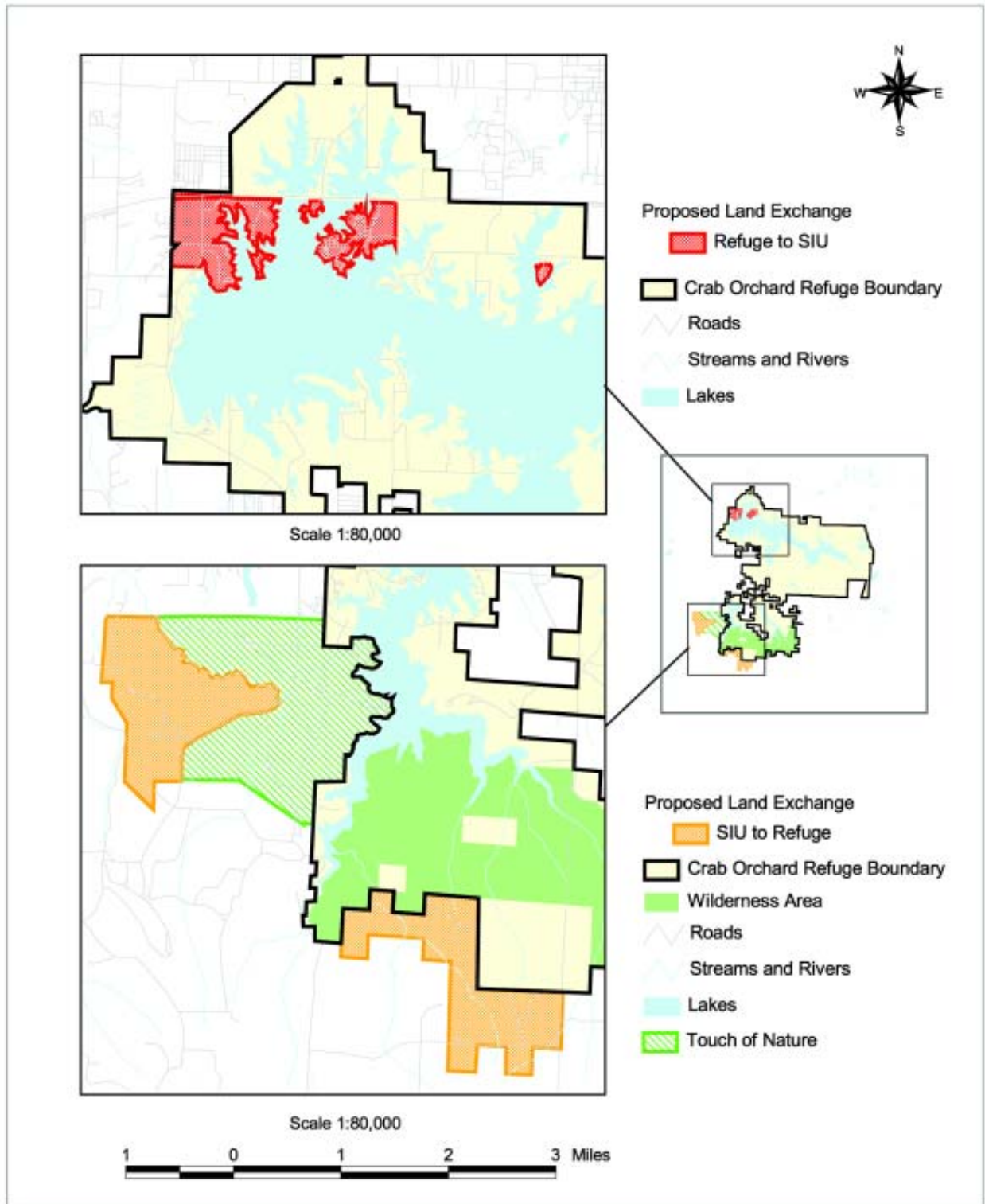
#### Objective 1

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). 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.

**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             |

**Table 3: Millions of Potential<sup>1</sup> Goose-use-days<sup>2</sup> 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 <sup>3</sup>   |                         |             |                   |             |             |
| Misc. Mowed Areas <sup>4</sup> |                         |             |                   |             |             |
| 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.
4. Production not calculated or included in total GUDs.

#### 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

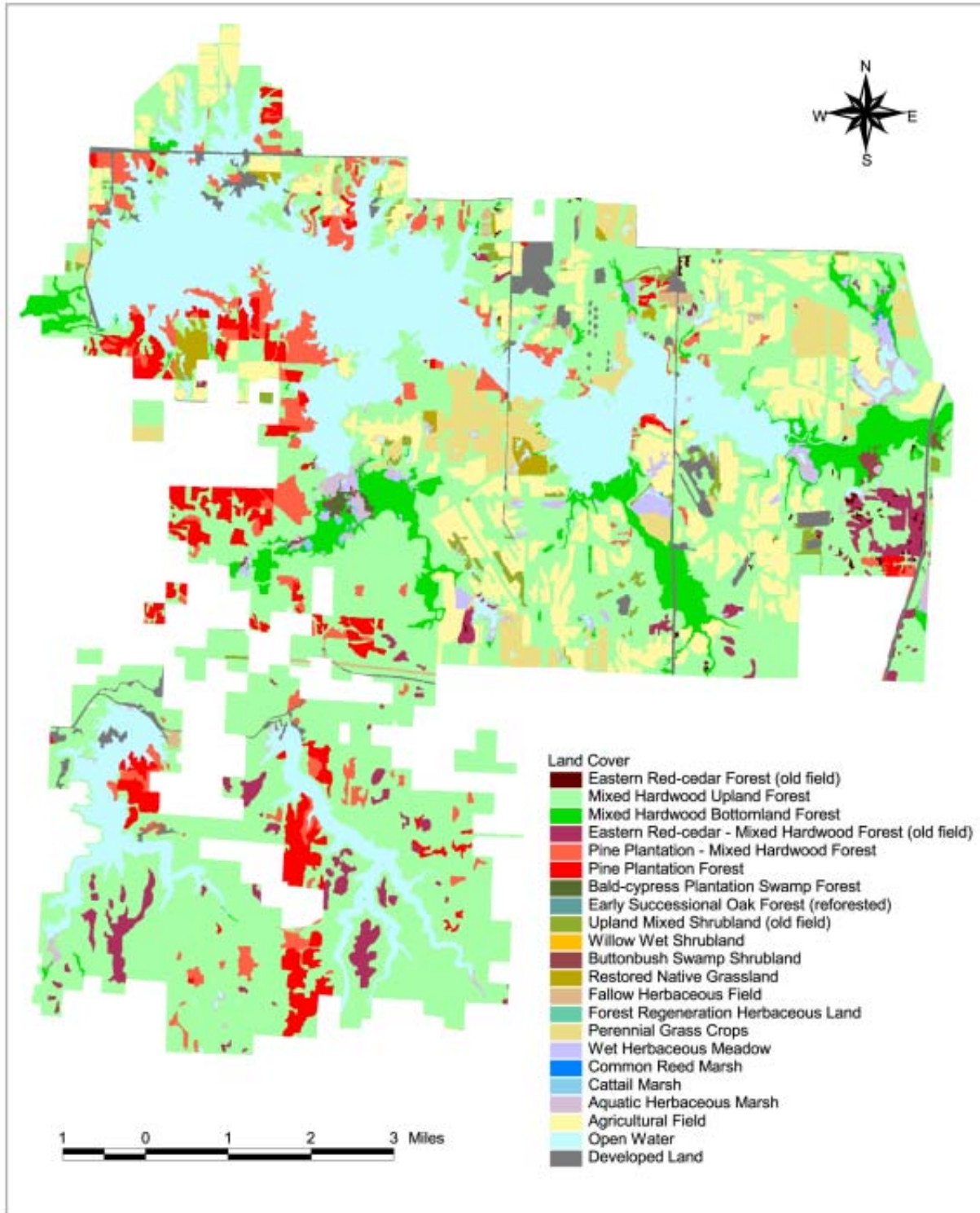
Manage two portions of the Refuge as large forest blocks to benefit area-sensitive forest birds. The first area (about 13,000 acres) extends from the southern end of Grassy Bay east to Caney

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.

##### Strategy

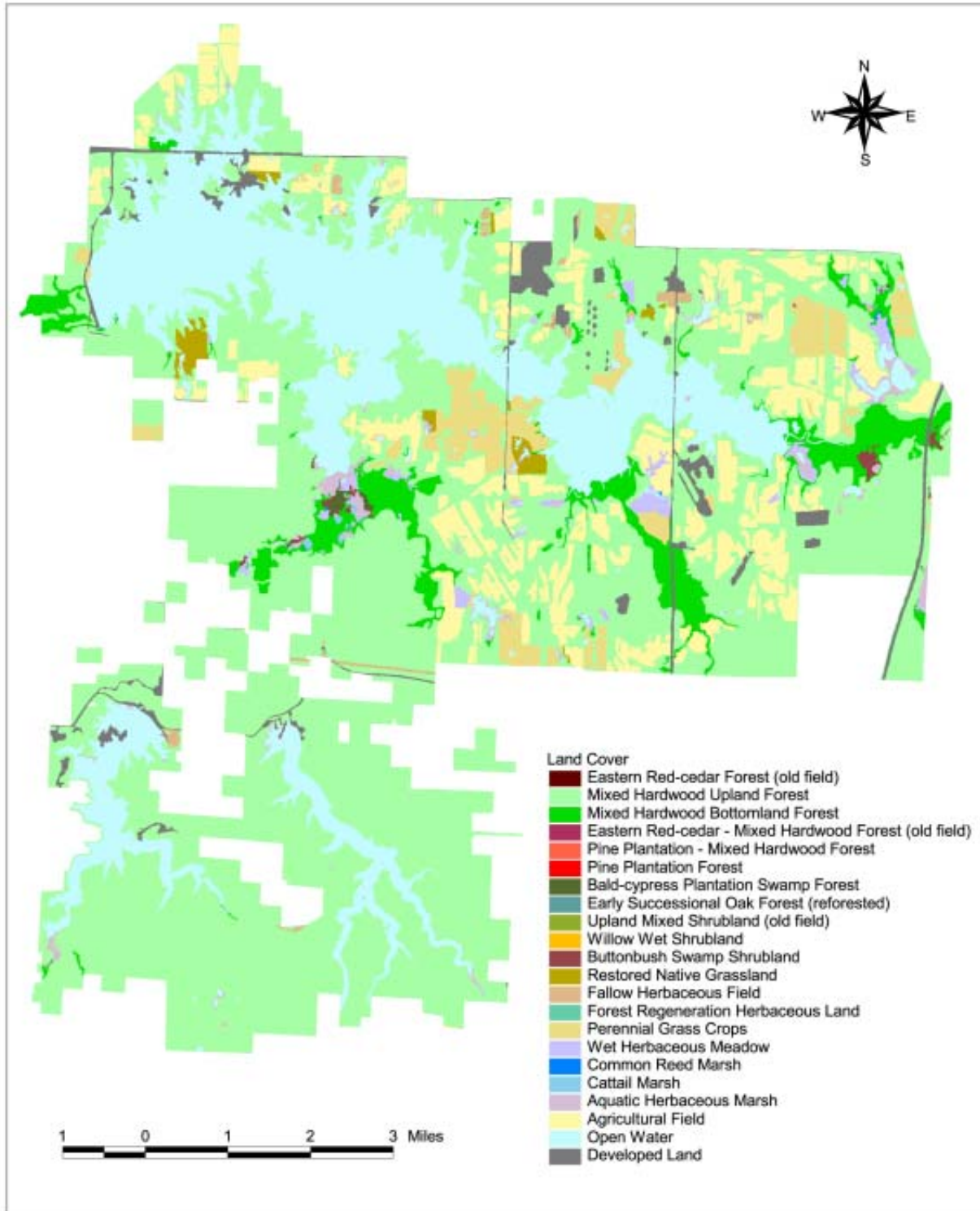
1. Reforest about 290 acres of crop fields, 130 acres of fallow fields, and 90 acres of perennial grasslands. This may include site prep-

**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**



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

eration, 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 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.

**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 2**

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.

**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.
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 facili-

tate 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 includes 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 (see Figure 11). Implement the zoning of motorized boating at Devils Kitchen Lake (see Figure 12). 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 13) and erosion due to trail use would be actively controlled through maintenance and/or seasonal closures. .
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.

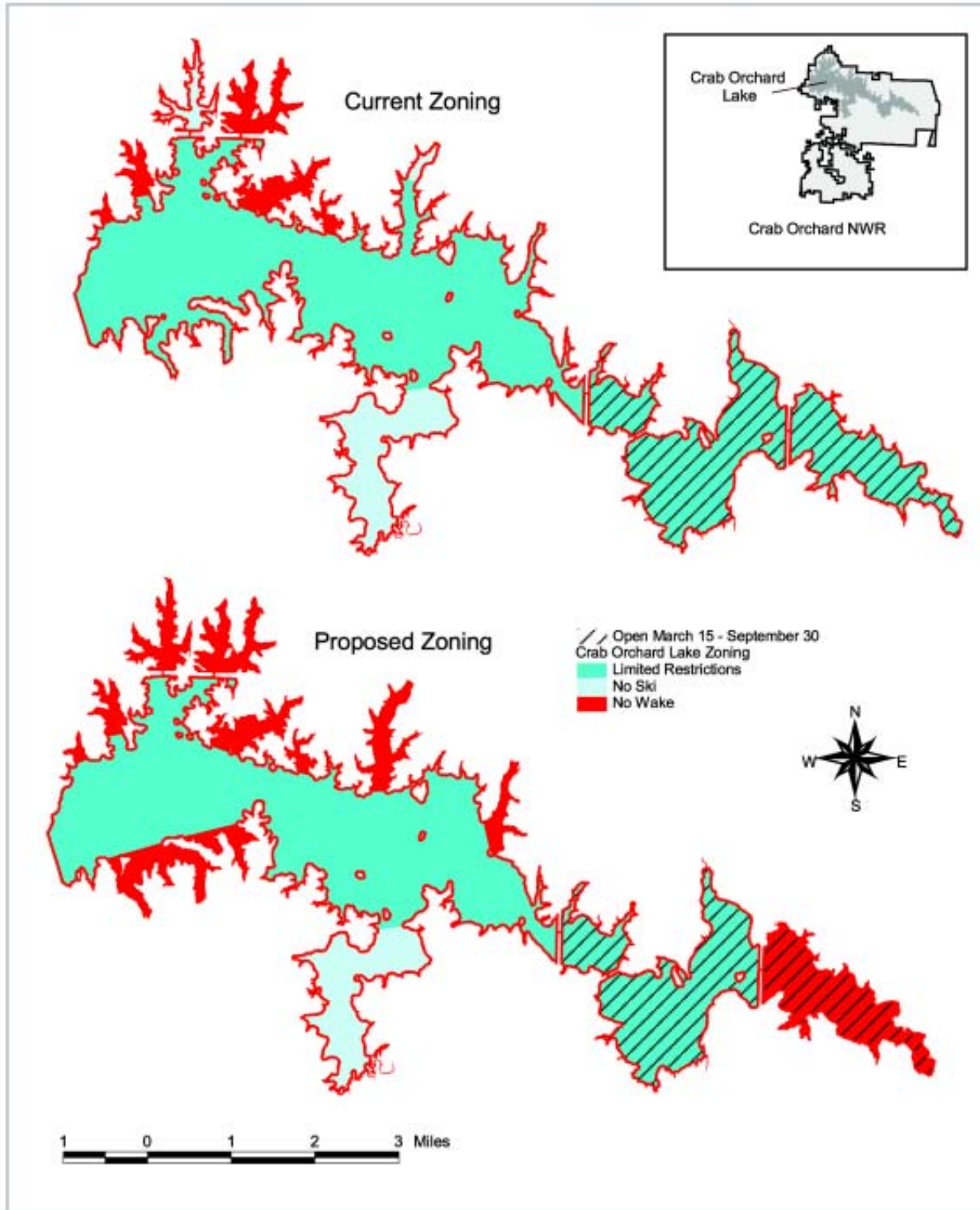
**Objective 1**

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

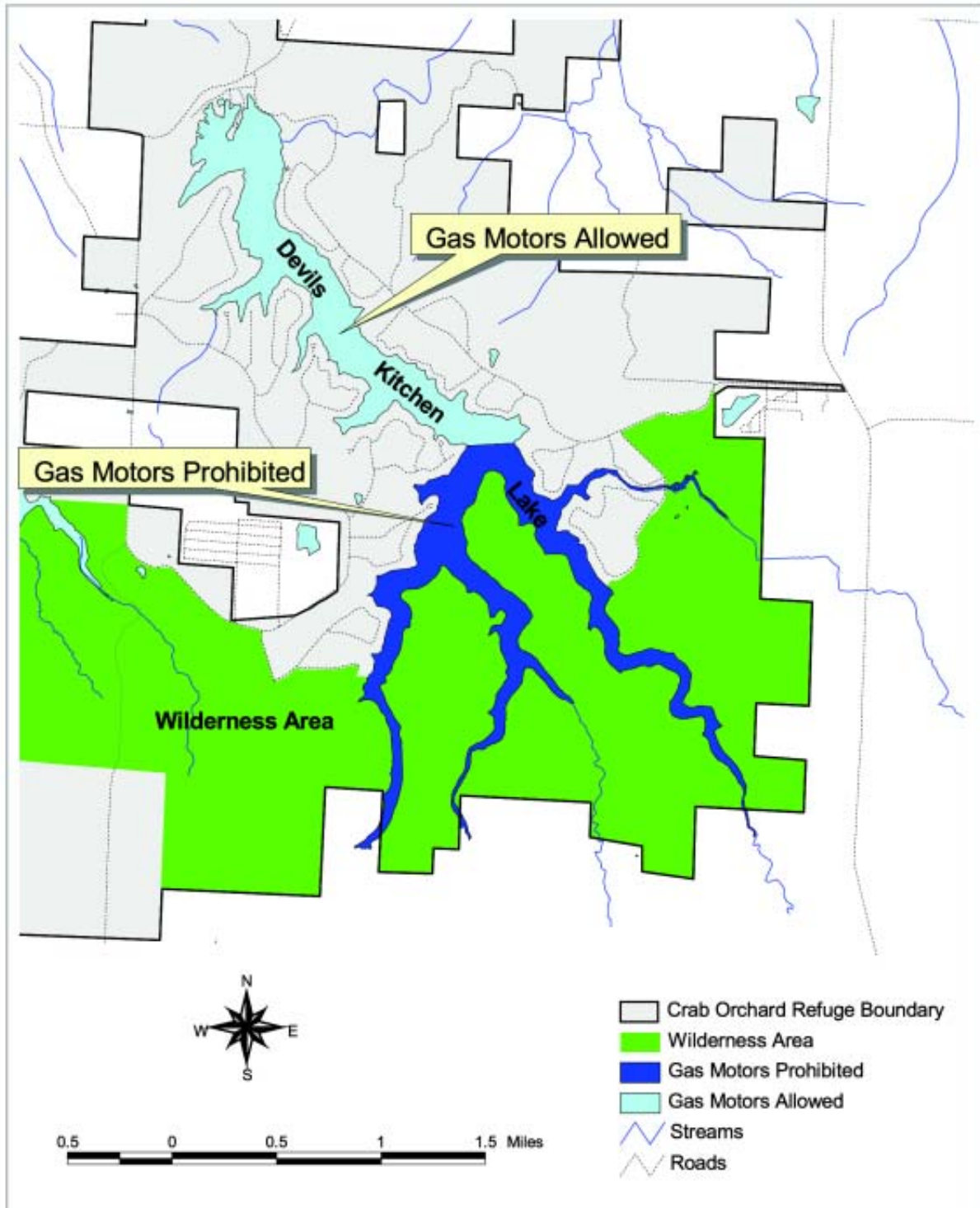
**Figure 11: Crab Orchard Lake Watercraft Zoning Proposed Under Alternatives B, C, D and E**



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

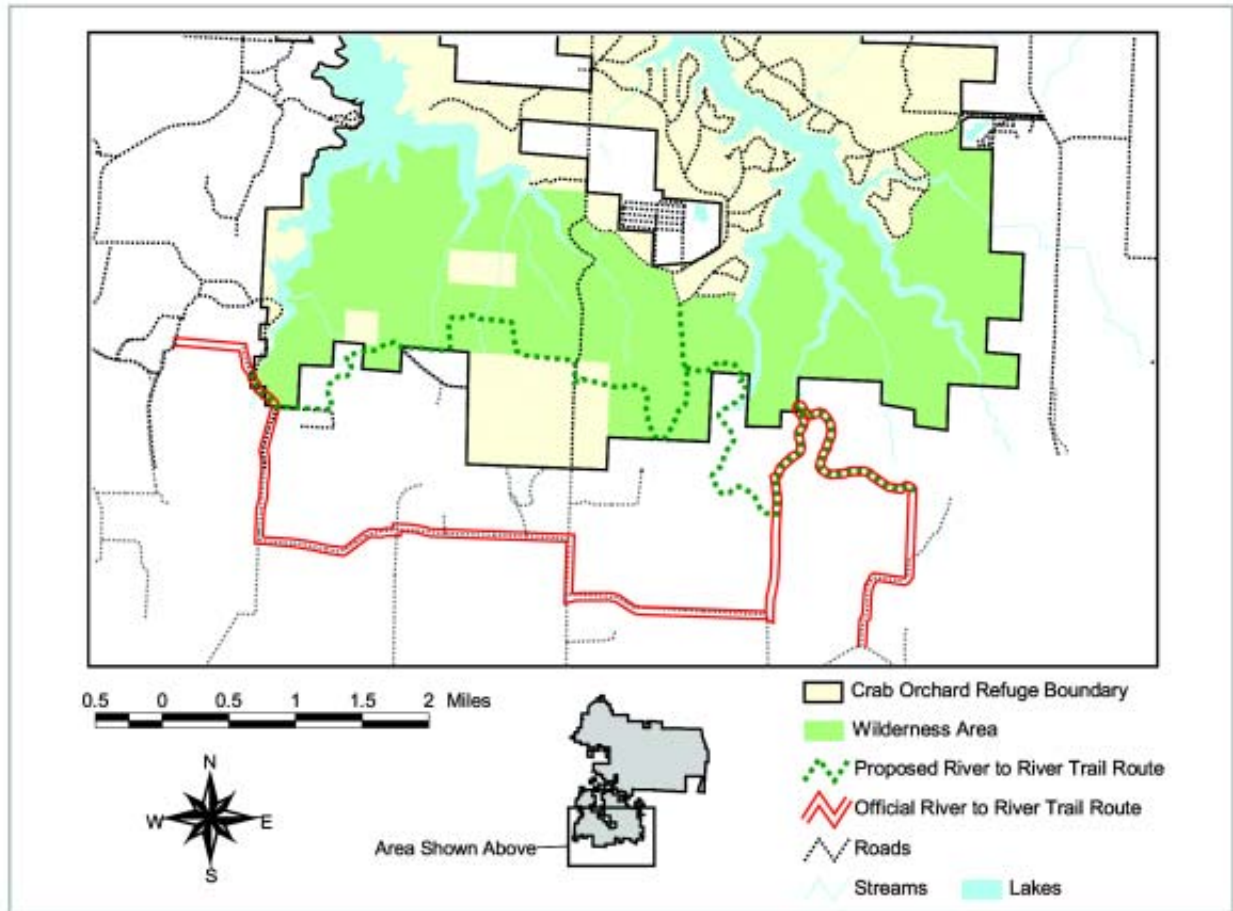


Figure 12: Devils Kitchen Lake Zoning, Crab Orchard NWR





**Figure 13: Proposed Horseback Riding Trails on Crab Orchard NWR Under Alternatives B, C and E**



- 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. 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 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 14 and Figure 8 on page 40).
- # 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 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.

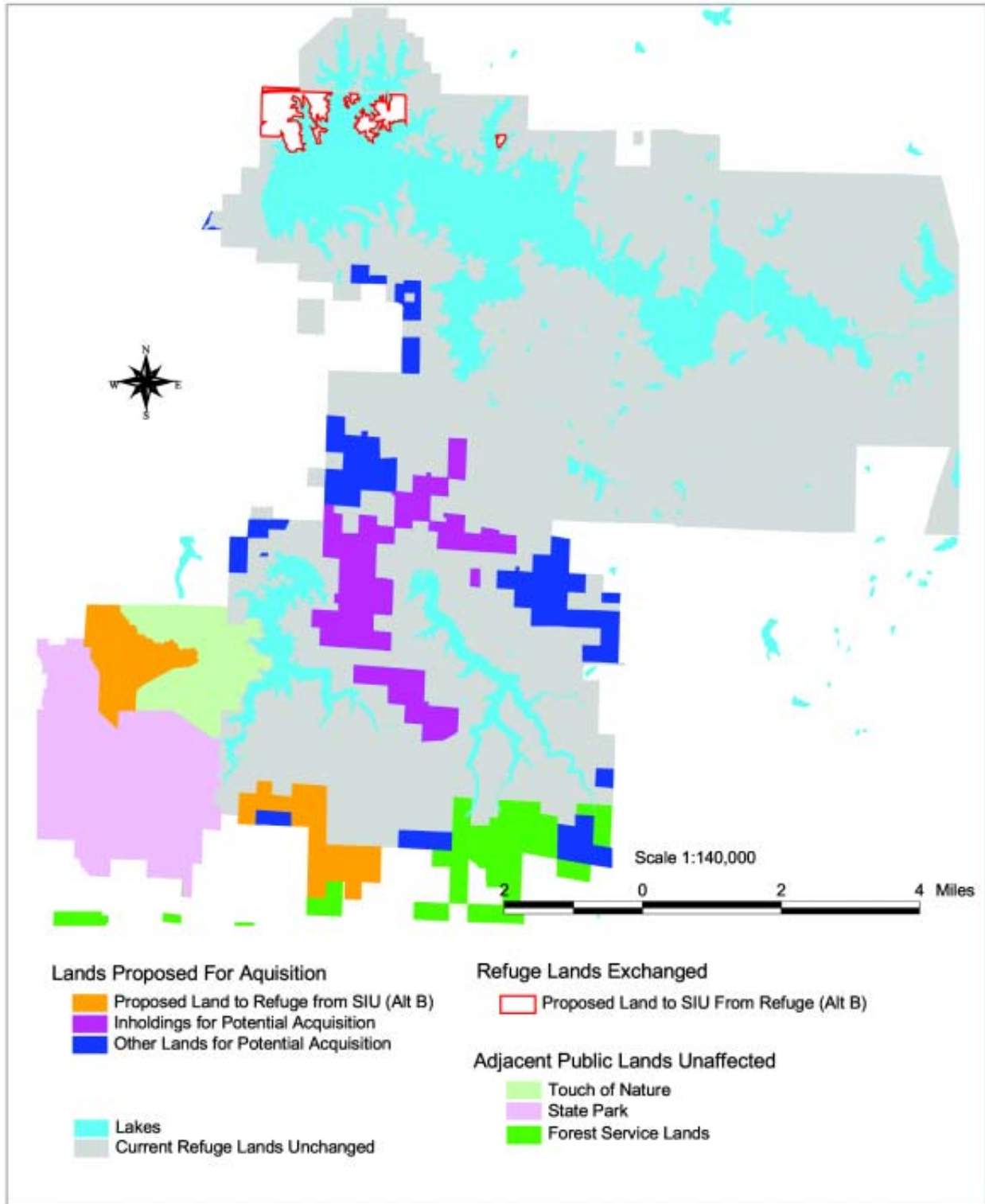
The inholdings, boundary modification, and adjacent protected lands are depicted in Figure 14. A more detailed analysis of the boundary modification is presented in a Land Protection Plan (Appendix L).

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

**Figure 14: Crab Orchard NWR Inholdings, Boundary Modification, and Adjacent Protected Lands**



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 15). 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 39).

#### 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).

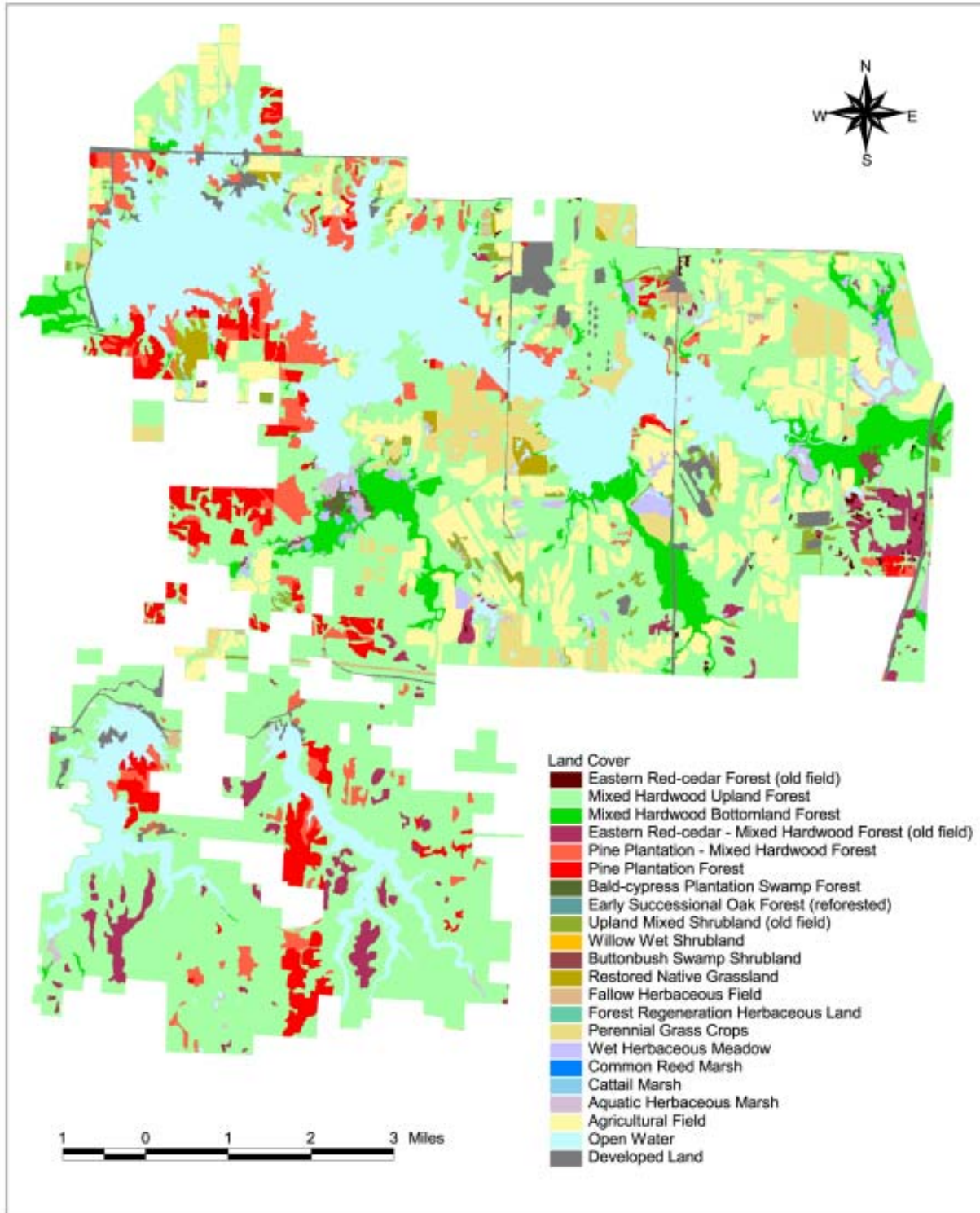
#### Water Quality Goal

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

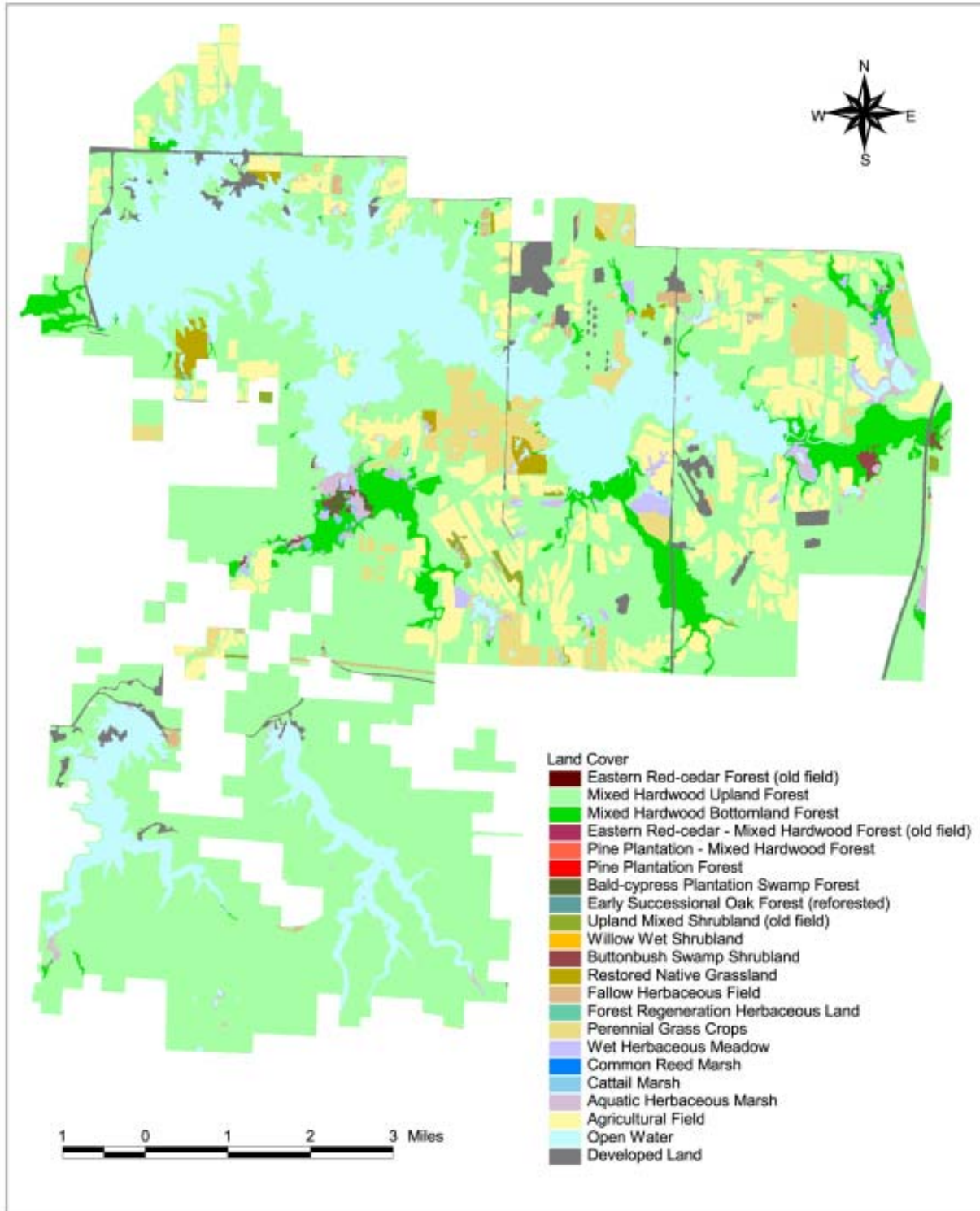
Objectives and strategies same as Alternative A (page 45).



**Figure 15: Land Cover of Crab Orchard NWR, Alternative C, Projected Conditions 2015**



**Figure 16: Land Cover of Crab Orchard NWR, Alternative C, Projected Conditions 2100**



Alternative C: Open Land Management / Consolidate and Improve Recreation

### 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.

#### 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 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. 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 current policies on tournaments and fish-offs conducted 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 existing Refuge boat ramps, fishing piers, and parking facilities. Study the feasibility for and con-



struct 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 46).

### 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 pro-



grams 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 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 3 years of the plan's approval and in cooperation with Friends of Crab Orchard National Wildlife Refuge and other part-

ners, 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 establishes a no-wake zone 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 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.

#### 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, Harmony Trail, Cambria Neck, Playport Marina and the Visitor Center. 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.
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 51). Gas motors would be permitted at Devils Kitchen Lake.
6. Horseback use on the Refuge would be confined to a designated River to River Trail (see Figure 13 on page 53) and erosion due to trail use would be actively controlled through maintenance and/or seasonal closures.
7. Camping at Devils Kitchen would be discontinued. 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 54).

Objectives and strategies for pastures are the same as Alternative B (page 54).

Objectives and strategies for hay fields are the same as Alternative A (page 54).

#### 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.



- 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 14 on page 56. 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 32).

#### *Strategy*

- Maintain 4,300 acres of cropland in agricultural production (Figure 17). 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 41).

#### **Objective 1**

Objectives and strategies for native warm-season grassland are the same as Alternative B (page 41).

#### **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*

- 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.*

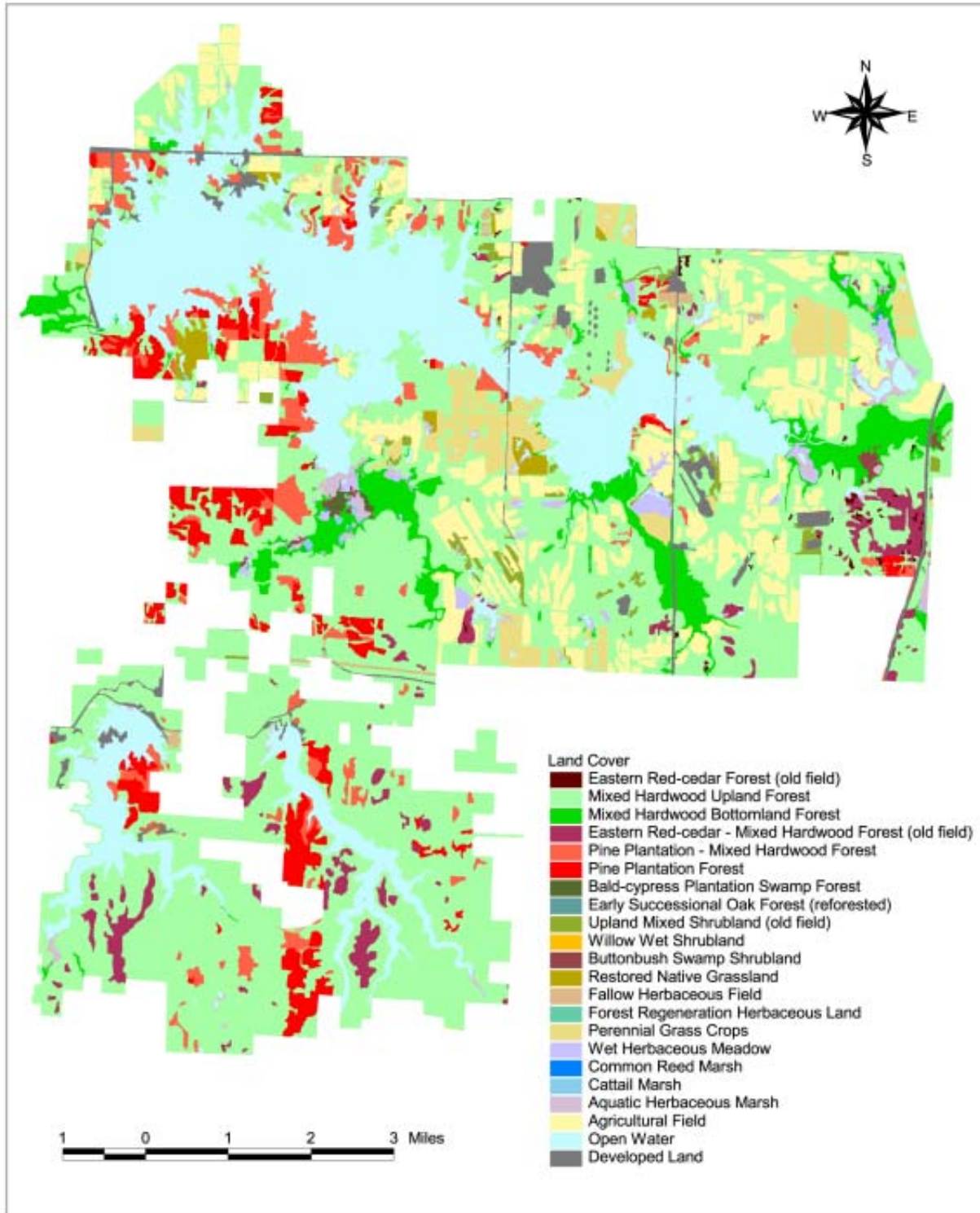
Objectives and strategies are the same as Alternative A (page 36).

#### **Water Quality Goal**

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

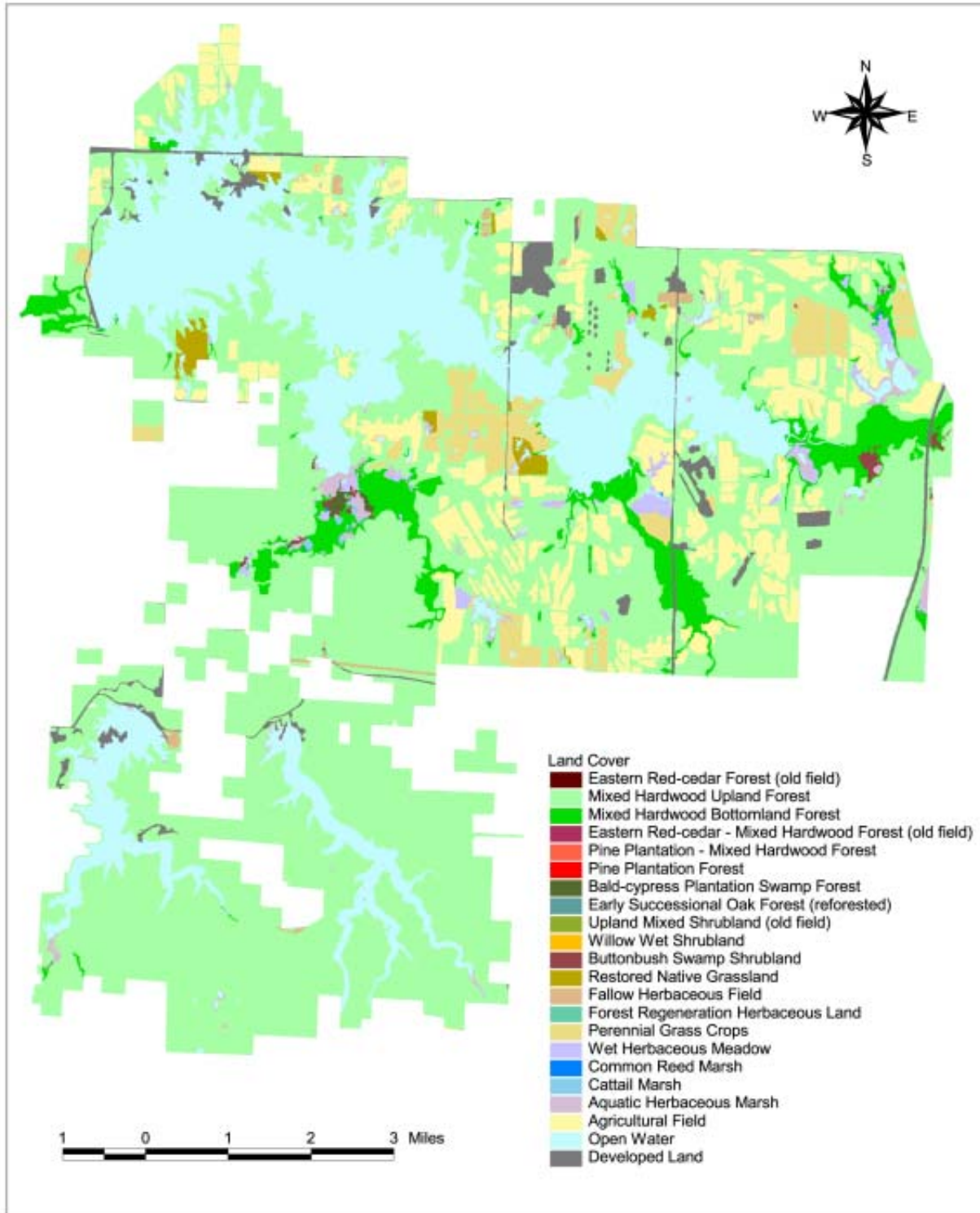
Objectives and strategies are the same as Alternative A (page 36).

**Figure 17: Land Cover of Crab Orchard NWR, Alternative D, Projected Conditions 2015**





**Figure 18: Land Cover of Crab Orchard NWR, Alternative D, Projected Conditions 2100**



Alternative D: Forest Land Management / Consolidate and Improve Recreation

### 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 60).

#### **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 64).

### 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 64).

### 2.6.5.5. Boundary Modification

Same as Alternative C (page 65).



## 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.

Goal, background, and objective same as Alternative A (page 32).

#### Strategy

1. Maintain 4,300 acres of cropland in agricultural production (see Figure 9 on page 42). 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.

#### 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 60).

#### 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 63) except that gas motors would be prohibited south of the southern-most boat ramp on Devils Kitchen Lake and ponds within the public use area of the Refuge.



### **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 64).

#### 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 53).

#### 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 54).

#### 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 14 on page 56. The background discussion of this proposed modification is presented under Alternative B (page 54).

## **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 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.

#### 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**

| <b>Issue</b>                  | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b>  | <b>Alternative B<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis</b> | <b>Alternative C<br/>Open Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b> | <b>Alternative D<br/>Forest Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b> | <b>Alternative E<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate and<br/>Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|-------------------------------|--|---|---|---|--|
| <b>Wildlife Conservation</b>  |  |   |   |   |  |
| 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.  |

**Table 4: Summary of Management Alternatives**

| <b>Issue</b>                          | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b>   | <b>Alternative B<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis</b>  | <b>Alternative C<br/>Open Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>  | <b>Alternative D<br/>Forest Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>  | <b>Alternative E<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate and<br/>Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</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 50 to 70 acres of new units.  | Same as Alt. B.  | Same as Alt. A.  | Same as Alt. B.  |
| 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.  |

**Table 4: Summary of Management Alternatives**

| <b>Issue</b>                               | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b> | <b>Alternative B<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis</b>  | <b>Alternative C<br/>Open Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>  | <b>Alternative D<br/>Forest Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>                                    | <b>Alternative E<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate and<br/>Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|--|---|--|--|--|--|
| <b>Recreation</b>                          |   |  |  |  |  |
| 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**

| <b>Issue</b>                                  | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b>   | <b>Alternative B<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis</b>  | <b>Alternative C<br/>Open Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>  | <b>Alternative D<br/>Forest Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b> | <b>Alternative E<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate and<br/>Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|---|---|--|--|---|--|
| 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 and group picnic area would close. Length of stay at campgrounds would be limited to 14 days. Four group camps would be maintained. Remaining picnic areas would continue to be open. | 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**

| <b>Issue</b>       | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b> | <b>Alternative B<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis</b>  | <b>Alternative C<br/>Open Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>   | <b>Alternative D<br/>Forest Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>   | <b>Alternative E<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate and<br/>Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|--------------------|---|--|---|---|--|
|                    | Maintain existing lake zoning for boating activities.           | A no-wake zone east of Highway 148 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.  |
|                    | Existing beaches would remain.                                  | Crab Orchard Lake beach becomes the responsibility of SIU.   | Same as Alt. A.   | Same as Alt. A.   | Same as Alt. A.  |
| <b>Agriculture</b> |   |  |   |   |  |
| 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.  |



**Table 4: Summary of Management Alternatives**

| <b>Issue</b>      | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b>  | <b>Alternative B<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis</b>             | <b>Alternative C<br/>Open Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>                                  | <b>Alternative D<br/>Forest Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b>  | <b>Alternative E<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate and<br/>Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</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.  |
| 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.  |
| <b>Wilderness</b> |  |   |  |  |  |
|                   | 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.  |

**Table 4: Summary of Management Alternatives**

| <b>Issue</b>      | <b>Alternative A<br/>Current<br/>Management<br/>(No Action)</b>  | <b>Alternative B<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis</b> | <b>Alternative C<br/>Open Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b> | <b>Alternative D<br/>Forest Land<br/>Management,<br/>Consolidate and<br/>Improve<br/>Recreation</b> | <b>Alternative E<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate and<br/>Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|-------------------|--|---|---|---|--|
| <b>Protection</b> |  |   |   |   |  |
|                   | 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.



### 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 sub-surface 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.

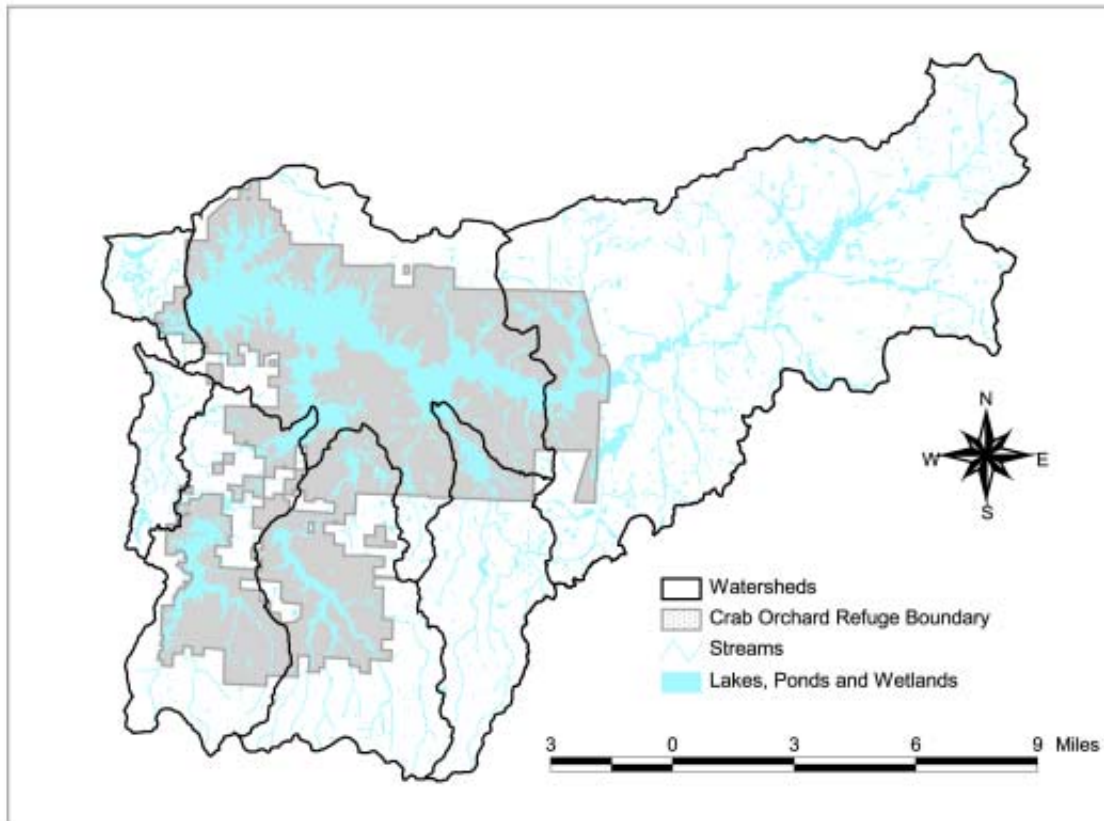
### 3.2.5 Hydrology and Water Quality

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 81). 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 mostly of forests (31 percent), grasslands (34 percent), and about 19 percent developed or in row crops.

**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), and about 8 percent developed or in row crops.

#### 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), and about 4 percent developed or in row crops.

### 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.

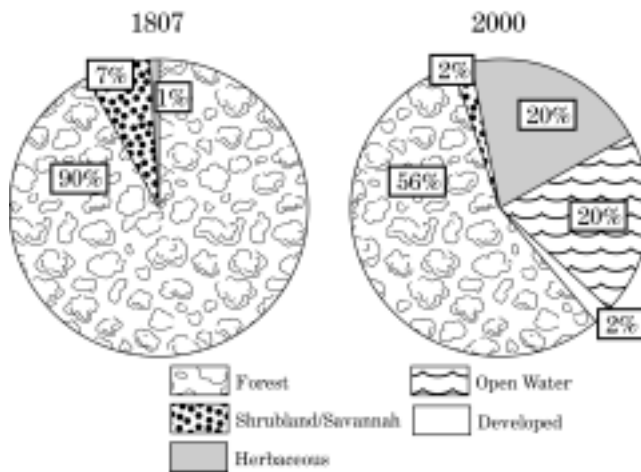
Investigation and cleanup are continuing at several sites in existing and former industrial areas within the restricted use portion of the Refuge. These activities are expected to continue into the foreseeable future.

### 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 96.

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.



**Figure 20: Land Cover of Crab Orchard NWR**

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

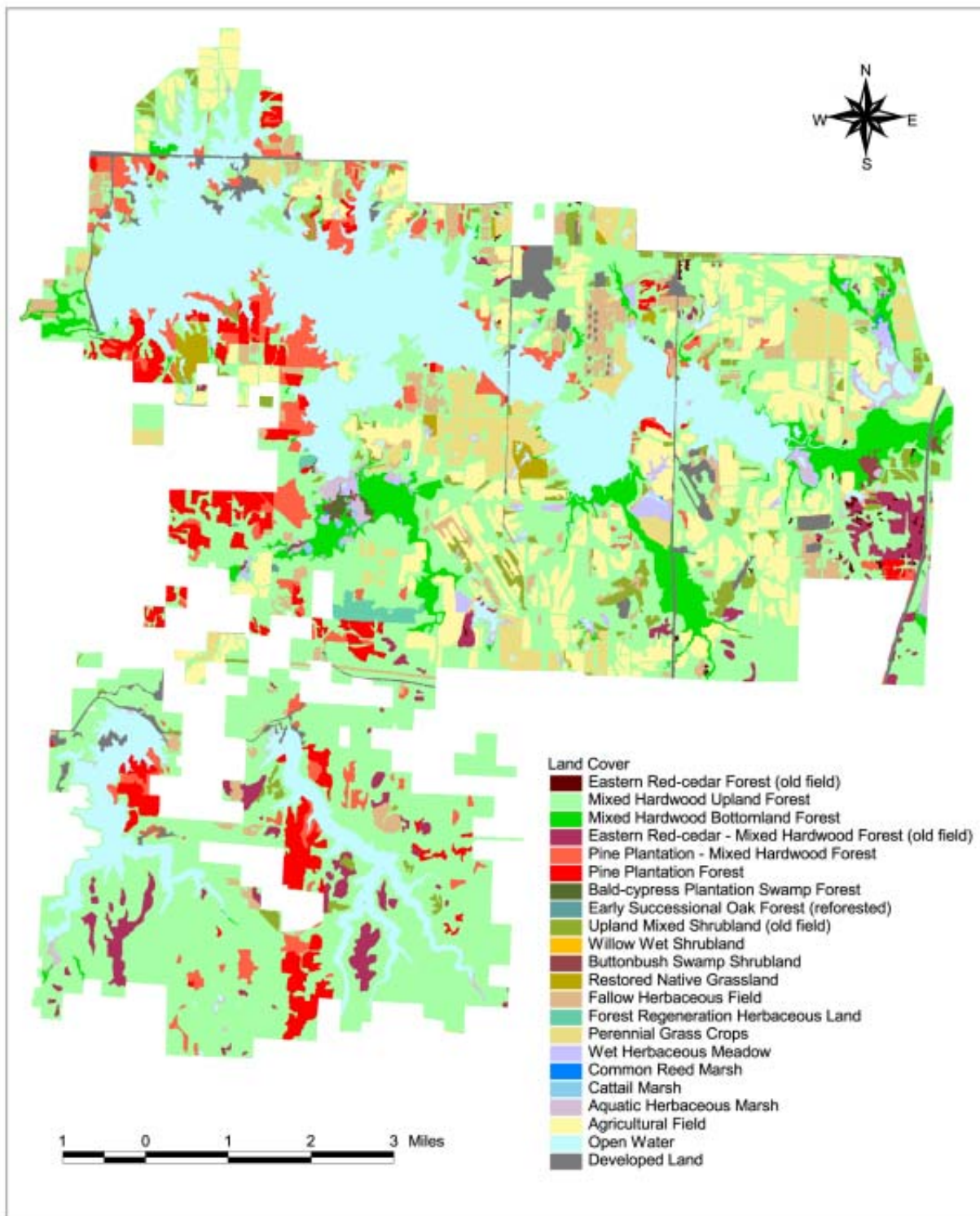
Before European settlement, there was relatively little wetland habitat on the area that is now the Refuge. Presently, most wetland habitat on the Refuge consists of man-made ponds and lakes, which are discussed in the following paragraphs. Wetlands cover about 6 percent of the Refuge. Examples of wildlife 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.



**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 |
|---|---------------|-----------------------|---------------|-----------------------|
| <b>Forest</b>                                       | <b>25,254</b> | <b>56</b>             | <b>41,820</b> | <b>92</b>             |
| 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                    |               |                       |
| <b>Shrubland</b>                                    | <b>956</b>    | <b>2</b>              | <b>3,182</b>  | <b>7</b>              |
| Upland Mixed Shrubland (old field)                  | 872           | 2                     |               |                       |
| Willow Wet Shrubland                                | 3             | <1                    |               |                       |
| Buttonbush Swamp Shrubland                          | 81            | <1                    |               |                       |
| <b>Herbaceous</b>                                   | <b>9,026</b>  | <b>20</b>             | <b>455</b>    | <b>1</b>              |
| Restored Native Grassland                           | 198           | <1                    |               |                       |
| Fallow Herbaceous Old 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                    |               |                       |
| <b>Other Land Cover</b>                             | <b>10,220</b> | <b>22</b>             | <b>0</b>      | <b>0</b>              |
| Open Water  | 9,082         | 20                    |               |                       |
| Developed Land                                      | 1,138         | 2                     |               |                       |
| <i>Totals</i>                                       | 45,456        | 100                   | 45,456        | 100                   |

### 3.3.7 Cropland

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

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

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

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.

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 manage-

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

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

ment plans, we must bring together a complex set of interests including private landowner, commercial, and public agencies.



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**

| <b>Taxonomic Group</b>  | <b>Number of Species Found in Illinois</b> | <b>Number of Species Found at Crab Orchard NWR</b> | <b>Percent of Illinois Species Found at Crab Orchard NWR</b> |
|-------------------------|--|--|--|
| 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*

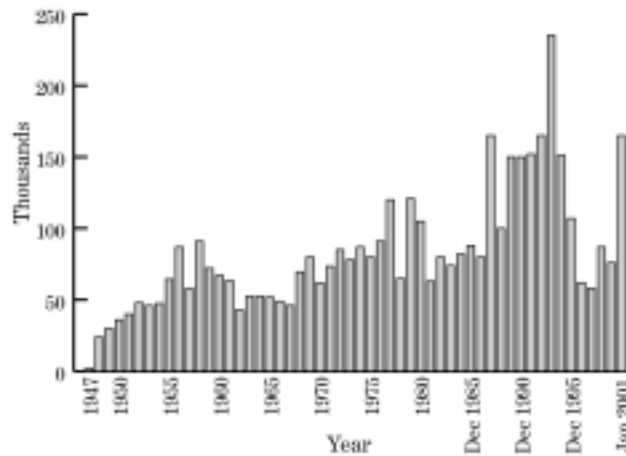
Prior to European settlement, Canada geese probably rarely used the Refuge area. The Refuge was dominated by forest (more than 90 percent) and had little habitat to attract geese. Refuge records indicate that there were only about 2,200 Canada geese on the Refuge in 1947. Establishing a large, wintering 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.

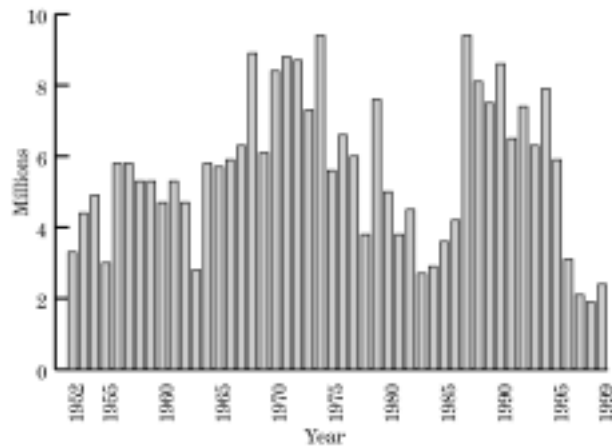
Since the Refuge was created in 1947, attracting and providing food for migratory Canada Geese has been a primary focus of activities on the Refuge. Early efforts to attract geese included maintaining a captive flock of pinioned geese, increasing the production of desirable agricultural crops, and, sometimes, 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 to potentially 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, black-

birds, 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 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<sup>1</sup>

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

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 10: Nongame Species of Management Concern, Crab Orchard NWR**

| Common Name           | Scientific Name                   |
|-----------------------|-----------------------------------|
| Common Loon           | <i>Gavia immer</i>                |
| Northern Harrier      | <i>Circus cyaneus</i>             |
| Red-shouldered Hawk   | <i>Buteo lineatus</i>             |
| Greater Yellowlegs    | <i>Tringa flavipes</i>            |
| Black-billed Cuckoo   | <i>Coccyzus erythrophthalmus</i>  |
| Chuck-will's-widow    | <i>Caprimulgus carolinensis</i>   |
| Whip-poor-will        | <i>Caprimulgus vociferus</i>      |
| Red-headed Woodpecker | <i>Melanerpes erythrocephalus</i> |
| Northern Flicker      | <i>Colaptes auratus</i>           |
| Acadian Flycatcher    | <i>Empidonax virescens</i>        |
| Loggerhead Shrike     | <i>Lanius ludovicianus</i>        |
| Bell's Vireo          | <i>Vireo belli</i>                |
| Wood Thrush           | <i>Hylocichla mustelina</i>       |
| Blue-winged Warbler   | <i>Vermivora pinus</i>            |
| Prairie Warbler       | <i>Dendroica discolor</i>         |
| Prothonotary Warbler  | <i>Protonotaria citrea</i>        |
| Worm-eating Warbler   | <i>Helmitheros vermivorus</i>     |
| Louisiana Waterthrush | <i>Seiurus motacilla</i>          |
| Kentucky Warbler      | <i>Oporomis formosus</i>          |
| Field Sparrow         | <i>Spizella pusilla</i>           |
| Grasshopper Sparrow   | <i>Ammordramus savannarum</i>     |
| Dickeissel            | <i>Spiza americana</i>            |
| Eastern Meadowlark    | <i>Sturnella neglecta</i>         |
| Orchard Oriole        | <i>Icterus spurius</i>            |

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.

**Table 11: Crab Orchard NWR Fish Species List**

| Common Name           | Scientific Name                    | Common Name  | Scientific Name                              |
|-----------------------|------------------------------------|--|--|
| <b>Bowfin</b>         |                                    | <b>Poeciliidae</b>   |  |
| Bowfin                | <i>Amia calva</i> (N)              | Mosquitofish   | <i>Gambusia affinis</i>                      |
| <b>Herrings</b>       |                                    | <b>Pikes</b>   |  |
| Gizzard shad          | <i>Dorosoma cepedianum</i> (N)     | Grass pickerel   | <i>Esox americanus</i> (N)                   |
| Threadfin shad        | <i>D. petenense</i> (I)*           | Northern pike  | <i>E. lucius</i> (I)                         |
| <b>Minnnows</b>       |                                    | <b>Silversides</b>   |  |
| Carp                  | <i>Cyprinus carpio</i> (I)         | Brook silversides  | <i>Labidesthes sicculus</i> (N)              |
| Bluntnose minnow      | <i>Pimephales notatus</i> (N)      | <b>Sunfishes</b>   |  |
| Fathead minnow        | <i>P. promelas</i>                 | Largemouth bass  | <i>Micropterus salmoides</i> (N)             |
| Golden shiner         | <i>Notemigonus crysoleucas</i> (N) | Green sunfish  | <i>Lepomis cyanellus</i> (N)                 |
| <b>Suckers</b>        |                                    | Warmouth   | <i>Chaenobryttus. gulosus</i> (N)            |
| Bigmouth buffalo      | <i>Ictiobus cyprinellus</i> (N)    | Orangespotted sunfish  | <i>L. humilus</i> (N)                        |
| <b>Perches</b>        |                                    | Redear sunfish   | <i>L. microlophus</i> (N)                    |
| Yellow perch          | <i>Perca flavescens</i> (I)        | Bluegill   | <i>L. macrochirus</i> (N)                    |
| Log perch             | <i>Percina caprodes</i> (N)        | White crappie  | <i>Pomoxis annularis</i> (N)                 |
| Slough darter         | <i>Etheostoma gracile</i>          | Black crappie  | <i>P. nigromaculatus</i> (N)                 |
| <b>Killifishes</b>    |                                    | Flier  | <i>Centrarchus macropterus</i> (N)           |
| Blackstripe topminnow |                                    | <b>Sea basses</b>  |  |
| <b>Catfishes</b>      |                                    | White bass   | <i>Morone chrysops</i> (N)                   |
| Black bullhead        | <i>Ameiurus melas</i> (N)          | Yellow bass  | <i>M. mississippiensis</i> (N)               |
| Yellow bullhead       | <i>A. natalis</i> (N)              | Striped bass   | <i>M. saxatilis</i> (I)                      |
| Channel catfish       | <i>I. punctatus</i> (N)            | Hybrid striped bass  | <i>M. chrysops</i> X <i>M. saxatilis</i> (I) |
| Flathead catfish      | <i>Pylodictus olivaris</i> (N)     | <b>Aphredoderidae</b>  |  |
| Tadpole madtom        | <i>Noturus gyrinus</i> (N)         | Pirate perch   | <i>Aphredoderus sayanus</i>                  |
| <b>Drums</b>          |                                    | * Periodically stocked<br>(I) introduced species<br>(N) native species |  |
| Freshwater drum       | <i>Aplodinotus grunniens</i> (N)   |  |  |

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.

The fish management goals for Crab Orchard Lake are to:

- # maintain and/or improve the existing bluegill and redbreast 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, redbreast, 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 water-



shed 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.

#### 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.

**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                      |

### 3.4.5 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 conducted mist-netting for 2 years 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 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.

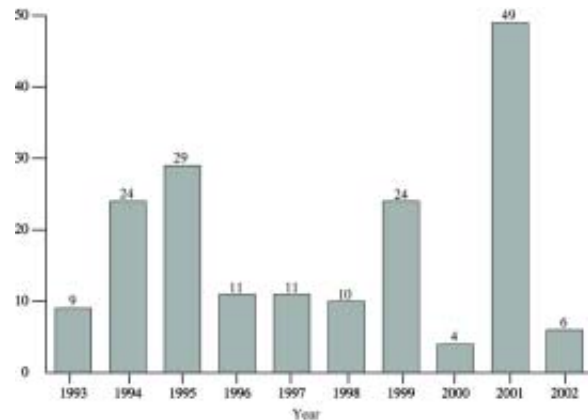
*Shoreline Surveys:* Shoreline and island erosion has been shown to be a contributor of sediment to the lakes, especially Crab Orchard Lake. Over the years various surveys and control efforts have been tried. The last effort was in 2001.

## 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.

**Figure 24: Bald Eagle Survey Counts on Crab Orchard NWR, 1993-2002**



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.

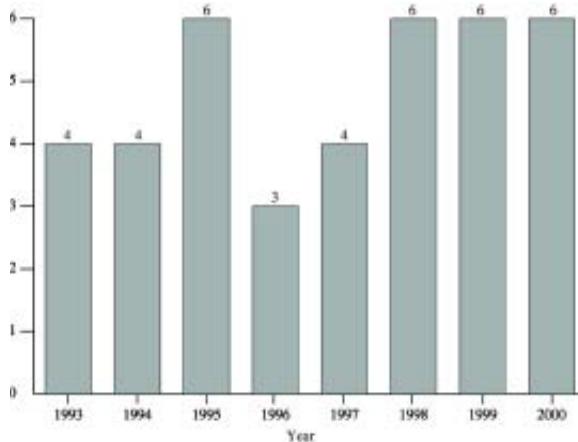
### 3.5.2 Birds

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.

**Figure 25: Bald Eagle Fledgling Counts on Crab Orchard NWR, 1993-2000**



## 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.

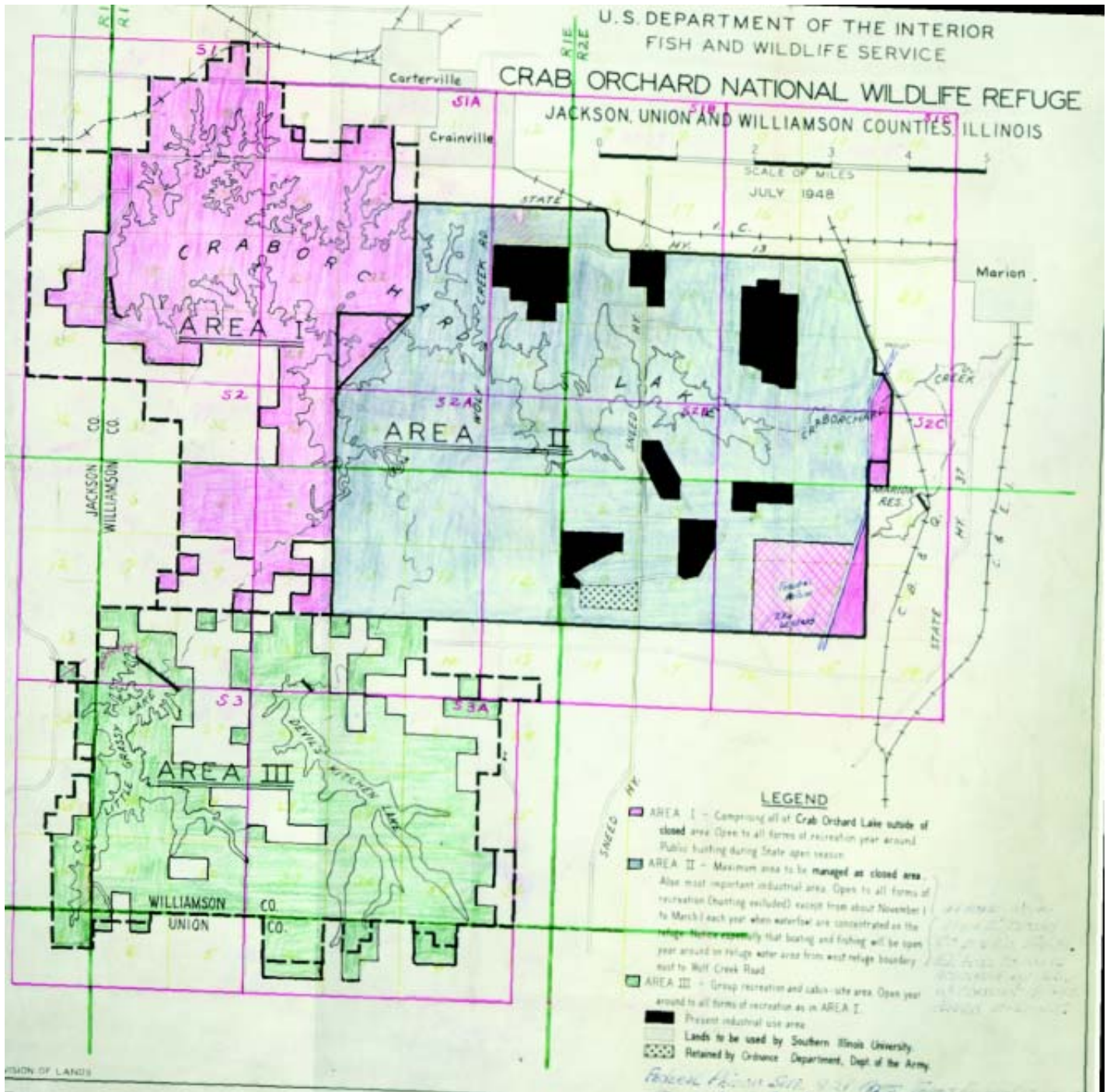
Most hunting occurs outside the restricted use area. The public use area of the Refuge makes up approximately 23,000 acres and is open to all hunting activities in accordance with State hunting seasons. Hunting includes muzzleloader, archery, shotgun and pistol deer hunting, waterfowl hunting, archery 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 phys-





Figure 26: 1948 Area Designations, Crab Orchard NWR



ical 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, 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.

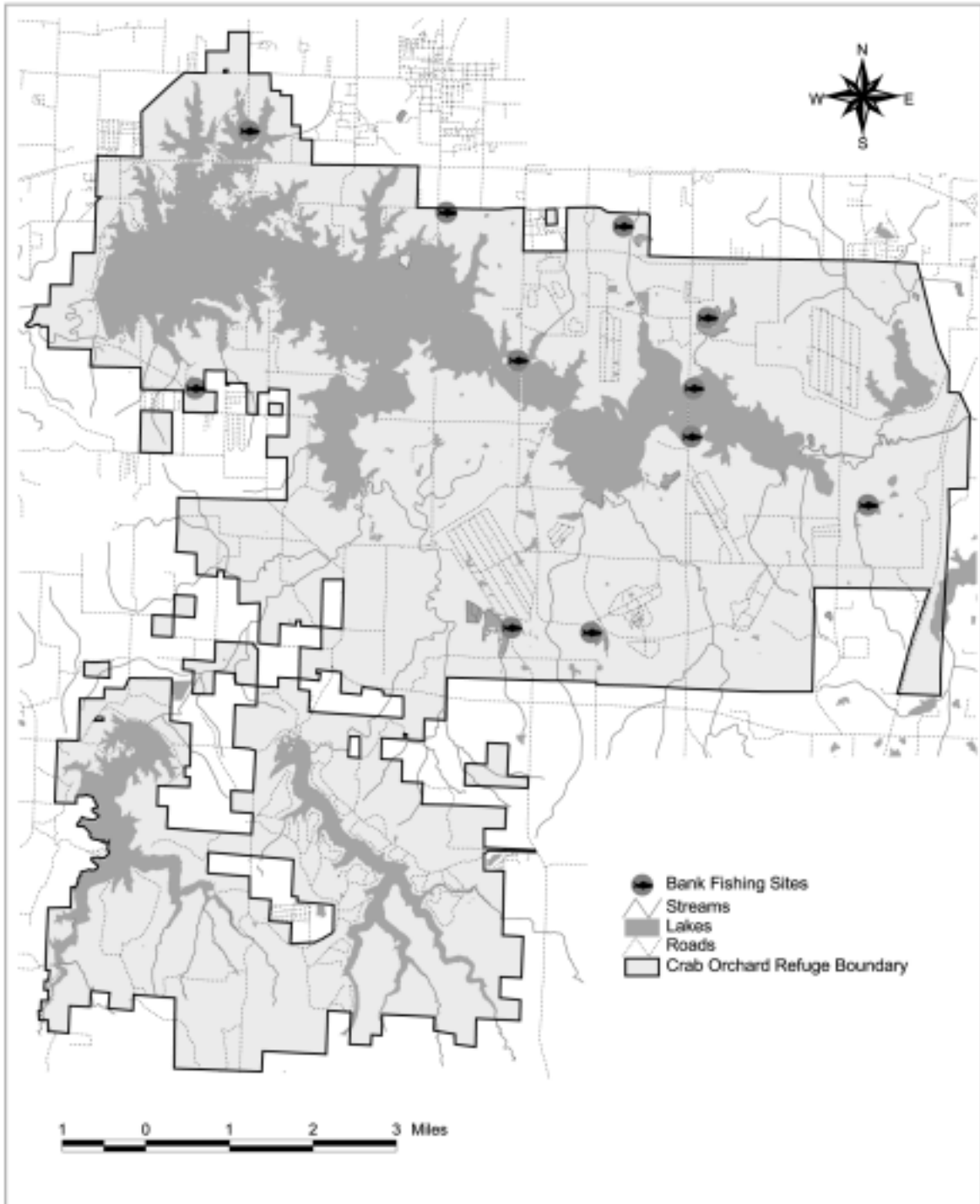
Blue Heron Pond is located in the restricted use area. The pond is open from March 15 to September 30. Because it is out of the way, the pond receives far fewer visits than other ponds in the restricted use area.

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.

**Figure 27: Bank Fishing Sites on Crab Orchard NWR**



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 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.

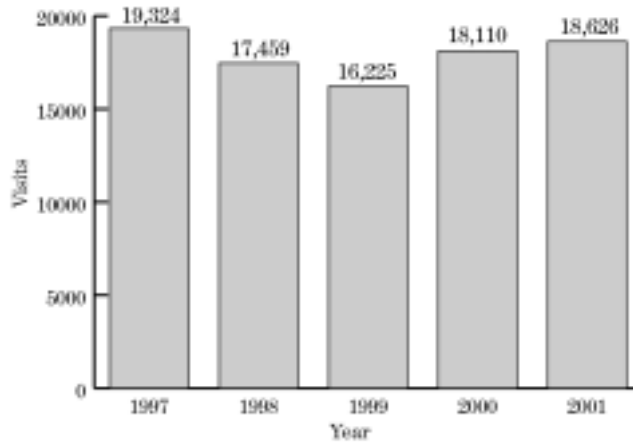
Figure 28 summarizes campground visits to the Refuge.

### **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



**Figure 28: Crab Orchard NWR Campground  
Visits Per Year**



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.

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

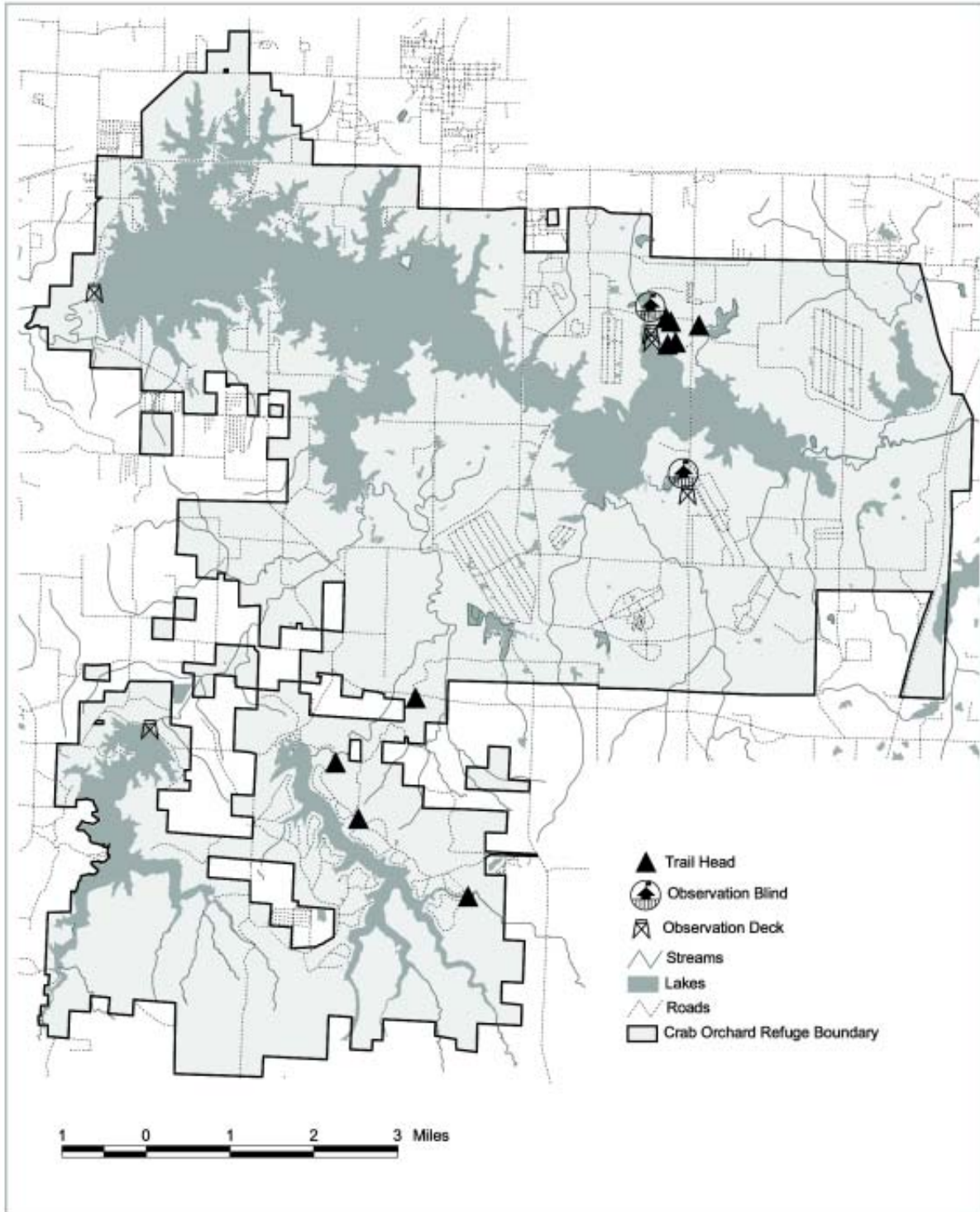
Hiking is permitted throughout the public use area of the Refuge. Refuge volunteers maintain seven trails that are open to the general public and one trail that is provided for educational purposes only. Numerous fire trails have served as hiking trails on the Refuge. The following is a list of maintained 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.

**Figure 29: Observation Areas on Crab Orchard NWR**



*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 blind 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.

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.

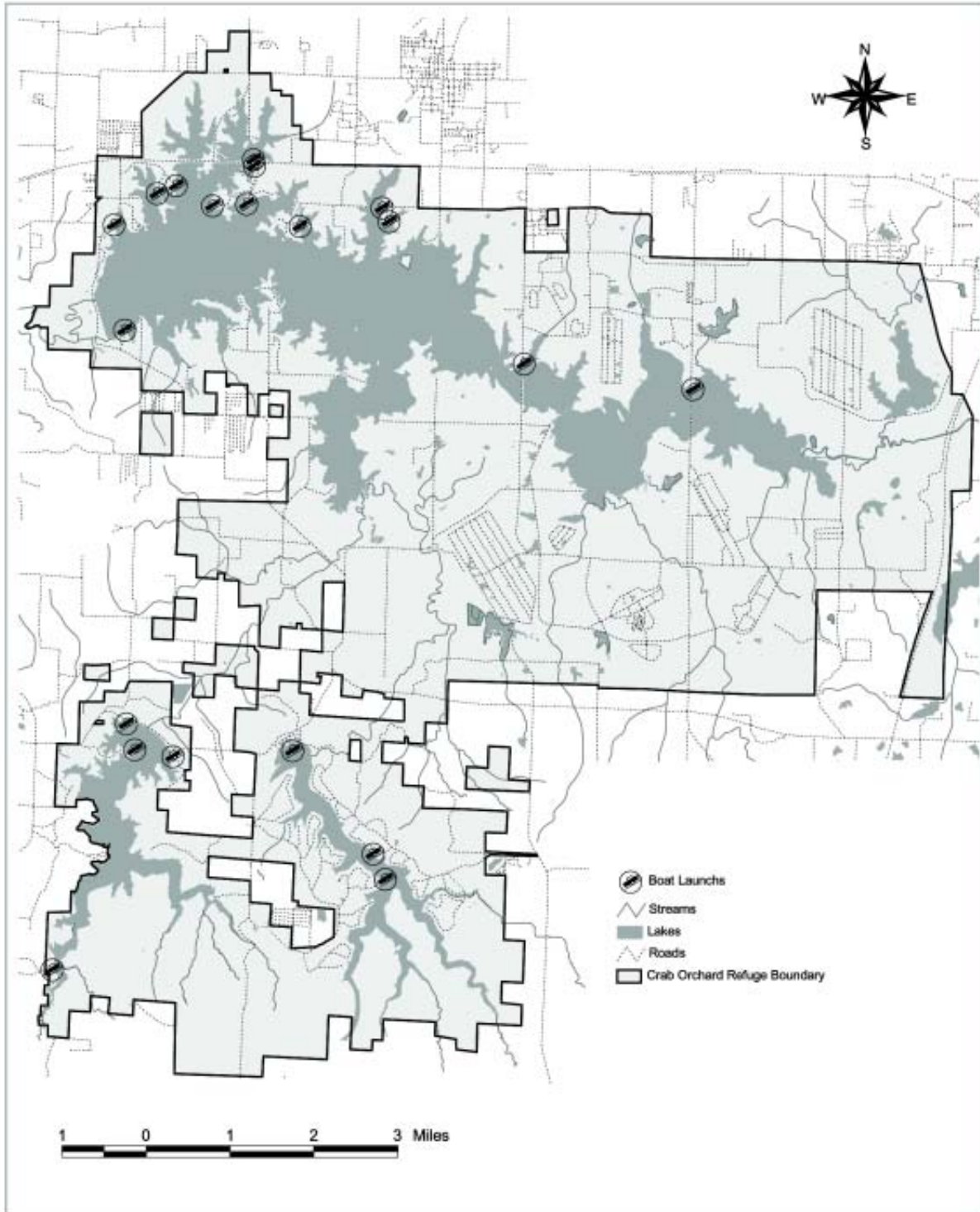
#### 3.6.6.2. Devils Kitchen Lake

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.

**Figure 30: Boat Launches on Crab Orchard NWR**





### 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 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 pic-

nicking 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 picnicking 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

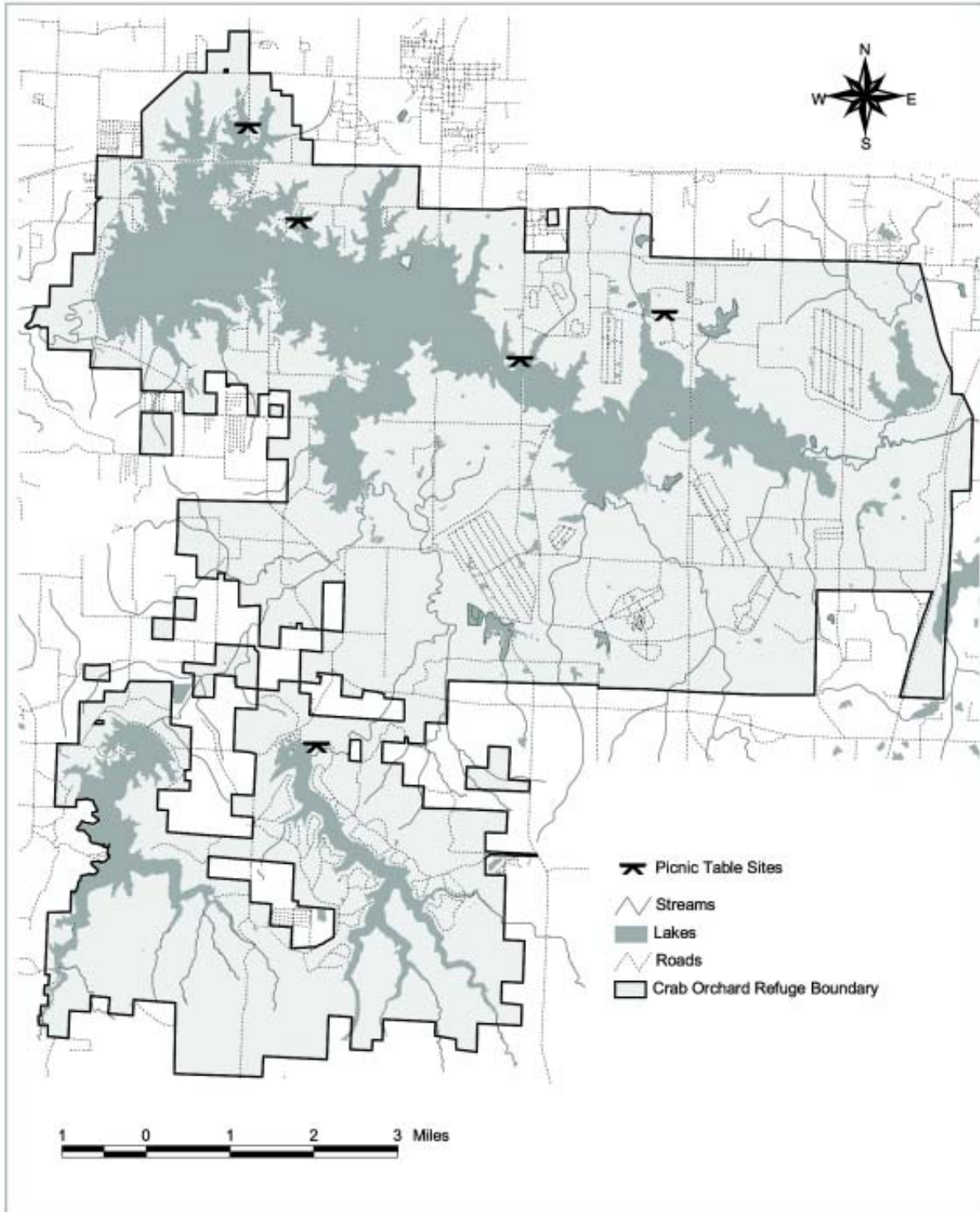
Regulations controlling horseback riding on Crab Orchard NWR have seen several changes over the years. During the 1960s and up to 1979, horseback riding was permitted only in areas designated by signs or on marked horseback trails. In 1979, the regulation permitted horseback riding only on existing paved 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.

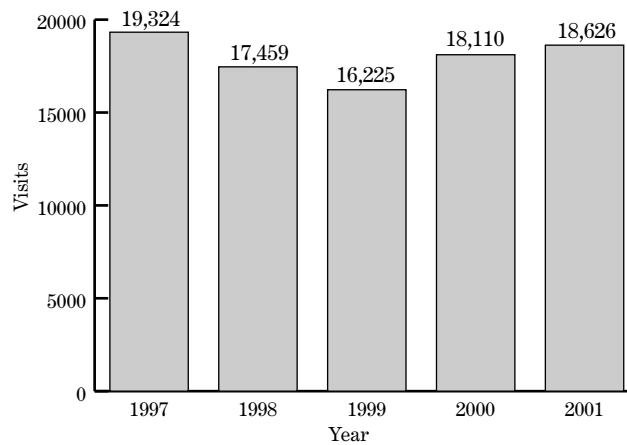
Even though the 1984 regulation allowed horseback riding in most of the public use area, this activity is concentrated in the more wild and scenic southern portion of the Refuge. In 1976, much of this southern portion was designated as the Crab Orchard Wilderness and horseback riding was not allowed. 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 Missis-



**Figure 31: Picnic Areas on Crab Orchard NWR**



**Figure 32: Annual Group Camp Attendance at Crab Orchard NWR, 1997-2001**

issippi 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.

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. The Williamson County Tourism Bureau also occupies office space in the building. 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.

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

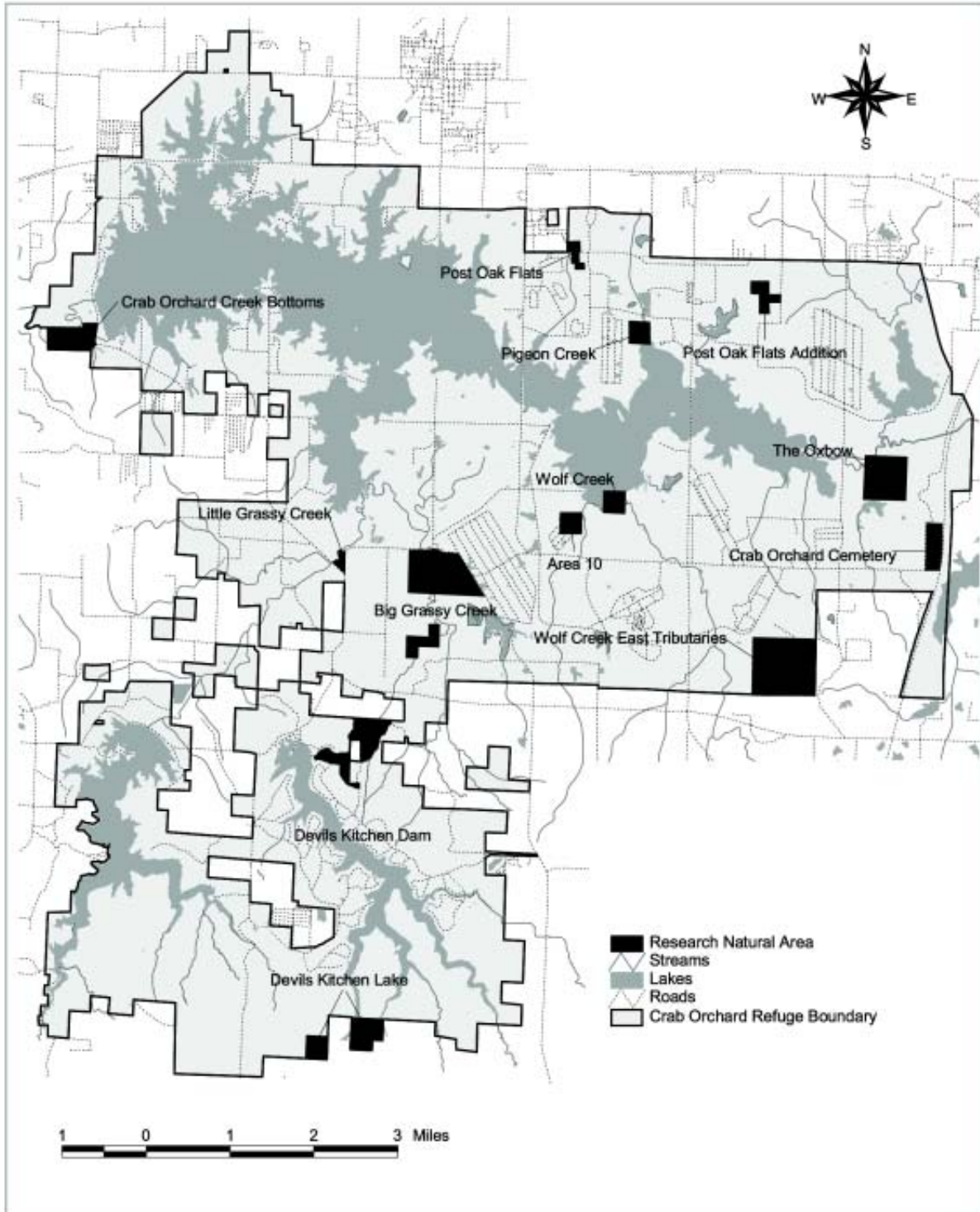
The entire northern boundary and almost all of the western boundary of the Wilderness border other Refuge land (see Figure 4 on page 20). Much of the northern boundary is formed by the Little Grassy and Devils Kitchen lakes, which are man-made reservoirs. At the time of designation, the Wilderness designation 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).

**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             |
| <i>Total</i>                | 1,353        |                  |

### 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. 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.

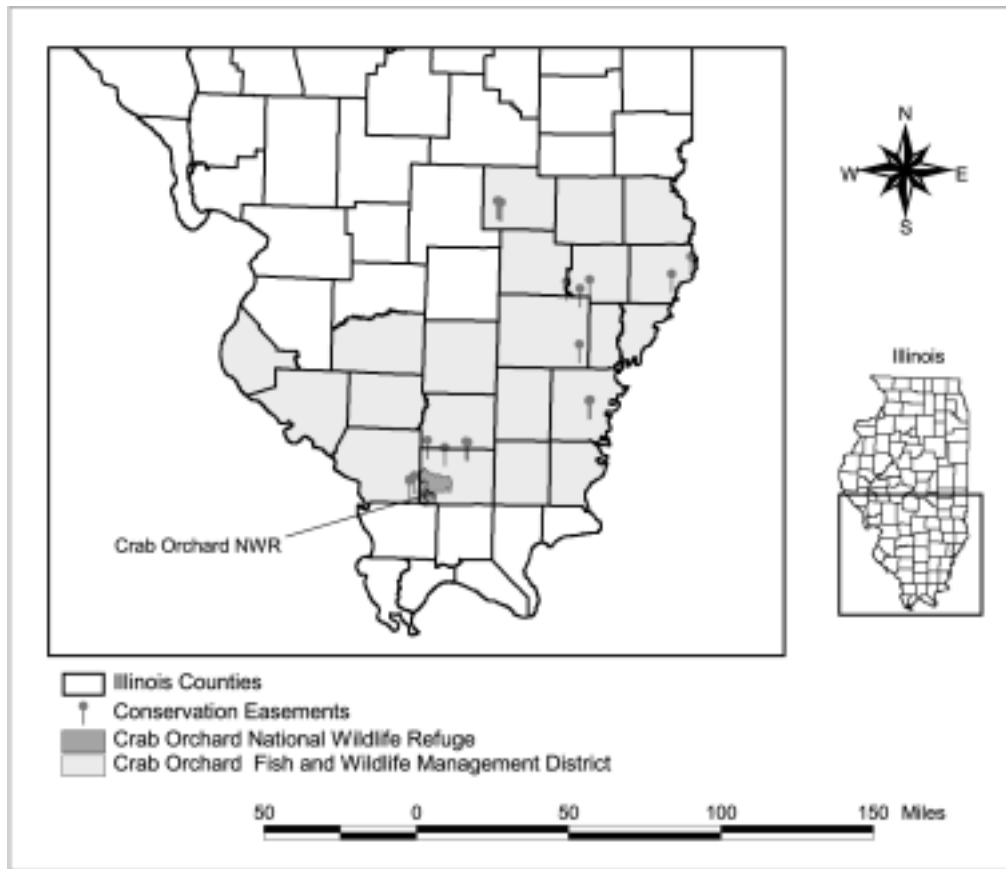
Initially, the Illinois Ordnance Plant contained 536 buildings with approximately 2.3 million square feet of space, water and sewage treatment plants and distribution systems, power and telephone utility systems, 88 miles of railroad track, 93 miles of access and service roads, parking for 6,900 vehicles, 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 manufactur-

**Figure 34: Conservation Easements Administered by Crab Orchard NWR**



ing, 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:

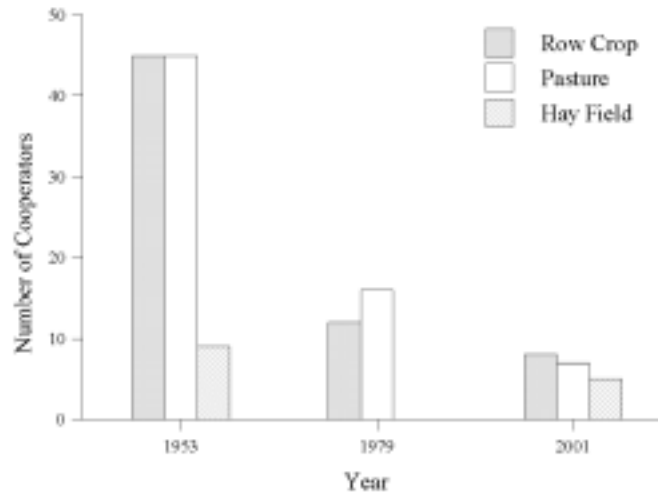
- # reclaim farmland that had been fallow during ordnance plant operations,

- # 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 35: Number of Agricultural Cooperators at Crab Orchard NWR, 1953, 1979, and 2001**



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

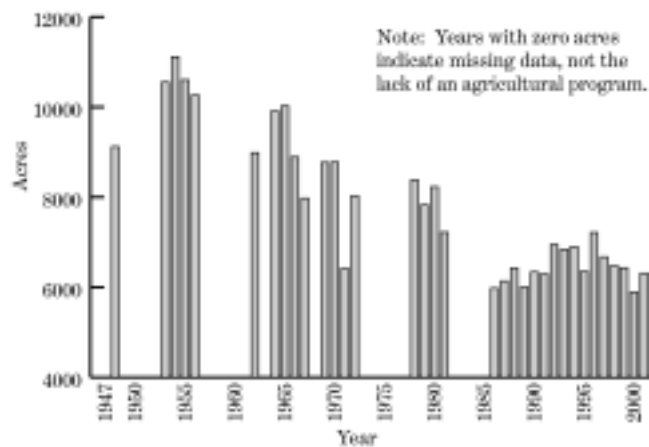
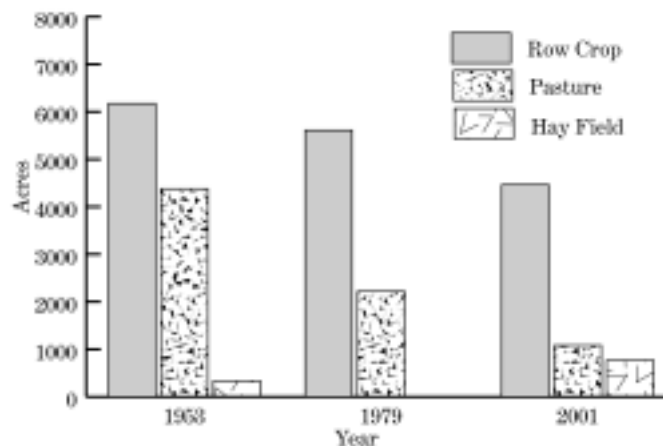
# Year 4 – clover

# 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 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

**Figure 36: Total Area of Agricultural Fields on Crab Orchard NWR, 1947-2001****Figure 37: Area of Row Crop Fields, Pastures and Hay Fields in 1953, 1979, and 2001**

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 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<sup>2</sup>

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 archaeological 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.



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 Illini-

2. This section of the Draft 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.

**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  |

wek 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 .

## 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.



**Table 15: 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 16: 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 |

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 15 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 16.

#### 3.12.1.2. Employment

Table 17 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.

**Table 17: 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 18: 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 <sup>1</sup> | 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                                  |

<sup>1</sup>Equals 5-year average 1980-84.

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 19: Employment Earnings by Major Business Sector, Williamson County, 1980 and 2000**

| <b>Sector</b>                            | <b>1980<br/>(thousands)</b> | <b>Percent of<br/>Total<br/>Employment</b> | <b>2000<br/>(thousands)</b> | <b>Percent of<br/>Total<br/>Employment</b> | <b>Percent<br/>Change in<br/>Employment,<br/>1980-2000</b> |
|--|-----------------------------|--|-----------------------------|--|--|
| 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/<br>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<br>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<br>Earnings             | \$604,056                   | 100.00                                     | \$789,314                   | 100.00                                     | 30.70  |
| Illinois Total<br>Employment<br>Earnings | \$194,155,230               | 100.00                                     | \$293,692,287               | 100.00                                     | 51.30  |

Table 18 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<sup>3</sup>

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, Illi-

nois, 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.

3. All dollar figures have been adjusted for inflation for year 2000 dollars.

**Table 20: Employment Earnings by Major Business Sector, Jackson County, 1980 and 2000**

| Sector                             | 1980<br>(thousands) | Percent of Total<br>Employment | 2000<br>(thousands) | Percent of<br>Total<br>Employment | Percent<br>Change in<br>Employment,<br>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  |

**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 |
|---------------------------|--------------|-----------------|------|--------------|
| <i>Salary Impacts</i>     |              |                 |      |              |
| 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    |
| <i>Non-salary Impacts</i> |              |                 |      |              |
| 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  |

**Table 23: Annual Tax Impacts of Refuge Expenditures**

|                               | <b>Federal Taxes</b> | <b>State and Local Taxes</b> | <b>Total Taxes</b> |
|-------------------------------|----------------------|------------------------------|--------------------|
| <i>Salary Tax Impacts</i>     |                      |                              |                    |
| 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          |
| <i>Non-salary Tax Impacts</i> |                      |                              |                    |
| 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 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. 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 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<sup>4</sup> 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 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.<sup>5</sup>

5. *More technically, direct effects are production changes associated with the immediate effects of changes 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.*

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

**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  |

**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       |

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.

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

**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  |

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 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%             |

**Table 30: Annual Number of Refuge Acres Farmed and Production Value Compared with the Study Area**

| Area  | Acres <sup>1</sup> | Value <sup>2</sup> |
|---|--------------------|--------------------|
| 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 <sup>1</sup> | Value <sup>2</sup> |
|---|-------------------------|--------------------|
| 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<sup>1</sup>**

| 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.

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).

### 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.

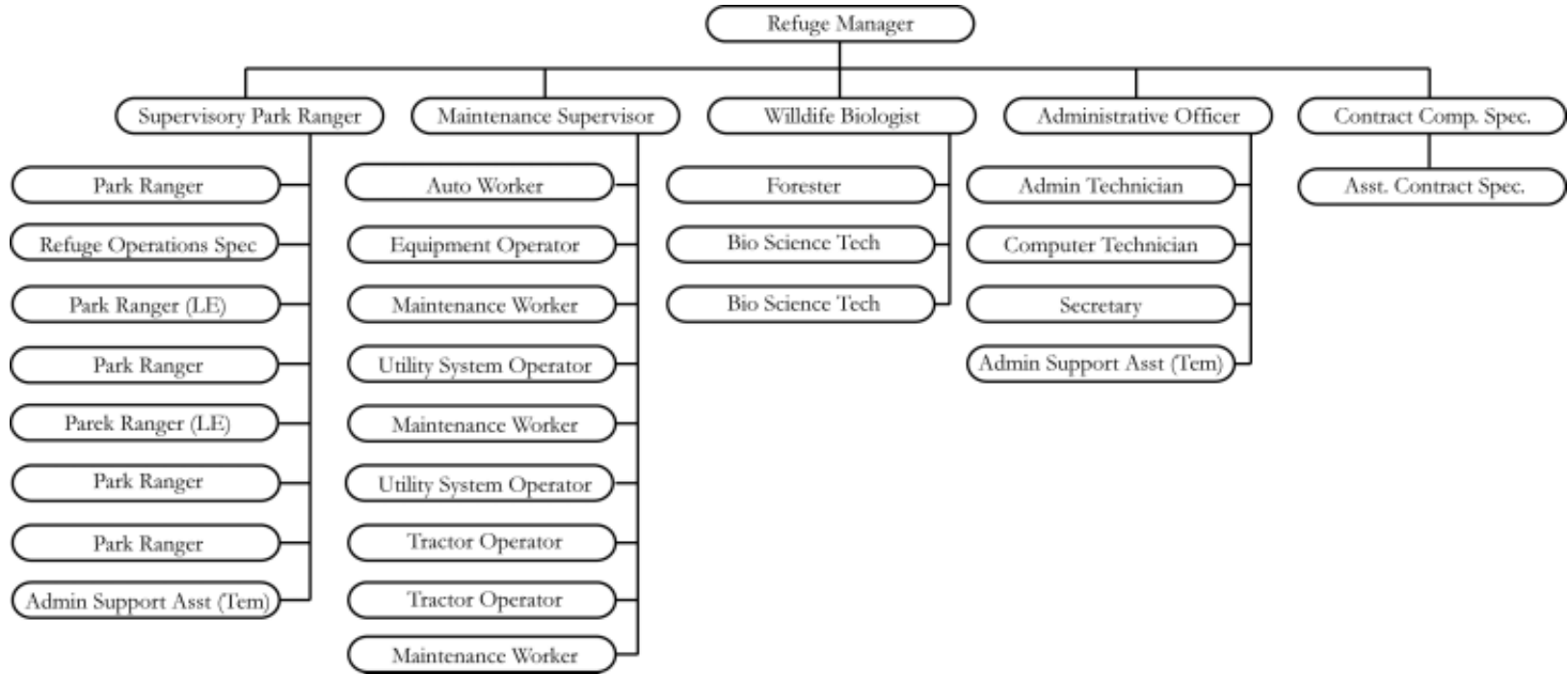
Southern Illinois University, Touch of Nature, the Friends of Crab Orchard NWR and the Refuge's Visitor Services Program have partnered to provide environmental education opportunities for local schools.

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



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 the same under all alternatives. Farming would have a small possible negative impact on cultural

**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<sup>1</sup>**

| Species                      | 2000 | 2015   |        |        |        |        | 2100   |        |        |        |        |
|------------------------------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                              |      | 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 <sup>2</sup>    | 1.39 | 1.50   | 1.51   | 1.49   | 1.52   | 1.51   | 1.65   | 1.66   | 1.63   | 1.67   | 1.66   |
| Grassland Birds <sup>3</sup> | 0.14 | 0.09   | 0.08   | 0.09   | 0.08   | 0.08   | 0.08   | 0.08   | 0.08   | 0.08   | 0.08   |
| Shrubland Birds <sup>4</sup> | 0.23 | 0.17   | 0.17   | 0.17   | 0.17   | 0.17   | 0.15   | 0.16   | 0.16   | 0.16   | 0.16   |
| Waterfowl <sup>5</sup>       | 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., Timothy 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.*

resources under all alternatives. The industrial programs 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 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 are conducting a Section 7 review concurrent with the review of the Draft EIS. The Section 7 review will examine 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. 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 are conducting a Section 7 review concurrent with the review of the Draft EIS. The Section 7 review will examine the prescribed fire program.

#### 4.2.7.5. 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.

#### 4.2.7.6. 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.

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 85, Figure 6 on page 34, and Figure 7 on page 35, respectively.

#### 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 131). 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 131). 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.

**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<br>(No Action) | Alts. B and E<br>(Preferred) | Alt. C<br>(Open Land) | Alt. D<br>(Forest) | Alt. A<br>(No Action) | Alts. B and E<br>(Preferred) | Alt. C<br>(Open Land) | Alt. D<br>(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**

| Land Cover  | 2000   | 2015                | 2100                | 2015   | 2100   | 2015                | 2100                | 2015             | 2100             |
|---|--------|---------------------|---------------------|--|--|---------------------|---------------------|------------------|------------------|
|   |        | Alt. A<br>No Action | Alt. A<br>No Action | Alts.<br>B and E<br>(Preferred<br>Alternative) | Alts.<br>B and E<br>(Preferred<br>Alternative) | Alt. C<br>Open Land | Alt. C<br>Open Land | Alt. D<br>Forest | Alt. D<br>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               |

#### 4.3.1.3. 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 131). 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 41). 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 41). 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 131). Most of these decreases would result from the succession of fallow fields to shrub land and forest (Table 35 on page 135). 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 fire-breaks 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 41). 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 135. The distribution of land cover types for the years 2000, 2015, and 2100 are shown in Figure 21 on page 85), Figure 9 on page 42, and Figure 10 on page 43, 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 131). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35 on page 135). The amount of forest (nesting) habitat would be 1 percent larger than in Alternative A (Table 36 on page 136).

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).

#### 4.4.1.3. 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 131). The amount of food producing habitat would be 1 percent less than under Alternative A (Table 2 on page 41). 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 41). 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 131). 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, 124 acres of linear forest habitat and 8 miles of hedge rows would be removed to enhance nesting habitat for grassland birds.

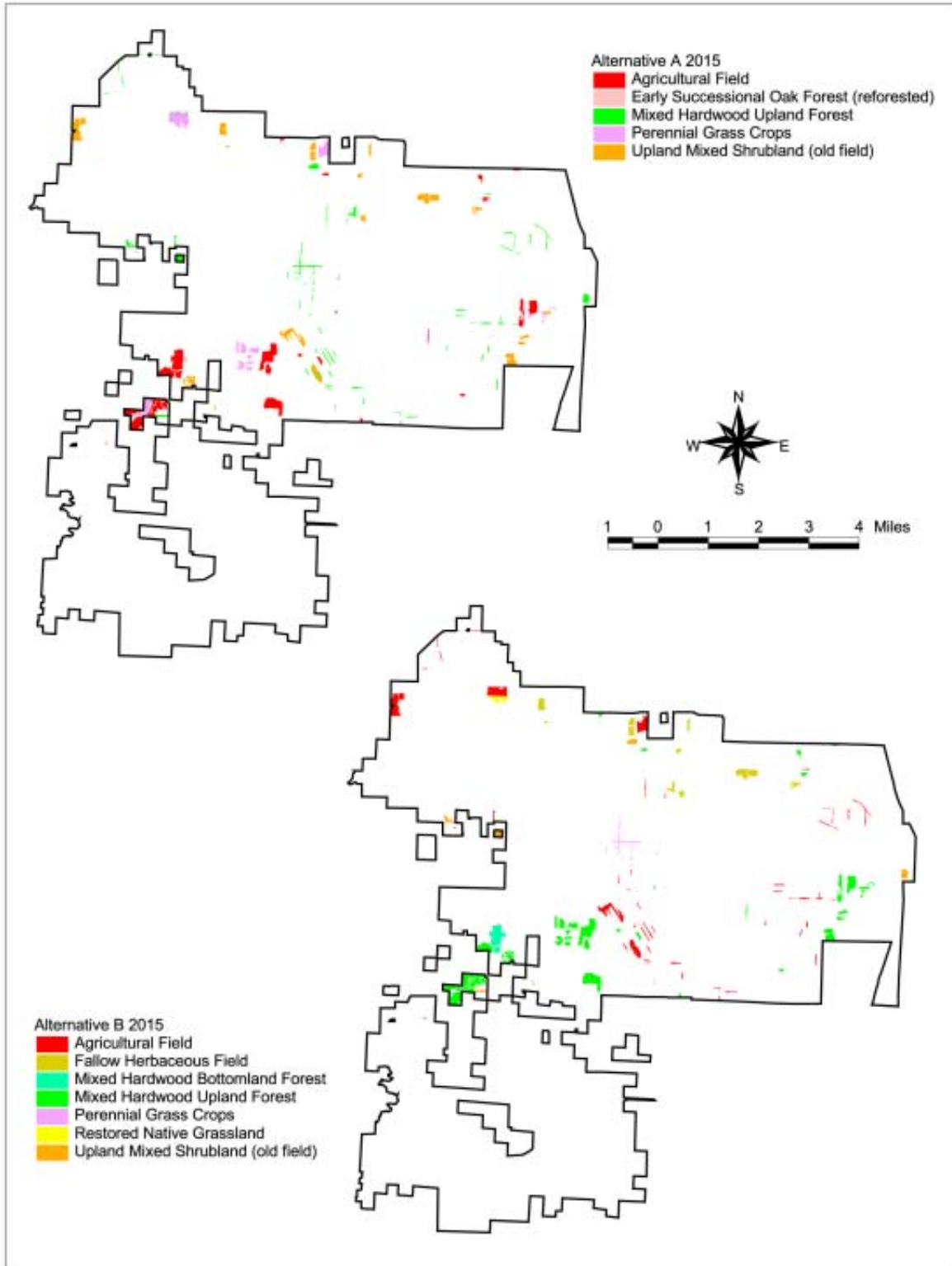
#### 4.4.1.6. Shrubland Birds

Under Alternative B, the PSO score for shrubland 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 shrubland 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.

**Figure 39: Differences in Land Cover, Crab Orchard NWR (Alternative A (No Action) / Alternative B and Alternative E (Preferred Alternative), 2015**





#### 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 fire-breaks 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-vegetated. 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, 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*

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 be operated as concessions and 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.

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



Glenn Smart

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 135. The distribution of land cover

for the years 2000, 2015, and 2100 are shown in Figure 21 on page 85, Figure 15 on page 58, and Figure 16 on page 59, 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 131). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35 on page 135). The amount of forest (nesting) habitat would be less than 1 percent smaller than in Alternative A (Table 36 on page 136).

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 131). 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 136).

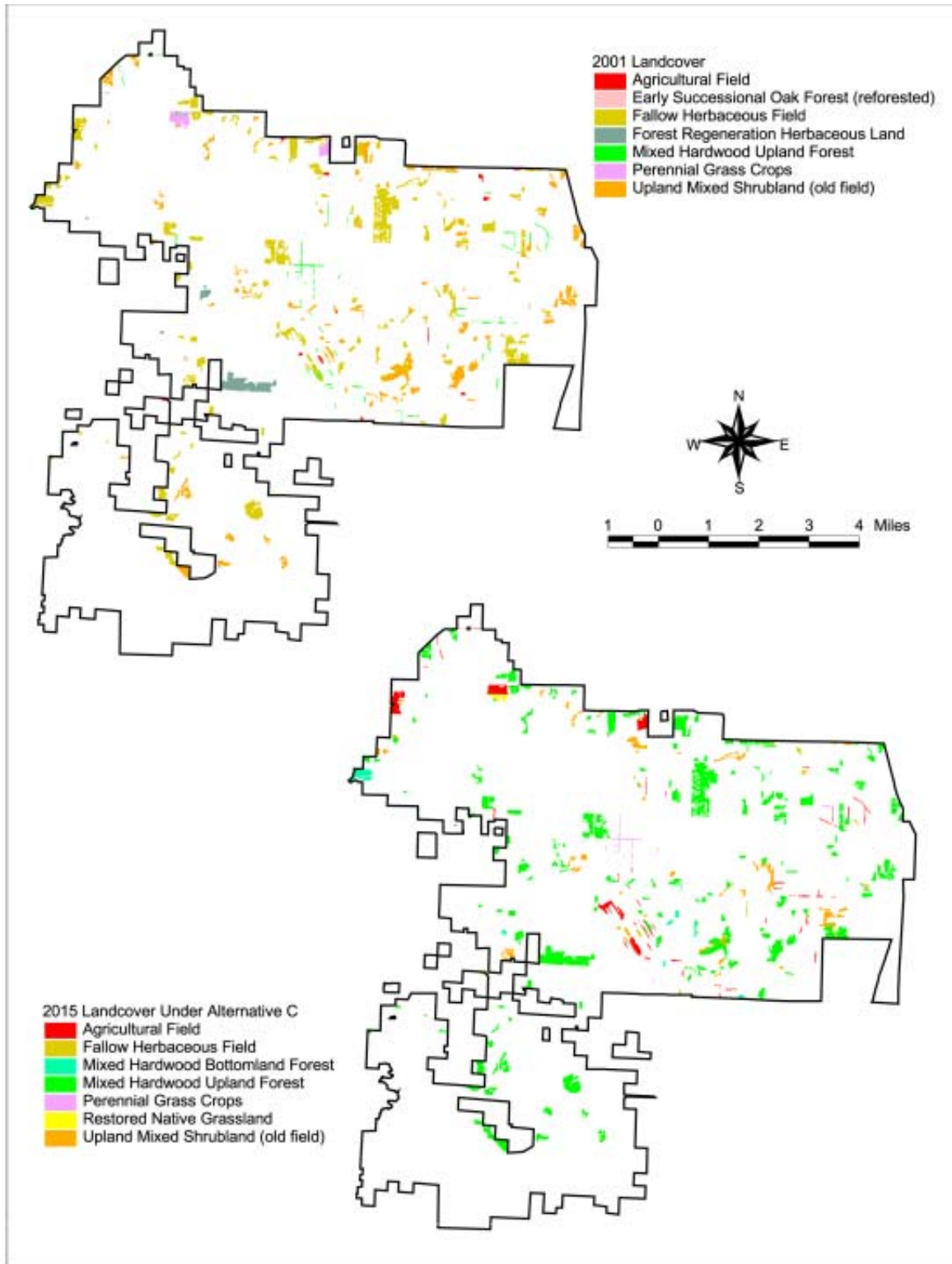
#### 4.5.1.4. Waterfowl and Other Water Bird Species

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 131). The amount of food-producing habitat would be 2 percent greater than under Alternative A (Table 2 on page 41). 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 41). 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

**Figure 40: Predicted Difference in Land Cover, Alternative A (No Action) / Alternative C (Open Land Management), 2015**



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 137).

#### 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 137).

#### *Picnicking*

Same as Alternative A (page 138).

#### *Motorboating/sailing*

Same as Alternative A (page 138).

#### *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 be operated as concessions and 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 run as a concession 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 142).

#### *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 142).

### **4.5.3 Volunteer and Support Groups**

Same as Alternative B (page 142).

### **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 wild-life 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 135. The distribution of land cover types for the years 2000, 2015, and 2100 are shown in Figure 21 on page 85, Figure 17 on page 66 and Figure 18 on page 67, 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 131). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35 on page 135). 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 136).

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 131).

#### 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 136). 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 41). 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 41). 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

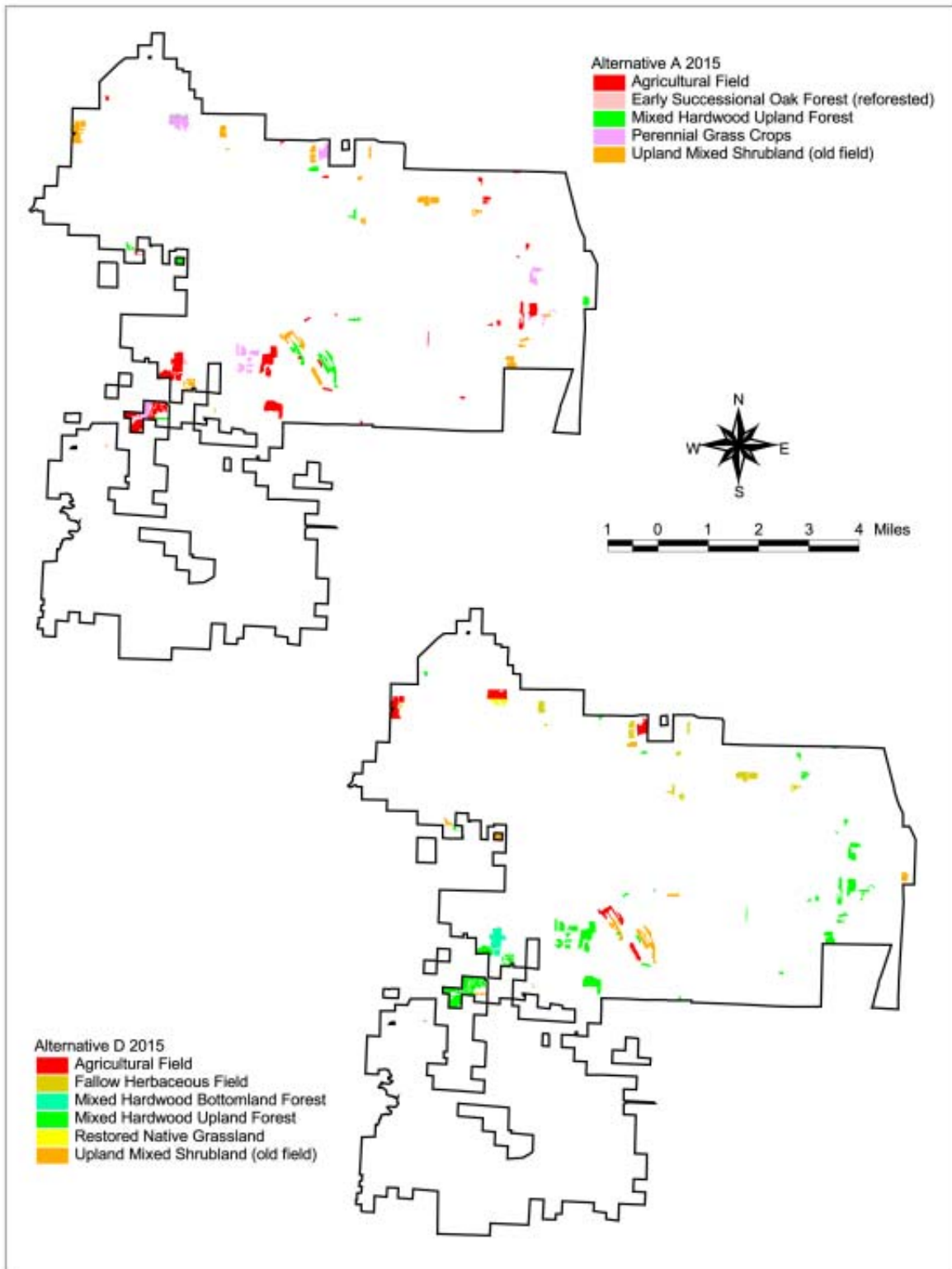
Under Alternative D, the PSO score for grassland birds would be 11 percent less by the end of the 15-year planning period and the same by the year 2100 as under Alternative A (Table 34 on page 131). As in Alternative A, nesting conditions for grassland birds would be improved by the prohibition of mowing 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.



**Figure 41: Predicted Difference in Land Cover, Alternative A (No Action) / Alternative D (Forest Land Management), 2015**



#### 4.6.1.7. Water Quality

Same as Alternative A (page 137).

#### 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 fire-breaks 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 146).

#### *Swimming*

Same as Alternative A (page 137).

#### *Picnicking*

Same as Alternative A (page 138).

#### *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 147).

#### *Marinas*

Same as Alternative C (page 147).

#### *Group Camps*

Same as Alternative B (page 142).

#### *Private Clubs*

Same as Alternative C (page 147).

#### *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 142).

### 4.6.4 Impacts on Industrial Use

Same as Alternative C (page 147).

### 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 than 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 148).

## 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 135. The distribution of land cover types for the years 2000, 2015, and 2100 are shown in Figure 21 on page 85, Figure 9 on page 42 and Figure 10 on page 43, 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 140.

#### 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 131). The amount of open water (feeding) habitat would be the same as in Alternative A (Table 35 on page 135). The amount of forest (nesting) habitat would be 1 percent larger than in Alternative A (Table 36 on page 136).

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 and Other Water Bird Species

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 41). 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 131). 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 grassland birds.

#### 4.7.1.6. Shrubland Birds

Under Alternative E, the PSO score for shrubland 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 shrubland bird habitat (124 acres of linear forest habitat and 8 miles of hedge rows) would be removed to enhance nesting habitat for grassland birds.

#### 4.7.1.7. 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 fire-breaks 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*

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*

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*

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 southernmost 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 be operated as concessions and 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 operated under concession. The changes would result in a consolidated marina operation run as a concession 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.

#### 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;

**Table 37: Comparison of Annual Economic Effects of Alternatives on Hunting in the Study Area**

| Category                       | Alt. A<br>(No<br>Action) | Change from Alt. A |                     |
|--------------------------------|--------------------------|--------------------|---------------------|
|                                |                          | Alt. B             | Alts. C, D<br>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<br>(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**

| Category                       | Alt. A<br>(No Action) | Change from Alt. A |                     |
|--------------------------------|-----------------------|--------------------|---------------------|
|                                |                       | Alt. B             | Alts. C, D<br>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<br>(number of jobs) | 180.5                 | 9                  | 0                   |
| Labor income                   | \$3,972,468           | \$198,073          | 0                   |

**Table 39: Comparison of Annual Economic Effects of Alternatives on Wildlife Observation**

| Category                       | Alt. A<br>(No Action) | Change from Alt. A |                  |
|--------------------------------|-----------------------|--------------------|------------------|
|                                |                       | 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<br>(number of jobs) | 118                   | 12                 | 3                |
| Labor income                   | \$2,477,711           | \$251,971          | \$62,993         |

- # 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 increase in wildlife observation and photography on the Refuge (Table 39).



**Table 40: Comparison of Annual Economic Effects of Alternatives on Boating**

| Category                       | Change from Alt. A    |           |                  |
|--------------------------------|-----------------------|-----------|------------------|
|                                | Alt. A<br>(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<br>(number of jobs) | 83.6                  | 4.4       | 0                |
| Labor income                   | \$2,068,264           | \$108,856 | 0                |

**Table 41: Comparison of Annual Economic Effects of Alternatives on Camping and Picnicking**

| Category                            | Change from Alt. A    |           |                  |
|-------------------------------------|-----------------------|-----------|------------------|
|                                     | Alt. A<br>(No Action) | Alt. B    | Alts. C, D and E |
| Activity days                       | 193,400               | 9,000     | 0                |
| Net economic value<br>(\$28.36/day) | \$5,484,824           | \$252,240 | 0                |
| Total expenditures<br>(\$15/day)    | \$2,901,000           | \$135,000 | 0                |
| Economic output                     | \$3,655,260           | \$170,100 | 0                |
| Employment<br>(number of jobs)      | 71.3                  | 3.3       | 0                |
| Labor income                        | \$1,569,180           | \$72,626  | 0                |

#### 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 higher overall campground utilization rate compared with Alternative A. Alternatives C, D and E would not materially affect campground usage on the Refuge (Table 41).

**Table 42: Summary of Economic Effects of Alternatives on Public Use**

| Category                       | Change from Alt. A    |             |                     |
|--------------------------------|-----------------------|-------------|---------------------|
|                                | Alt. A<br>(No Action) | Alt. B      | Alts. C, D and<br>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<br>(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 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.

**Table 43: Comparison of Annual Average Crop Values in Study Area**

|                     | Change from Alternative A |                    |  |           |                              |          |                           |           |
|---------------------|---------------------------|--------------------|--|-----------|------------------------------|----------|---------------------------|-----------|
|                     | 2001 Baseline<br>(Alt. A) |                    | Alts. B and E<br>(Preferred Alternative) |           | Alternative C<br>(Open Land) |          | Alternative D<br>(Forest) |           |
|                     | Acres                     | Value <sup>1</sup> | Acres                                    | Value     | Acres                        | Value    | Acres                     | Value     |
| Corn                | 1,877                     | \$506,784          | -53                                      | -\$14,288 | 87                           | \$23,553 | -99                       | \$26,679  |
| Clover <sup>2</sup> | 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 <sup>3</sup>    | 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 area 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.

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

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 gener-

**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 <sup>1</sup> | \$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.

**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 <sup>1</sup> |                      | \$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.

ated 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 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 192 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.

### 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 cen-



tral 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 priority 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 Alterna-



tive D and especially in Alternatives B, C, and E, grassland bird habitat 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.

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**

|  | <b>Alternative A:<br/>Current<br/>Management<br/>(No Action)</b>                        | <b>Alternative B:<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis With<br/>Land Exchange</b> | <b>Alternative C:<br/>Open Land<br/>Management,<br/>Consolidate<br/>and Improve<br/>Recreation</b>                    | <b>Alternative D:<br/>Forest Land<br/>Management,<br/>Consolidate<br/>and Improve<br/>Recreation</b>                         | <b>Alternative E:<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate<br/>and Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|--|---|---|---|--|---|
| <b>Threatened and Endangered Species</b> |   |   |   |  |   |
| <i>Bald Eagle</i>                        | 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.  |
| <i>Indiana bat</i>                       | 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.  |
| <b>Resident Fish &amp; Wildlife</b>      | Minimal impacts.  | Minimal impacts.  | Minimal Impacts   | Minimal impacts  | Minimal impacts   |
| <b>Canada Geese</b>                      | 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.   |
| <b>Waterbirds</b>                        | Minimal impacts.  | Minor increase in habitat.  | Minor increase in habitat.  | Minimal impacts.   | Minor increase in habitat.  |
| <b>Grassland Birds</b>                   | 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.  |
| <b>Area-sensitive Forest Birds</b>       | 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.   |
| <b>Shrubland Birds</b>                   | Decrease in habitat (26%).  | Decrease in habitat (26%).  | Decrease in habitat (26%).  | Decrease in habitat (26%).   | Decrease in habitat (26%).  |
| <b>Invasive Species</b>                  | Most species increase.  | Most species increase.  | Most species increase.  | Most species increase.   | Most species increase.  |
| <b>Agricultural Uses</b>                 | 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.   |



**Table 47: Summary of Effects of Alternatives Described in Chapter 4 (Continued)**

|   | <b>Alternative A:<br/>Current<br/>Management<br/>(No Action)</b> | <b>Alternative B:<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis With<br/>Land Exchange</b> | <b>Alternative C:<br/>Open Land<br/>Management,<br/>Consolidate<br/>and Improve<br/>Recreation</b> | <b>Alternative D:<br/>Forest Land<br/>Management,<br/>Consolidate<br/>and Improve<br/>Recreation</b> | <b>Alternative E:<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate<br/>and Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|---|--|---|--|--|---|
| <b>Wilderness</b>                                 | 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.   |
| <b>Industrial Uses</b>                            | Minimal impacts.   | Minimal impacts.  | Minor decreases in facilities.   | Minor decreases in facilities.   | Minimal impacts.  |
| <b>Hunting</b>                                    | 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.  |
| <b>Fishing</b>                                    | 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.  |
| <b>Wildlife Viewing &amp; Photography</b>         | 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.  |
| <b>Interpretation and Environmental Education</b> | 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.  |
| <b>Swimming</b>                                   | No change.   | Increased opportunities provided by SIU.  | Minimal impacts.   | Minimal impacts.   | Minimal impacts.  |
| <b>Camping</b>                                    | 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.  |
| <b>Picnicking</b>                                 | Minor improvements.  | Increased opportunities provided by SIU.  | Minor improvements.  | Minor improvements.  | Minor improvements.   |
| <b>Motor boating /Sailing</b>                     | 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 Lake.                           | Minor restrictions in use (zoning); restricted use on Devils Kitchen Lake.  |
| <b>Water-skiing</b>                               | 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.   |
| <b>Marinas</b>                                    | 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)**

|                                     | <b>Alternative A:<br/>Current<br/>Management<br/>(No Action)</b>   | <b>Alternative B:<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Wildlife-<br/>dependent<br/>Recreation<br/>Emphasis With<br/>Land Exchange</b> | <b>Alternative C:<br/>Open Land<br/>Management,<br/>Consolidate<br/>and Improve<br/>Recreation</b>                               | <b>Alternative D:<br/>Forest Land<br/>Management,<br/>Consolidate<br/>and Improve<br/>Recreation</b>                             | <b>Alternative E:<br/>Reduced<br/>Habitat<br/>Fragmentation,<br/>Consolidate<br/>and Improve<br/>Recreation<br/>(Preferred<br/>Alternative)</b> |
|-------------------------------------|--|---|--|--|---|
| <b>Group Camps</b>                  | 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.   |
| <b>Private Clubs</b>                | 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.                |
| <b>Horseback Riding</b>             | Minimal impacts.   | More restricted opportunities.  | More restricted opportunities.   | No horseback riding.   | More restricted opportunities.  |
| <b>Water Quality</b>                | Minimal impacts.   | Minor improvements.   | Minor improvements.  | Minimal impacts.   | Minor improvements.   |
| <b>Communication with Community</b> | Improved.  | Improved.   | Improved.  | Improved.  | Improved.   |
| <b>Volunteer Program</b>            | Minimal impacts.   | Improved.   | Improved.  | Improved.  | Improved.   |
| <b>Cultural Resources</b>           | No impacts.  | No impacts.   | No impacts.  | No impacts.  | No impacts.   |
| <b>Economics</b>                    | Minimal impacts.   | Most positive impact.   | Minimal positive impacts.  | Minimal positive impacts.  | Minimal positive impacts.   |
| <b>Fire</b>                         | Minimal impacts.   | Minimal impacts.  | Minimal impacts.   | Minimal impacts.   | Minimal impacts.  |
| <b>Environmental Justice</b>        | 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.  |
| <b>Climate Change</b>               | 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.   |
| <b>Air Quality</b>                  | Minimal impacts.   | Minimal impacts.  | Minimal impacts.   | Minimal impacts.   | Minimal impacts.  |

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# Chapter 5: List of Preparers

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# 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 Draft Comprehensive Conservation Plan. The public participation process is described in detail in Chapter One of this Draft Environmental Impact Statement. Also included in the present chapter is a list of all organizations and persons who have been sent a copy of this Draft Environmental Impact Statement and Draft Comprehensive Plan or Summary. Each Draft Summary contains a postage paid comment card and information on how to obtain a copy of the Draft Environmental Impact Statement.

## 6.1 Summary of Public Involvement

We began asking for public comments regarding the 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.

## 6.2 List of Agencies, Organizations and Individuals Receiving a Draft Document

Copies of the Draft Environmental Impact Statement and/or Draft Environmental Impact Statement Summary were provided to Federal, state, and local agencies and elected officials, businesses, organizations, and media.

### 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, Illinois
- # Midwest Regional Rep, Wildlife Management Institute, Pratt, Kansas
- # National Audubon Society, Washington, D.C.
- # National Rifle Association, Fairfax, Virginia
- # 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 Draft EIS/CCP Summary.





# **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 Draft Comprehensive Conservation Plan/Environmental Impact Statement. Elements dealing with the implementation of the plan, not included in the Draft 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. Numbers in parentheses following some strategies indicate that the project is included in the Refuge's Refuge Operations Needs System (RONS). Appendix K contains a list of the priority RONS projects. Following public review and comment of the Draft CCP/EIS, we will publish a Final EIS and a stand-alone CCP made up of the EIS Chapter 1, the selected alternative from Chapter 2, Chapters 3, 5, 6 and the appendices.

Listed in the following pages are the goals, objectives and strategies that we plan to pursue over the next 15 years. Numbers in parentheses following some strategies indicate that the project is included in the Refuge's Refuge Operations Needs System (RONS). Appendix K is a list of the priority RONS projects.

## 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.

*Strategies:*

1. Provide 1,840 acres of corn, 960 acres of winter wheat, and 1,600 acres of clover annually, averaged over a 5-year period.

2. Enhance and create enough moist-soil habitat to have the capability to actively manage 500 acres of moist-soil habitat annually. (02006)
3. Continue prohibition of boating on Crab Orchard Lake east of Wolf Creek Road during the goose wintering season.
4. Mow the shorelines of selected ponds in the fall.
5. Ensure technical support of the agricultural program (02007)
6. Remove woody fence rows and roadside vegetation (02008)
7. Remove trees from explosives storage bunkers and replace with grass. (02009)

#### 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.

*Strategies:*

1. Conduct reforestation activities that may include site preparation (mechanical clearing and/or applying herbicides to unwanted vegetation), planting hardwood tree seedlings, and follow-up mechanical or chemical treatments.
2. Conduct periodic prescribed burning to encourage oak-hickory forest.
3. Thin non-native pine plantations (02001)
4. Increase pest plant control efforts (97001)
5. Reduce forest fragmentation (97009)
6. Enhance forest management (97008)
7. Conduct Indiana bat surveys (98027)

## 2.2 Objective

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

*Strategies:*

1. Conduct prescribed burning in pine plantations during the dormant season (November through March) on a 3- to 5-year cycle to enhance habitat conditions and promote desirable hardwood regeneration.
2. Increase pest plant control efforts. (97001)
3. Enhance forest management. (97008)
4. Thin non-native pine plantations. (02001)
5. Conduct Indiana bat surveys. (98027)

## 2.3 Objective

Maintain about 300 acres in early successional habitat.

*Strategies:*

1. Maintain about 200 acres of early successional habitat with burning and mowing. (02005)
2. Maintain about 100 acres of 30-foot-wide borders of native warm-season grasses in row crop fields in the open area of the Refuge.
3. Increase pest plant control efforts. (97001)

## 2.4 Objective

Maintain 260 acres of native, warm-season grassland to benefit area sensitive grassland birds.

*Strategies:*

1. Remove woody fencerows and roadside vegetation (02008).
2. Control or eliminate invasive species. (97001)

## 2.5 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:*

1. Remove woody fencerows and roadside vegetation adjacent to grasslands (02008).
2. Convert fescue pastures to native, warm-season grasses and more desirable cool-season grasses. (02002)

3. Maintain grassland structure desirable to breeding grassland birds through grazing and prescribed burning.
4. Control or eliminate invasive species. (97001)
5. Mow hay and clover fields after August 1.
6. Increase technical support of agricultural program. (02007)
7. Remove trees from explosives storage bunkers and replace with grass. (02009)

## 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:*

1. Construct new moist-soil units for a total of 50 to 70 acres of additional moist-soil habitat. (02006)
2. Maintain dikes on existing units.
3. Repair and maintain water control structures on existing units.
4. Increase pest plant control efforts (97001)

## 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:**

*The Service will manage the Crab Orchard Wilderness according to Service policy and the Wilderness Act of 1964.*

##### **7.1 Objective:**

Meet the guidelines of Service policy for wilderness management.

*Strategies:*

1. Recommend the designation of two parcels totaling about 120 acres as Wilderness.
2. Revise and implement the Crab Orchard Wilderness Management Plan within 5 years of approval of the CCP.
3. Explore opportunities with the U.S. Forest Service for cooperative management of the adjacent Panther Den Wilderness.

## 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 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 10 years and in cooperation with a partner organization, improve all hunting blinds used in the controlled goose hunting program. 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 wording within 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 current policies on tournaments and fish-offs conducted 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 existing 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 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. 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.
2. Within 2 years of this plan's approval, develop an observation/photography brochure 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.
3. Within 2 years of this plan's approval, improve the existing photography/observation blinds and platform by adding camouflage as needed to enhance viewing opportunities. Maintain existing blinds and platforms. Position interpretive and identification panels in or near blinds and platform to promote understanding and appreciation of natural and cultural resources. Enhance panels to promote awareness of Crab Orchard as a component of a National Wildlife Refuge System.
4. Within 5 years of this plan's approval, add additional blinds/platforms, including interpretive and identification panels, where 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 this 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 pho-

tography through participation in selected community and regional birding, nature, and photography festivals and events.

6. Within 8 years of this 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 this plan, expand the Refuge web site to promote wildlife and cultural resource 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.

#### 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 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 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 orienta-

tions. 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 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. Ensure volunteers and Friends members are treated professionally and courteously by Refuge staff.
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, Cambria Neck, Playport Marina and the Visitor Center. 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 area of the Refuge. The route would run along old railroad beds.
3. Continue current policies on swimming at Devils Kitchen, Little Grassy, and Crab Orchard Lakes.
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. Modify current policies on lake zoning on Crab Orchard Lake with additional no-wake zones (See Figure 11 on page 51).
6. Horseback use on the Refuge would be confined to designated trails only (see Figure 12, page 66) and erosion due to trail use would be actively controlled through maintenance and/or seasonal closures.
7. Camping at Devils Kitchen would be discontinued to allow the Service to upgrade Crab Orchard and Little Grassy Campgrounds 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 contract.
10. 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.

**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, wild-life, 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).

**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. Address erosion with buffer strips. 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 cattle among the paddocks during the grazing season. Enlist technical support 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 48 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 48: Step-down Management Plans**

| 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                 |

**Table 48: Step-down Management Plans**

| <b>Title</b>                                    | <b>Service Manual Reference</b> |
|---|---------------------------------|
| 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                        |
| 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: 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 nec-

essary. 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.

### **Geographic Information System**

GIS aids in the collection, analysis, output and distribution of spatial data and information.

### **Goose-use-day**

Enough food to feed one goose for one day.

### **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.

### **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.

### **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).

**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, non-governmental 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, 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” (PL. 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 (PL. 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 (PL. 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 (PL. 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 Sec-

retary 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 (PL. 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 4601 - 4601-11) 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 con-

trolled 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

### **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; PL. 96-510, December 11, 1980; 94 Stat. 2797). Major amendments were enacted in 1983 (42 U.S.C. 9601-9657; PL. 98-802, August 23, 1983; 97 Stat. 485) and in 1986 (PL. 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 |
|   |    |   |   |   |
| BITTERN, 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 | - |

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**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 |

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### 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 |
|                           |    |   |   |   |
| <b>GALLINACEOUS BIRDS</b> | Sp | S | F | W |
| Wild Turkey*              | c  | c | c | c |
| Northern Bobwhite*        | c  | c | c | c |
|                           |    |   |   |   |
| <b>RAILS</b>              | Sp | S | F | W |
| Virginia Rail             | r  | r | r | - |
| Sora                      | o  | - | o | - |
| American Coot             | u  | u | c | c |
| <b>SHOREBIRDS</b>         | 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 | - |
|                           |    |   |   |   |
| <b>GULLS, TERNS</b>       | 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 | - |
|                           |    |   |   |   |

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**Bird Species Found on Crab Orchard NWR**

| Species                            | Sp | S | F | W |
|------------------------------------|----|---|---|---|
| <b>DOVES</b>                       | Sp | S | F | W |
| Rock Dove                          | u  | u | u | u |
| Mourning Dove                      | c  | c | c | c |
|                                    |    |   |   |   |
| <b>CUCKOOS</b>                     | Sp | S | F | W |
| Black-billed Cuckoo                | o  | o | o | - |
| Yellow-billed Cuckoo               | u  | c | c | - |
|                                    |    |   |   |   |
| <b>OWLS</b>                        | 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 |
|                                    |    |   |   |   |
| <b>GOATSUCKERS</b>                 | Sp | S | F | W |
| Common Nighthawk*                  | o  | u | o | - |
| Chuck-will's-widow*                | o  | o | - | - |
| Whip-poor-will                     | u  | u | o | - |
|                                    |    |   |   |   |
| <b>SWIFTS, HUMMINGBIRDS</b>        | Sp | S | F | W |
| Chimney Swift*                     | c  | c | c | - |
| Ruby-throated Hummingbird*         | u  | c | o | - |
|                                    |    |   |   |   |
| <b>KINGFISHERS</b>                 | Sp | S | F | W |
| Belted Kingfisher*                 | u  | u | u | u |
|                                    |    |   |   |   |
| <b>WOODPECKERS</b>                 | 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 |
|                                    |    |   |   |   |
| <b>FLYCATCHERS</b>                 | 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 | - |
|                                |    |   |   |   |
| <b>LARKS</b>                   | Sp | S | F | W |
| Horned Lark*                   | o  | o | o | o |
|                                |    |   |   |   |
| <b>SWALLOWS</b>                | 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 | - |
|                                |    |   |   |   |
| <b>JAYS, CROWS</b>             | Sp | S | F | W |
| Blue Jay*                      | a  | a | a | a |
| American Crow*                 | c  | c | c | - |
| Fish Crow                      | o  | o | o | o |
|                                |    |   |   |   |
| <b>CHICKADEES</b>              | Sp | S | F | W |
| Carolina Chickadee*            | c  | c | c | c |
| Tufted Titmouse*               | c  | c | c | c |
|                                |    |   |   |   |
| <b>NUTHATCHES</b>              | Sp | S | F | W |
| Red-breasted Nuthatch          | o  | - | o | u |
| White-breasted Nuthatch        | u  | o | u | u |
|                                |    |   |   |   |
| <b>CREEPERS</b>                | Sp | S | F | W |
| Brown Creeper                  | o  | - | o | o |
|                                |    |   |   |   |
| <b>WRENS</b>                   | 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 | - |

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**Bird Species Found on Crab Orchard NWR**

| Species                | Sp | S | F | W |
|------------------------|----|---|---|---|
| <b>KINGLETS</b>        | Sp | S | F | W |
| Golden-crowned Kinglet | u  | - | u | u |
| Ruby-crowned Kinglet   | u  | - | u | u |
| Blue-gray Gnatcatcher* | e  | c | o | - |
|                        |    |   |   |   |
| <b>THRUSHES</b>        | Sp | S | F | W |
| Eastern Bluebird*      | e  | e | e | e |
| 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*        | e  | e | e | u |
|                        |    |   |   |   |
| <b>THRASHERS</b>       | Sp | S | F | W |
| Gray Catbird*          | e  | c | e | - |
| Northern Mockingbird*  | e  | e | e | e |
| Brown Thrasher*        | e  | c | e | o |
|                        |    |   |   |   |
| <b>WAXWINGS</b>        | Sp | S | F | W |
| Cedar Waxwing*         | e  | u | u | e |
|                        |    |   |   |   |
| <b>SHRIKES</b>         | Sp | S | F | W |
| Loggerhead Shrike      | u  | u | u | u |
|                        |    |   |   |   |
| <b>STARLINGS</b>       | Sp | S | F | W |
| European Starling*     | a  | a | a | a |
|                        |    |   |   |   |
| <b>VIREOS</b>          | Sp | S | F | W |
| White-eyed Vireo*      | e  | c | u | - |
| Bell's Vireo           | r  | r | - | - |
| Yellow-throated Vireo* | o  | u | o | - |
| Warbling Vireo*        | e  | e | o | - |
| Red-eyed Vireo*        | u  | u | o | - |
|                        |    |   |   |   |
| <b>WOOD WARBLERS</b>   | Sp | S | F | W |
| Blue-winged Warbler    | o  | r | r | - |
| Golden-winged Warbler  | o  | r | - | r |
| Tennessee Warbler      | u  | - | o | - |
| Nashville Warbler      | r  | - | r | - |

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### 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 | - |
|                              |    |   |   |   |
| <b>TANAGERS</b>              | Sp | S | F | W |
| Summer Tanager*              | u  | u | o | - |
| Scarlet Tanager*             | u  | u | o | - |
|                              |    |   |   |   |
| <b>SPARROWS</b>              | 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 | - |
| Dickeissel*                  | 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 | e |
| Swamp Sparrow                     | u  | - | u | u |
| White-throated Sparrow            | e  | - | e | e |
| White-crowned Sparrow             | e  | - | e | e |
| Dark-eyed Junco                   | a  | - | e | a |
|                                   |    |   |   |   |
| MEADOWLARKS, BLACK-BIRDS, ORIOLES | Sp | S | F | W |
| Red-winged Blackbird*             | e  | e | a | e |
| Eastern Meadowlark*               | e  | e | e | e |
| Common Grackle*                   | e  | e | a | e |
| Brown-headed Cowbird*             | e  | e | e | e |
| Orchard Oriole*                   | u  | u | o | - |
| Baltimore Oriole*                 | u  | u | o | - |
|                                   |    |   |   |   |
| FINCHES                           | Sp | S | F | W |
| House Finch                       | e  | e | e | e |
| Purple Finch                      | e  | - | u | e |
| Pine Siskin#                      | o  | - | o | o |
| American Goldfinch*               | e  | e | e | e |
| Evening Grosbeak#                 | o  | - | - | o |
|                                   |    |   |   |   |
| OLD WORLD SPARROWS                | Sp | S | F | W |
| House Sparrow*                    | e  | e | e | e |

*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             |
|---------------------------|---------------------------------------|-------|-----------|------------------|---------------------|
| <b>Salamanders</b>        |                                       |       |           |                  |                     |
| spotted salamander        | <i>Ambystoma maculatum</i>            | A     | B, W      | U                | W, BF, UF           |
| marbled salamander        | <i>Ambystoma opacum</i>               | A     | B, W      | U                | W, BF               |
| smallmouth salamander     | <i>Ambystoma texanum</i>              | A     | B, W      | U                | W, BF               |
| tiger salamander          | <i>Ambystoma tigrinum</i>             | A     | B, W      | U                | W, UF, BF           |
| eastern newt              | <i>Notophthalmus viridescens</i>      | A     | B, W      | U                | W, BF               |
| northern slimy salamander | <i>Plethodon glutinosus</i>           | A     | B, W      | C                | UF, BF, RB          |
| lesser siren              | <i>Siren intermedia</i>               | A     | B, W      | U                | W, S                |
| <b>Toads and Frogs</b>    |                                       |       |           |                  |                     |
| cricket frog              | <i>Acris crepitans</i>                | A     | B, W      | A                | W, RB, R, UF, S, BF |
| American toad             | <i>Bufo americanus</i>                | A     | B, W      | C                | W, RB, UF, PF, BF   |
| Fowler-s toad             | <i>Bufo fowleri</i>                   | A     | B, W      | C                | W, RB, UF, PF, BF   |
| green treefrog            | <i>Hyla cinerea</i>                   | A     | B, W      | U                | W, R, BF            |
| gray treefrog             | <i>Hyla chrysoscelis / versicolor</i> | A     | B, W      | C                | W, UF, BF, PF       |
| spring peeper             | <i>Pseudacris crucifer</i>            | A     | B, W      | C                | W, UF, BF           |
| upland chorus frog        | <i>Pseudacris feriarum</i>            | A     | B, W      | C                | W, RB, UF, BF       |
| crawfish frog             | <i>Rana areolata</i>                  | A     | B, W      | R                | W                   |
| bullfrog                  | <i>Rana catesbeiana</i>               | A     | B, W      | A                | W, R, BF, S         |
| green frog                | <i>Rana clamitans</i>                 | A     | B, W      | C                | W, R, BF, S         |
| southern leopard frog     | <i>Rana sphenoccephala</i>            | A     | B, W      | A                | W, R, BF, S         |
| wood frog                 | <i>Rana sylvatica</i>                 | A     | B, W      | R                | W, BF               |
| eastern spadefoot         | <i>Scaphiopus holbrookii</i>          | A     | B, W      | R                | W, BF               |
| <b>Turtles</b>            |                                       |       |           |                  |                     |
| snapping turtle           | <i>Chelydra serpentina</i>            | R     | B, W      | C                | W, R, S             |
| painted turtle            | <i>Chrysemys picta</i>                | R     | B, W      | C                | W, S                |
| eastern box turtle        | <i>Terrapene carolina</i>             | R     | B, W      | A                | RB, UF, PF, BF      |
| red-eared slider          | <i>Trachemys scripta</i>              | R     | B, W      | C                | W, R, S             |
| eastern mud turtle        | <i>Kinosternon subrubrum</i>          | R     | B, W      | U                | W, BF               |
| common musk turtle        | <i>Sternotherus odoratus</i>          | R     | B, W      | C                | W, BF               |
| spiny softshell turtle    | <i>Apalone spinifera</i>              | R     | B, W      | U                | W, R, S             |
| <b>Lizards</b>            |                                       |       |           |                  |                     |
| fence lizard              | <i>Sceloporus undulatus</i>           | R     | B, W      | U                | UF, RB, BF          |
| ground skink              | <i>Scincella lateralis</i>            | R     | B, W      | C                | UF, RB, BF          |
| five-lined skink          | <i>Eumeces fasciatus</i>              | R     | B, W      | C                | UF, RB, BF          |
| six-lined racerunner      | <i>Cnemidophorus sexlineatus</i>      | R     | B, W      | R                | RB                  |
| <b>Snakes</b>             |                                       |       |           |                  |                     |
| worm snake                | <i>Carphophis amoenus</i>             | R     | B, W      | U                | RB, UF, BF          |
| racer                     | <i>Coluber constrictor</i>            | 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          | <i>Diadophis punctatus</i>       | R                   | B, W      | U                | RB, UF, BF       |
| rat snake               | <i>Elaphe obsoleta</i>           | R                   | B, W      | C                | RB, UF, PF, BF   |
| mud snake               | <i>Farancia abacura</i>          | R                   | B, W      | R                | W                |
| eastern hognose snake   | <i>Heterodon platirhinos</i>     | R                   | B, W      | U                | RB, UF, PF, BF   |
| prairie kingsnake       | <i>Lampropeltis calligaster</i>  | R                   | B, W      | C                | RB               |
| common kingsnake        | <i>Lampropeltis getula</i>       | R                   | B, W      | U                | RB, UF, BF       |
| plainbelly water snake  | <i>Nerodia erythrogaster</i>     | R                   | B, W      | C                | W, R, S          |
| diamondback water snake | <i>Nerodia rhombifer</i>         | R                   | B, W      | C                | W, R, S          |
| midland water snake     | <i>Nerodia sipedon</i>           | R                   | B, W      | C                | W, R, S          |
| rough green snake       | <i>Opheodrys aestivus</i>        | R                   | B, W      | U                | RB, UF, BF, PF   |
| brown snake             | <i>Storeria dekayi</i>           | R                   | B, W      | U                | RB, UF, BF       |
| redbelly snake          | <i>Storeria occipitomaculata</i> | R                   | B, W      | R                | RB, UF, BF       |
| common garter snake     | <i>Thamnophis sirtalis</i>       | R                   | B, W      | C                | W, S, RB, UF, BF |
| smooth earth snake      | <i>Virginia valeriae</i>         | R                   | B, W      | R                | RB, UF, BF       |
| copperhead              | <i>Agkistrodon contortrix</i>    | R                   | B, W      | U                | RB, UF, BF       |
| Total Amphibians = 20   |                                  | Total Reptiles = 28 |           |                  |                  |

## Mammal Checklist, Crab Orchard NWR

| Common Name                 | Scientific Name                  | Status on Refuge |
|-----------------------------|----------------------------------|------------------|
| Virginia opossum            | <i>Didelphis virginiana</i>      | C                |
| Southeastern shrew          | <i>Sorex longirostris</i>        | U                |
| Southern short-tailed shrew | <i>Blarina carolinensis</i>      | U                |
| Least Shrew                 | <i>Cryptotis parva</i>           | U                |
| Eastern mole                | <i>Scalopus aquaticus</i>        | U                |
| Little brown bat            | <i>Myotis lucifugus</i>          | U                |
| Northern myotis             | <i>Myotis septentrionalis</i>    | U                |
| Indiana bat                 | <i>Myotis sodalis</i>            | unknown          |
| Silver-haired bat           | <i>Lasionycteris noctivagans</i> | U                |
| Eastern pipistrelle         | <i>Pipistrellus subflavus</i>    | U                |
| Big brown bat               | <i>Eptesicus fuscus</i>          | U                |
| Red bat                     | <i>Lasiurus borealis</i>         | U                |
| Hoary bat                   | <i>Lasiurus cinereus</i>         | U                |
| Evening bat                 | <i>Nycticeius humeralis</i>      | unknown          |
| Eastern cottontail          | <i>Sylvilagus floridanus</i>     | U                |
| Swamp rabbit                | <i>Sylvilagus aquaticus</i>      | U                |
| Eastern chipmunk            | <i>Tamias striatus</i>           | U                |
| Woodchuck                   | <i>Marmota monax</i>             | U                |
| Gray squirrel               | <i>Sciurus carolinensis</i>      | A                |
| Fox squirrel                | <i>Sciurus niger</i>             | A                |
| Southern flying squirrel    | <i>Glaucomys volans</i>          | U                |
| Beaver                      | <i>Castor canadensis</i>         | C                |
| Marsh rice rat              | <i>Oryzomys palustris</i>        | unknown          |
| Deer mouse                  | <i>Peromyscus maniculatus</i>    | U                |
| White-footed mouse          | <i>Peromyscus leucopus</i>       | U                |
| Cotton mouse                | <i>Peromyscus gossypinus</i>     | U                |
| Golden mouse                | <i>Peromyscus nuttalli</i>       | R                |
| Prairie vole                | <i>Microtus ochrogaster</i>      | U                |
| Woodland (pine) vole        | <i>Microtus pinetorum</i>        | U                |
| Muskrat                     | <i>Ondatra zibethicus</i>        | U                |
| Norway rat                  | <i>Rattus norvegicus</i>         | U                |
| House mouse                 | <i>Mus musculus</i>              | U                |
| Meadow jumping mouse        | <i>Zapus hudsonius</i>           | U                |
| Coyote                      | <i>Canis latrans</i>             | U                |
| Red fox                     | <i>Vulpes fulva</i>              | U                |
| Gray fox                    | <i>Urocyon cinereoargenteus</i>  | R                |
| Raccoon                     | <i>Procyon lotor</i>             | C                |
| Long-tailed weasel          | <i>Mustela frenata</i>           | U                |
| Mink                        | <i>Mustela vison</i>             | U                |
| Striped skunk               | <i>Mephitis mephitis</i>         | C                |
| River otter                 | <i>Lutra canadensis</i>          | R                |
| Bobcat                      | <i>Felis rufus</i>               | U                |
| White-tailed deer           | <i>Odocoileus virginianus</i>    | C                |

| Class Code   | Type Code  | Status Code  | Habitat Code  |
|--|--|--|---|
| A= Agnatha<br>C= Chondrichthyes<br>O= Osteichthyes   | A= anadromous<br>C= catadromous<br>F= freshwater<br>S= saltwater | A= Abundant, a common species that is very common<br>C= Common, certain to be seen or encountered in suitable habitat<br>U= Uncommon, present but not always seen<br>R= Rare, seen only occasionally<br>S= Stocked populations | L= Lake<br>R= River<br>P= Pone<br>SL= Slough<br>S= Stream |
| Names of the fish herein are after: Mayden, R.L. 1992. <i>Systematics, Historical Ecology, &amp; North American Freshwater Fishes</i> . 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       | <i>Ictiobus cyprinellus</i>    | O     | F    | U                | L         | N                |
| Black bullhead         | <i>Ameiurus melas</i>          | O     | F    | C                | L,S,SL,PR | N                |
| Black buffalo          | <i>Ictiobus niger</i>          | O     | F    | U                | R         | N                |
| Black crappie          | <i>Pomoxis nigromaculatus</i>  | O     | F    | C                | L,S,SL,PR | N                |
| Blacknose dace         | <i>Rhinichthys atratulus</i>   | O     | F    | R                | S         | N                |
| Blackspotted topminnow | <i>Fundulus olivaceus</i>      | O     | F    | C                | S,L,PR    | N                |
| Blackstripe topminnow  | <i>Fundulus notatus</i>        | O     | F    | C                | S,L,PR    | N                |
| Bluegill               | <i>Lepomis macrochirus</i>     | O     | F    | A                | L,S,SL,PR | N                |
| Bluntnose darter       | <i>Etheostoma chlorosomum</i>  | O     | F    | R                | S,R       | N                |
| Bluntnose minnow       | <i>Pimephales notatus</i>      | O     | F    | A                | L,S,R     | N                |
| Bowfin                 | <i>Amia calva</i>              | O     | F    | C                | L,SL,PR   | N                |
| Brown trout            | <i>Salmo trutta</i>            | O     | F    | U,S              | L         | E                |
| Brook silverside       | <i>Labidesthes sicculus</i>    | O     | F    | C                | L,S,R     | N                |
| Bullhead minnow        | <i>Pimephales vigilax</i>      | O     | F    | U                | S,SL      | N                |
| Central stoneroller    | <i>Campostoma anomalum</i>     | O     | F    | U                | S,R       | N                |
| Channel catfish        | <i>Ictalurus punctatus</i>     | O     | F    | C                | S,L,PR    | N                |
| Creek chubsucker       | <i>Erimyzon oblongus</i>       | O     | F    | C                | S,SL      | N                |
| Common carp            | <i>Cyprinus carpio</i>         | O     | F    | A                | L,S,SL,PR | E                |
| Creek chub             | <i>Semotilus atromaculatus</i> | O     | F    | C                | S,R       | N                |
| Fathead minnow         | <i>Pimephales promelas</i>     | O     | F    | U                | S,SL      | N                |
| Flathead catfish       | <i>Pylodictis olivaris</i>     | O     | F    | U,S              | L         | E                |
| Flier                  | <i>Centrarchus macropterus</i> | O     | F    | U                | S,SL      | N                |
| Freshwater drum        | <i>Aplodinotus grunniens</i>   | O     | F    | U                | R         | N                |
| Gizzard shad           | <i>Dorosoma cepedianum</i>     | O     | F    | A                | L,S,R     | N                |
| Golden shiner          | <i>Notemigonus crysoleucas</i> | O     | F    | C                | L,S,SL,PR | N                |
| Grass pickerel         | <i>Esox americanus</i>         | O     | F    | C                | L,S,SL,PR | N                |
| Green sunfish          | <i>Lepomis cyanellus</i>       | O     | F    | C                | L,S,SL,PR | N                |
| Hybrid striped bass    |                                | O     | F    | U,S              | L         | E                |
| Johnny darter          | <i>Etheostoma nigrum</i>       | O     | F    | U                | S,R       | N                |
| Largemouth bass        | <i>Micropterus salmoides</i>   | O     | F    | C                | L,S,SL,PR | N                |
| Logperch               | <i>Percina caprodes</i>        | O     | F    | U                | L,S       | N                |
| Longear sunfish        | <i>Lepomis megalotis</i>       | O     | F    | C                | L,S,PR    | N                |

## Fish Species of Crab Orchard National Wildlife Refuge

| Common Name             | Scientific Name                | Class | Type | Status on Refuge | Habitat   | Exotic or Native |
|-------------------------|--------------------------------|-------|------|------------------|-----------|------------------|
| Mosquitofish            | <i>Gambusia affinis</i>        | O     | F    | A                | L,S,SL,PR | N                |
| Orangespotted sunfish   | <i>Lepomis humilis</i>         | O     | F    | U                | L,S,SL,PR | N                |
| Orangethroat darter     | <i>Etheostoma spectabile</i>   | O     | F    | U                | S,R       | N                |
| Paddlefish              | <i>Polyodon spathula</i>       | A     | F    | R                | R         | N                |
| Pirate perch            | <i>Aphredoderus sayanus</i>    | O     | F    | U                | S,SL      | N                |
| Rainbow trout           | <i>Oncorhynchus mykiss</i>     | O     | F    | U,S              | L         | E                |
| Red shiner              | <i>Cyprinella lutrensis</i>    | O     | F    | C                | S,R       | N                |
| Redear sunfish          | <i>Lepomis microlophus</i>     | O     | F    | C                | L,S,PR    | N                |
| Redfin shiner           | <i>Lythrurus umbratilis</i>    | O     | F    | U                | S,R       | N                |
| Ribbon Shiner           | <i>Lythrurus fumeus</i>        | O     | F    | R                | S,R       | N                |
| River darter            | <i>Percina shumardi</i>        | O     | F    | R                | R         | N                |
| Shortnose gar           | <i>Lepisosteus platostomus</i> | O     | F    | R                | R         | N                |
| Slough darter           | <i>Etheostoma gracile</i>      | O     | F    | U                | S,SL      | N                |
| Small mouth bass        | <i>Micropterus dolomieu</i>    | O     | F    | R,S              | L         | E                |
| Small mouth buffalo     | <i>Ictiobus bubalus</i>        | O     | F    | U                | R         | N                |
| Spotted bass            | <i>Micropterus punctulatus</i> | O     | F    | R                | S         | N                |
| Spotted sucker          | <i>Minytrema melanops</i>      | O     | F    | C                | L,S,R     | N                |
| Steelcolor shiner       | <i>Cyprinella whipplei</i>     | O     | F    | U                | L,S,R     | N                |
| Striped bass            | <i>Morone saxatilis</i>        | O     | F    | C,S              | L,R       | E                |
| Tadpole madtom          | <i>Noturus gyrinus</i>         | O     | F    | U                | S,R       | N                |
| Threadfin shad          | <i>Dorosoma petenense</i>      | O     | F    | C,S              | L         | E                |
| Walleye                 | <i>Stizostedion vitreum</i>    | O     | F    | U,S              | L         | E                |
| Walleye x sauger hybrid |                                | O     | F    | U,S              | L         | E                |
| Warmouth                | <i>Chaenobryttus gulosus</i>   | O     | F    | C                | L,S,SL,PR | N                |
| White bass              | <i>Morone chrysops</i>         | O     | F    | C                | L,S,R     | N                |
| White crappie           | <i>Pomoxis annularis</i>       | O     | F    | C                | L,S,SL,PR | N                |
| White sucker            | <i>Catostomus commersoni</i>   | O     | F    | U                | L,S,R     | N                |
| Yellow bass             | <i>Morone mississippiensis</i> | O     | F    | C                | L,R       | N                |
| Yellow bullhead         | <i>Ameiurus natalis</i>        | O     | F    | U                | L,S,SL,PR | N                |
| Yellow perch            | <i>Perca flavescens</i>        | 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   | <i>Lycopodiaceae</i> C Clubmoss         | ground-cedar                          | <i>Lycopodium complanatum</i><br><i>var. flabelliforme</i> |             | U                       |        |       | N              |      |
| Isoetales      | <i>Isoetaceae</i> C Quillwort           | black quillwort                       | <i>Isoetes melanopoda</i>                                  |             | U                       |        |       |                | 1    |
| Equisetales    | <i>Equisetaceae</i> C Horsetail         | common horsetail [field horse-tail]   | <i>Equisetum arvense</i>                                   |             | LC                      |        |       |                | 1    |
| Equisetales    | <i>Equisetaceae</i> C Horsetail         | scouring rush                         | <i>Equisetum hyemale affine</i>                            |             | LA                      |        |       |                | 1    |
| Ophioglossales | <i>Ophioglossaceae</i> C Adder-s-tongue | bronze fern [cut-leaved grape-fern]   | <i>Botrychium dissectum dissectum</i>                      |             | U                       |        |       |                | 1    |
| Ophioglossales | <i>Ophioglossaceae</i> C Adder-s-tongue | bronze fern [grape fern]              | <i>Botrychium dissectum obliquum</i>                       |             | LC                      |        |       |                | 1    |
| Ophioglossales | <i>Ophioglossaceae</i> C Adder-s-tongue | rattlesnake fern                      | <i>Botrychium virginianum</i>                              |             | C                       |        |       |                | 1    |
| Ophioglossales | <i>Ophioglossaceae</i> C Adder-s-tongue | adder-s-tongue fern                   | <i>Ophioglossum vulgatum pycnostichum</i>                  |             | O                       |        |       |                | 1    |
| Ficales        | <i>Osmundaceae</i> C Royal Fern         | interrupted fern                      | <i>Osmunda claytoniana</i>                                 |             | R                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | resurrection fern                     | <i>Polypodium polypodioides</i>                            |             | U                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | polypody                              | <i>Polypodium virginianum</i>                              |             | LC                      |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | maidenhair fern                       | <i>Adiantum pedatum</i>                                    |             | LC                      |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | pinnatifid [lobed] spleenwort         | <i>Asplenium pinnatifidum</i>                              |             | R                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | ebony spleenwort                      | <i>Asplenium platyneuron</i>                               |             | C                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | walking fern                          | <i>Asplenium rhizophyllum</i>                              |             | LC                      |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | maidenhair spleenwort                 | <i>Asplenium trichomanes ssp. trichomanes</i>              |             | U                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | lady fern                             | <i>Athyrium angustum</i>                                   |             | U                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | southern lady fern                    | <i>Athyrium asplenioides</i>                               |             | U                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | glade fern [narrow-leaved spleenwort] | <i>Athyrium pycnocarpon</i>                                |             | U                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | silvery spleenwort                    | <i>Athyrium thelypteroides</i>                             |             | U                       |        |       |                | 1    |
| Ficales        | <i>Polypodiaceae</i> C Fern             | fragile fern                          | <i>Cystopteris protrusa</i>                                |             | 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     | <i>Polypodiaceae</i> C Fern        | Tennessee fragile fern                      | <i>Cystopteris X tennesseensis</i> |             | R                       |        |       |                | 1    |
| Ficales     | <i>Polypodiaceae</i> C Fern        | Goldie-s fern                               | <i>Dryopteris goldiana</i>         |             | U                       |        |       |                | 1    |
| Ficales     | <i>Polypodiaceae</i> C Fern        | marginal shield fern [leather fern]         | <i>Dryopteris marginalis</i>       |             | LC                      |        |       |                | 1    |
| Ficales     | <i>Polypodiaceae</i> C Fern        | sensitive fern                              | <i>Onoclea sensibilis</i>          |             | O                       |        |       |                | 1    |
| Ficales     | <i>Polypodiaceae</i> C Fern        | Christmas fern                              | <i>Polystichum acrostichoides</i>  |             | LC                      |        |       |                | 1    |
| Ficales     | <i>Polypodiaceae</i> C Fern        | blunt-lobed woodsia [common woodsia]        | <i>Woodsia obtusa</i>              |             | O-C                     |        |       |                | 1    |
| Ginkgoales  | <i>Ginkgoaceae</i> C Ginkgo        | ginkgo [maidenhair tree]                    | <i>Ginkgo biloba</i>               | tree        | R                       |        |       | E              |      |
| Coniferales | <i>Pinaceae</i> C Pine             | shortleaf pine                              | <i>Pinus echinata</i>              | tree        | A                       |        | E     | E              | 1    |
| Coniferales | <i>Pinaceae</i> C Pine             | loblolly pine                               | <i>Pinus taeda</i>                 | tree        | C                       |        |       | E              | 1    |
| Coniferales | <i>Pinaceae</i> C Pine             | Virginia pine [scrub, Jersey, poverty pine] | <i>Pinus virginiana</i>            | tree        | C                       |        |       | E              | 1    |
| Coniferales | <i>Pinaceae</i> C Pine             | Scotch pine                                 | <i>Pinus sylvestris</i>            | tree        | R                       |        |       | E              |      |
| Coniferales | <i>Pinaceae</i> C Pine             | ponderosa pine                              | <i>Pinus ponderosa</i>             | tree        | R                       |        |       | E              |      |
| Coniferales | <i>Pinaceae</i> C Pine             | eastern white pine                          | <i>Pinus strobus</i>               | tree        | R                       |        |       | E              |      |
| Coniferales | <i>Pinaceae</i> C Pine             | Norway spruce                               | <i>Picea abies</i>                 | tree        | R                       |        |       | E              |      |
| Coniferales | <i>Taxodiaceae</i> C Baldcypress   | baldcypress                                 | <i>Taxodium distichum</i>          | tree        | O                       |        |       | E              |      |
| Coniferales | <i>Cupressaceae</i> C Cypress      | eastern redcedar                            | <i>Juniperus virginiana</i>        | tree        | LC                      |        |       | N              | 1    |
| Typhales    | <i>Typhaceae</i> C Cat-tail        | narrow-leaved cat-tail                      | <i>Typha angustifolia</i>          |             |                         |        |       |                | 1    |
| Typhales    | <i>Typhaceae</i> C Cat-tail        | common cat-tail                             | <i>Typha latifolia</i>             |             |                         |        |       |                | 1    |
| Najadales   | <i>Potamogetonaceae</i> C Pondweed | waterthread pondweed                        | <i>Potamogeton diversifolius</i>   |             | O                       |        |       |                | 1    |
| Najadales   | <i>Potamogetonaceae</i> C Pondweed | leafy pondweed                              | <i>Potamogeton foliosus</i>        |             | U                       |        |       |                | 1    |
| Najadales   | <i>Potamogetonaceae</i> C Pondweed | American pondweed                           | <i>Potamogeton nodosus</i>         |             | LC                      |        |       |                | 1    |
| Alismatales | <i>Alismaceae</i> C Water Plantain | arrowhead [arrowleaf]                       | <i>Sagittaria calycina</i>         |             | 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     | <i>Alismaceae</i> C Water Plantain   | water plantain [small-flowered water plantain] | <i>Alisma plantago-aquatica parviflorum</i> |             | R(1) C                  |        |       |                | 1    |
| Hydrocharitales | <i>Hydrocharitaceae</i> C Frog-s-bit | anacharis [Canadian water-weed]                | <i>Elodea canadensis</i>                    |             | U                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | giant cane                                     | <i>Arundinaria gigantea</i>                 | shrub       | U                       |        |       | N              |      |
| Cyperales       | <i>Poaceae</i> C Grass               | goose grass [yard grass]                       | <i>Eleusine indica</i>                      |             | LC                      |        |       | E              | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | three-flowered melic grass                     | <i>Melica nitens</i>                        |             | U                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | orchard grass                                  | <i>Dactylis glomerata</i>                   |             | C                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | bluegrass                                      | <i>Poa angustifolia</i>                     |             | R                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | annual bluegrass [low spear-grass]             | <i>Poa annua</i>                            |             | O                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | Canadian bluegrass                             | <i>Poa compressa</i>                        |             | O                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | Kentucky bluegrass                             | <i>Poa pratensis</i>                        |             | LC                      |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | woodland bluegrass                             | <i>Poa sylvestris</i>                       |             | U                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | chess [field brome]                            | <i>Bromus arvensis</i>                      |             | LC                      |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | hairy brome [hairy chess]                      | <i>Bromus commutatus</i>                    |             | LC                      |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | awnless brome [Hungarian, smooth brome]        | <i>Bromus inermis</i>                       |             | O                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | Japanese brome [Japanese chess]                | <i>Bromus japonicus</i>                     |             | LC                      |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | Canada brome [woodland brome]                  | <i>Bromus pubescens</i>                     |             | O                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | bald brome [chess]                             | <i>Bromus racemosus</i>                     |             | LA                      |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | cheat grass brome [downy brome]                | <i>Bromus tectorum</i>                      |             | LA                      |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | fowl manna grass                               | <i>Glyceria striata</i>                     |             | LC                      |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | purple-top [false red-top, tall red-top]       | <i>Tridens flavus</i>                       |             | A                       |        |       |                | 1    |
| Cyperales       | <i>Poaceae</i> C Grass               | lace grass                                     | <i>Eragrostis capillaris</i>                |             | 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]                 | <i>Eragrostis cilianensis</i>         |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | sandbar love grass                                | <i>Eragrostis frankii</i>             |             | U                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | Carolina love grass [small love grass]            | <i>Eragrostis pectinacea</i>          |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | purple love grass [sand love grass]               | <i>Eragrostis spectabilis</i>         |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | nodding fescue                                    | <i>Festuca obtusa</i>                 |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | English bluegrass [meadow fescue]                 | <i>Festuca pratensis</i>              |             | O-LA                    |        |       |                | 1    |
| Cyperales | Poaceae C Grass | curly grass [poverty oat grass]                   | <i>Danthonia spicata</i>              |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | shining wedge grass                               | <i>Sphenopholis nitida</i>            |             | R                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | prairie wedge grass [prairie wedgescale]          | <i>Sphenopholis obtusata</i>          |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | bearded wheat [wheat]                             | <i>Triticum aestivum</i>              |             | R                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | little barley [small wild barley]                 | <i>Hordeum pusillum</i>               |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | bottlebrush grass                                 | <i>Elymus hirtus</i>                  |             |                         |        |       |                | 1    |
| Cyperales | Poaceae C Grass | hairy wild rye [silky wild rye, slender wild rye] | <i>Elymus villosus</i>                |             |                         |        |       |                | 1    |
| Cyperales | Poaceae C Grass | lyme grass [Virginia wild rye]                    | <i>Elymus virginicus virginicus</i>   |             |                         |        |       |                | 1    |
| Cyperales | Poaceae C Grass | lyme grass [Virginia wild rye]                    | <i>Elymus virginicus glabriflorus</i> |             |                         |        |       |                | 1    |
| Cyperales | Poaceae C Grass | giant foxtail [nodding foxtail]                   | <i>Setaria faberii</i>                |             | LC                      |        |       | E              | 1    |
| Cyperales | Poaceae C Grass | pigeon grass [yellow foxtail]                     | <i>Setaria glauca</i>                 |             | O-LC                    |        |       | E              | 1    |
| Cyperales | Poaceae C Grass | common foxtail [green foxtail]                    | <i>Setaria viridis</i>                |             | O                       |        |       | E              | 1    |
| Cyperales | Poaceae C Grass | barnyard grass                                    | <i>Echinochloa muricata</i>           |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | bead grass [hairy lens grass]                     | <i>Paspalum ciliatifolium</i>         |             | 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                                       | <i>Paspalum dissectum</i>      |             | R                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | smooth lens grass                                | <i>Paspalum laeve</i>          |             | LA                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | bead grass [hairy seed paspalum]                 | <i>Paspalum pubiflorum</i>     |             | O-LA                    |        |       |                | 1    |
| Cyperales | Poaceae C Grass | panic grass                                      | <i>Panicum anceps</i>          |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | fall panicum [knee grass]                        | <i>Panicum dichotomiflorum</i> |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | panic grass                                      | <i>Panicum gattingeri</i>      |             | LA                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | Munro grass                                      | <i>Panicum rigidulum</i>       |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | smooth crab grass                                | <i>Digitaria ischaemum</i>     |             | LA                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | hairy crab grass [common crab grass]             | <i>Digitaria sanguinalis</i>   |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | stoutwood reed                                   | <i>Cinna arundinacea</i>       |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | red top  | <i>Agrostis alba</i>           |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | tickle-grass [hair grass, winter bent grass]     | <i>Agrostis hyemalis</i>       |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | autumn bent grass [upland bent grass]            | <i>Agrostis perennans</i>      |             | C                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | muhly  | <i>Muhlenbergia bushii</i>     |             | R                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | common satin grass [nimble will, wirestem muhly] | <i>Muhlenbergia frondosa</i>   |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | nimble will                                      | <i>Muhlenbergia schreberi</i>  |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | muhly [rock satin grass]                         | <i>Muhlenbergia sobolifera</i> |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | three-awn  | <i>Aristida longispica</i>     |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | plains three-awn [prairie three-awn, wire grass] | <i>Aristida oligantha</i>      |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass | timothy  | <i>Phleum pratense</i>         |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass | dropseed [rough dropseed, tall dropseed]         | <i>Sporobolus asper</i>        |             | 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]            | <i>Sporobolus vaginiflorus</i>                                    |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | long-awned wood grass                             | <i>Brachyelytrum erectum</i>                                      |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | rice cutgrass                                     | <i>Leersia oryzoides</i>  |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | white grass                                       | <i>Leersia virginica</i>  |             | O                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | silver plume grass                                | <i>Erianthus alopecuroides</i>                                    |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | Indian grass [yellow Indian grass]                | <i>Sorghastrum nutans</i>   |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | Johnsongrass [Egyptian millet]                    | <i>Sorghum halepense</i>  |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | Elliott's broom-sedge                             | <i>Andropogon elliotii</i>  |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | big bluestem [turkeyfoot]                         | <i>Andropogon gerardii</i>  |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | broom-sedge                                       | <i>Andropogon virginicus</i>                                      |             | C                       |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | little bluestem                                   | <i>Schizachyrium scoparium</i><br>[ <i>Andropogon scoparius</i> ] |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | gama grass  | <i>Tripsacum dactyloides</i>                                      |             | LC                      |        |       |                | 1    |
| Cyperales | Poaceae C Grass    | corn [maize]                                      | <i>Zea mays</i>   |             | LA                      |        |       |                |      |
| Cyperales | Cyperaceae C Sedge | bearded flat sedge                                | <i>Cyperus aristatus</i>  |             | O                       |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge | chufa [ground almond, nut sedge, yellow nutgrass] | <i>Cyperus esculentus</i>   |             | LC                      |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge | slender flatsedge                                 | <i>Cyperus ferruginescens</i>                                     |             | O                       |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge | fern flatsedge                                    | <i>Cyperus filiculmis</i>   |             | R                       |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge | hedgheg club rush                                 | <i>Cyperus ovularis</i>   |             | O                       |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge | straw colored flatsedge                           | <i>Cyperus strigosus</i>  |             | LC                      |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge | needle spike rush                                 | <i>Eleocharis acicularis</i>                                      |             | LC                      |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge | spike rush  | <i>Eleocharis elliptica elliptica</i>                             |             | U                       |        |       |                | 1    |
| Cyperales | Cyperaceae C Sedge |   | <i>Eleocharis obtusa</i>  |             | 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 | <i>Cyperaceae</i> C Sedge | hair sedge [threadleaf beak-seed] | <i>Bulbostylis capillaris</i> |             | U                       |        |       |                |      |
| Cyperales | <i>Cyperaceae</i> C Sedge | dark green rush [green bulrush]   | <i>Scirpus atrovirens</i>     |             | LC                      |        |       |                |      |
| Cyperales | <i>Cyperaceae</i> C Sedge | wool grass                        | <i>Scirpus cyperinus</i>      |             | LC                      |        |       |                |      |
| Cyperales | <i>Cyperaceae</i> C Sedge | red bulrush                       | <i>Scirpus pendulus</i>       |             | O                       |        |       |                |      |
| Cyperales | <i>Cyperaceae</i> C Sedge | great bulrush                     | <i>Scirpus acutus</i>         |             | R                       |        |       |                | 2    |
| Cyperales | <i>Cyperaceae</i> C Sedge | nut-rush                          | <i>Scleria pauciflora</i>     |             | R                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex albursina</i>        |             | O-C                     |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex artitecta</i>        |             | C                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | woodland sedge                    | <i>Carex blanda</i>           |             | O                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex bushii</i>           |             | C                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge |                                   | <i>Carex cephalophora</i>     |             | O                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge |                                   | <i>Carex convoluta</i>        |             | O                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | fringed sedge                     | <i>Carex crinita</i>          |             | O                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex cristatella</i>      |             | U                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex digitalis</i>        |             | U                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | Emory sedge                       | <i>Carex emoryi</i>           |             | U                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex festucacea</i>       |             | O                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex frankii</i>          |             | O                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex glaucodea</i>        |             | C                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex hirsutella</i>       |             | LC                      |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | bottlebrush sedge                 | <i>Carex hystericina</i>      |             | LC                      |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | grass sedge                       | <i>Carex jamesii</i>          |             | O                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex lurida</i>           |             | LC                      |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | Mead sedge                        | <i>Carex meadii</i>           |             | U                       |        |       |                | 1    |
| Cyperales | <i>Cyperaceae</i> C Sedge | sedge                             | <i>Carex muhlenbergii</i>     |             | 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    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex normalis</i>          |             | O                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex oligocarpa</i>        |             | R                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | Pennsylvania sedge                        | <i>Carex pennsylvanica</i>     |             | LC                      |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex physorhyncha</i>      |             | LC                      |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex retroflexa</i>        |             | O                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex rosea</i>             |             | O                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | broom sedge                               | <i>Carex scoparia</i>          |             | U                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex styloflexa</i>        |             | U                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex tenera</i>            |             | U                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex texensis</i>          |             | O                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex torta</i>             |             | LA                      |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex tribuloides</i>       |             | O                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | sedge                                     | <i>Carex umbellata</i>         |             | O                       |        |       |                | 1    |
| Cyperales    | <i>Cyperaceae</i> C Sedge         | fox sedge                                 | <i>Carex vulpinoidea</i>       |             | LC                      |        |       |                | 1    |
| Arales       | <i>Araceae</i> C Arum             | green dragon                              | <i>Arisaema dracontium</i>     |             | O                       |        |       |                | 1    |
| Arales       | <i>Araceae</i> C Arum             | jack-in-the-pulpit [Indian turnip]        | <i>Arisaema triphyllum</i>     |             | C-O                     |        |       |                | 1    |
| Arales       | <i>Araceae</i> C Arum             | sweet flag [flag root, calamus]           | <i>Acorus americanus</i>       |             | U                       |        |       |                | 1    |
| Arales       | <i>Lemnaceae</i> C Duckweed       | Columbian water-meal [common water-meal]  | <i>Wolffia columbiana</i>      |             | LA                      |        |       |                | 1    |
| Arales       | <i>Lemnaceae</i> C Duckweed       | big duckweed [common ducksmeat, duckweed] | <i>Spirodela polyrhiza</i>     |             | LA                      |        |       |                | 1    |
| Arales       | <i>Lemnaceae</i> C Duckweed       | duckweed                                  | <i>Wolffiella gladiata</i>     |             | LA                      |        |       |                | 1    |
| Commelinales | <i>Commelinaceae</i> C Spiderwort | spiderwort                                | <i>Tradescantia ohioensis</i>  |             | U                       |        |       |                | 1    |
| Commelinales | <i>Commelinaceae</i> C Spiderwort | common spiderwort                         | <i>Tradescantia virginiana</i> |             | 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 | <i>Commelinaceae</i> C Spiderwort | wide-leaved spiderwort                          | <i>Tradescantia subaspera</i>       |             | LC                      |        |       |                | 1    |
| Commelinales | <i>Commelinaceae</i> C Spiderwort | common dayflower                                | <i>Commelina communis</i>           |             | LC                      |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | knotty-leaved rush [tapertip rush]              | <i>Juncus acuminatus</i>            |             | LC                      |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | two-flowered rush                               | <i>Juncus biflorus</i>              |             | LC                      |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | rush  | <i>Juncus brachycarpus</i>          |             | LA                      |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | Dudley rush                                     | <i>Juncus dudleyi</i>               |             | O                       |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | common rush                                     | <i>Juncus effusus solutus</i>       |             | O                       |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | inland rush                                     | <i>Juncus interior</i>              |             | U                       |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | rush  | <i>Juncus nodatus</i>               |             | U                       |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | rush  | <i>Juncus secundus</i>              |             | O                       |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | path rush [poverty rush]                        | <i>Juncus tenuis</i>                |             | LA                      |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | Torrey rush                                     | <i>Juncus torreyi</i>               |             | LC                      |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | common wood rush                                | <i>Luzula multiflora multiflora</i> |             | C                       |        |       |                | 1    |
| Juncales     | <i>Juncaceae</i> C Rush           | wood rush                                       | <i>Luzula multiflora echinata</i>   |             | O                       |        |       |                | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | large-flowered bellwort [big merry bells]       | <i>Uvularia grandiflora</i>         |             | O                       |        |       |                | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | field garlic                                    | <i>Allium vineale</i>               |             | A                       |        |       | E              | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | wild garlic [wild onion]                        | <i>Allium canadense</i>             |             | LA                      |        |       |                | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | garlic [garlic onion]                           | <i>Allium sativum</i>               |             | O                       |        |       |                | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | false garlic [erow poison]                      | <i>Nothoscordum bivalve</i>         |             | LC                      |        |       |                | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | orange day-lily [day-lily]                      | <i>Hemerocallis fulva</i>           |             | LC                      |        |       | E              | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | Turk-s-cap lily [Michigan lily]                 | <i>Lilium michiganense</i>          |             | U                       |        |       |                | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | superb lily [Turk-s-cap lily]                   | <i>Lilium superbum</i>              |             | R                       |        |       |                | 1    |
| Liliales     | <i>Liliaceae</i> C Lily           | yellow dog-tooth violet [yellow adder-s tongue] | <i>Erythronium americanum</i>       |             | 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]  | <i>Ornithogalum umbellatum</i>                       |             | LC                      |        |       |                | 1    |
| Liliales | Liliaceae C Lily           | yucca [Adam-s needle, Spanish bayonet]  | <i>Yucca flaccida</i>                                |             | U                       |        |       |                | 1    |
| Liliales | Liliaceae C Lily           | asparagus [garden asparagus]            | <i>Asparagus officinalis</i>                         |             | O                       |        |       |                | 1    |
| Liliales | Liliaceae C Lily           | false Solomon-s-seal [wild spikenard]   | <i>Smilacina racemosa</i>                            |             | LA                      |        |       |                | 1    |
| Liliales | Liliaceae C Lily           | small Solomon-s-seal                    | <i>Polygonatum biflorum</i>                          |             | O                       |        |       |                | 1    |
| Liliales | Liliaceae C Lily           | great Solomon-s-seal                    | <i>Polygonatum commutatum</i>                        |             | U                       |        |       |                | 1    |
| Liliales | Liliaceae C Lily           | red trillium [recurved wakerobin]       | <i>Trillium recurvatum</i>                           |             | C                       |        |       |                | 1    |
| Liliales | Liliaceae C Lily           | white trillium [declined trillium]      | <i>Trillium flexipes</i>                             |             | LC                      |        |       |                | 1    |
| Liliales | Smilacaceae C Greenbrier   | greenbrier [catbrier, bullbrier]        | <i>Smilax bona-nox</i>                               |             | U                       |        |       |                | 1    |
| Liliales | Smilacaceae C Greenbrier   | greenbrier [catbrier]                   | <i>Smilax glauca</i>                                 |             | LC                      |        |       |                | 1    |
| Liliales | Smilacaceae C Greenbrier   | bristly greenbrier [catbrier]           | <i>Smilax hispida</i>                                |             | O                       |        |       |                | 1    |
| Liliales | Smilacaceae C Greenbrier   | carrion flower                          | <i>Smilax pulverulenta</i>                           |             | O                       |        |       |                | 1    |
| Liliales | Smilacaceae C Greenbrier   | greenbrier [catbrier]                   | <i>Smilax rotundifolia</i>                           |             | U                       |        |       |                | 1    |
| Liliales | Dioscoreaceae C Yam        | wild yam                                | <i>Dioscorea villosa</i>                             |             | LC                      |        |       |                | 1    |
| Liliales | Dioscoreaceae C Yam        | wild yam                                | <i>Dioscorea quaternata</i>                          |             | C                       |        |       |                | 1    |
| Liliales | Dioscoreaceae C Yam        | Chinese yam [cinnamon vine]             | <i>Dioscorea oppositifolia</i> [ <i>D. batatas</i> ] |             | U                       |        |       | E              |      |
| Liliales | Amaryllidaceae C Amaryllis | common goldstargrass [yellow stargrass] | <i>Hypoxis hirsuta</i>                               |             | LC                      |        |       |                | 1    |
| Liliales | Amaryllidaceae C Amaryllis | daffodil                                | <i>Narcissus pseudo-narcissus</i>                    |             | LC                      |        |       |                | 1    |
| Liliales | Amaryllidaceae C Amaryllis | poet-s narcissus                        | <i>Narcissus poeticus</i>                            |             | U                       |        |       |                | 1    |
| Liliales | Iridaceae C Iris           | blackberry lily                         | <i>Belamcanda chinensis</i>                          |             | U                       |        |       | E              |      |
| Liliales | Iridaceae C Iris           | flag [German iris, fleur-de-lis]        | <i>Iris X germanica</i>                              |             | 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    | <i>Iridaceae</i> C Iris          | blue-eyed grass                                    | <i>Sisyrinchium albidum</i>       |             | O                       |        |       |                |      |
| Liliales    | <i>Iridaceae</i> C Iris          | common blue-eyed grass<br>[stout blue-eyed grass]  | <i>Sisyrinchium angustifolium</i> |             | O                       |        |       |                |      |
| Orchidales  | <i>Orchidaceae</i> C Orchid      | nodding ladies-tresses                             | <i>Spiranthes cernua</i>          |             | O-LC                    |        |       |                |      |
| Orchidales  | <i>Orchidaceae</i> C Orchid      | little ladies-tresses                              | <i>Spiranthes tuberosa</i>        |             | U                       |        |       |                |      |
| Orchidales  | <i>Orchidaceae</i> C Orchid      | rattlesnake plantain                               | <i>Goodyera pubescens</i>         |             | R                       |        |       |                |      |
| Orchidales  | <i>Orchidaceae</i> C Orchid      | large twayblade [lily twayblade, purple twayblade] | <i>Liparis lilifolia</i>          |             | LC-O                    |        |       |                |      |
| Orchidales  | <i>Orchidaceae</i> C Orchid      | puttyroot orchid [Adam-and-Eve]                    | <i>Aplectrum hyemale</i>          |             | LC-O                    |        |       |                |      |
| Orchidales  | <i>Orchidaceae</i> C Orchid      | Wister-s coral-root orchid<br>[coral root]         | <i>Corallorhiza wisteriana</i>    |             | R                       |        |       |                |      |
| Piperales   | <i>Saururaceae</i> C Lizard-tail | lizard-s-tail                                      | <i>Saururus cernuus</i>           |             | LC                      |        |       |                |      |
| Salicales   | <i>Salicaceae</i> C Willow       | black willow                                       | <i>Salix nigra</i>                | tree        | C                       |        |       | N              | 1    |
| Salicales   | <i>Salicaceae</i> C Willow       | brittle willow [crack willow]                      | <i>Salix fragilis</i>             |             | O                       |        |       | E              | 1    |
| Salicales   | <i>Salicaceae</i> C Willow       | prairie willow [dwarf prairie willow]              | <i>Salix humilis</i>              |             | R                       |        |       |                | 1    |
| Salicales   | <i>Salicaceae</i> C Willow       | sandbar willow                                     | <i>Salix exigua [S. interior]</i> |             | O                       |        |       |                | 1    |
| Salicales   | <i>Salicaceae</i> C Willow       | white poplar                                       | <i>Populus alba</i>               | tree        | O                       |        |       | E              | 1    |
| Salicales   | <i>Salicaceae</i> C Willow       | eastern cottonwood                                 | <i>Populus deltoides</i>          | tree        | C                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut     | butternut [white walnut]                           | <i>Juglans cinerea</i>            | tree        | R                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut     | black walnut                                       | <i>Juglans nigra</i>              | tree        | O                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut     | shagbark hickory [scaly-bark hickory]              | <i>Carya ovata</i>                | tree        | O-C                     |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut     | shellbark hickory [kingnut hickory]                | <i>Carya laciniosa</i>            | tree        | R                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut     | mockernut hickory                                  | <i>Carya tomentosa</i>            | tree        | O                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut     | pignut hickory                                     | <i>Carya glabra</i>               | 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 | <i>Juglandaceae</i> C Walnut | small pignut hickory [false shagbark hickory] | <i>Carya ovalis</i>  | tree        | C                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut | bitternut hickory                             | <i>Carya cordiformis</i>                                       | tree        | C                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut | black hickory                                 | <i>Carya texana</i>  | tree        | R                       |        |       | N              | 1    |
| Juglandales | <i>Juglandaceae</i> C Walnut | pecan   | <i>Carya illinoensis</i>                                       | tree        | O                       |        |       | N              |      |
| Fagales     | <i>Betulaceae</i> C Birch    | river birch [red birch]                       | <i>Betula nigra</i>  | tree        | C                       |        |       | N              | 1    |
| Fagales     | <i>Betulaceae</i> C Birch    | common alder [smooth alder]                   | <i>Alnus serrulata</i>   | tree        | R                       |        |       | N              |      |
| Fagales     | <i>Betulaceae</i> C Birch    | eastern hophornbeam [iron-wood]               | <i>Ostrya virginiana</i>                                       | tree        | C                       |        |       | N              |      |
| Fagales     | <i>Betulaceae</i> C Birch    | American hornbeam [blue-beech]                | <i>Carpinus caroliniana</i>                                    | tree        | R                       |        |       | N              |      |
| Fagales     | <i>Betulaceae</i> C Birch    | hazelnut [American filbert]                   | <i>Corylus americana</i>                                       | shrub       | O                       |        |       | N              |      |
| Fagales     | <i>Fagaceae</i> C Beech      | American beech [beech]                        | <i>Fagus grandifolia caroliniana</i>                           | tree        | O                       |        |       | N              | 1    |
| Fagales     | <i>Fagaceae</i> C Beech      | American chestnut                             | <i>Castanea dentata</i>  | tree        | R                       |        |       | N              |      |
| Fagales     | <i>Fagaceae</i> C Beech      | Chinese chestnut (various hybrids)            | <i>Castanea mollissima</i>                                     | tree        | R                       |        |       | E              |      |
| Fagales     | <i>Fagaceae</i> C Beech      | white oak                                     | <i>Quercus alba</i>  | tree        | C                       |        |       | N              | 1    |
| Fagales     | <i>Fagaceae</i> C Beech      | post oak                                      | <i>Quercus stellata</i>  | tree        | A                       |        |       | N              | 1    |
| Fagales     | <i>Fagaceae</i> C Beech      | bur oak [mossy cup oak]                       | <i>Quercus macrocarpa</i>                                      | tree        | O                       |        |       | N              | 1    |
| Fagales     | <i>Fagaceae</i> C Beech      | swamp white oak                               | <i>Quercus bicolor</i>   | tree        | R                       |        |       | N              |      |
| Fagales     | <i>Fagaceae</i> C Beech      | swamp chestnut oak [cow oak, basket oak]      | <i>Quercus michauxii</i>                                       | tree        | C                       |        |       | N              |      |
| Fagales     | <i>Fagaceae</i> C Beech      | chinkapin oak [yellow chestnut oak]           | <i>Quercus prinoides acuminata</i> [ <i>Q. muehlenbergii</i> ] | tree        | O                       |        |       | N              |      |
| Fagales     | <i>Fagaceae</i> C Beech      | northern red oak                              | <i>Quercus rubra</i>   | tree        | C                       |        |       | N              | 1    |
| Fagales     | <i>Fagaceae</i> C Beech      | pin oak                                       | <i>Quercus palustris</i>                                       | tree        | A                       |        |       | N              | 1    |
| Fagales     | <i>Fagaceae</i> C Beech      | scarlet oak                                   | <i>Quercus coccinea</i>  | tree        | R                       |        |       | N              | 1    |
| Fagales     | <i>Fagaceae</i> C Beech      | black oak [yellow-barked oak]                 | <i>Quercus velutina</i>  | 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         | <i>Fagaceae</i> C Beech             | southern red oak [Spanish oak]        | <i>Quercus falcata</i>                         | tree        | O                       |        |       | N              | 1    |
| Fagales         | <i>Fagaceae</i> C Beech             | cherrybark oak                        | <i>Quercus pagoda</i>                          | tree        | R                       |        |       | E              |      |
| Fagales         | <i>Fagaceae</i> C Beech             | blackjack oak                         | <i>Quercus marilandica</i>                     | tree        | O                       |        |       | N              | 1    |
| Fagales         | <i>Fagaceae</i> C Beech             | willow oak                            | <i>Quercus phellos</i>                         | tree        | R                       |        |       | E              |      |
| Fagales         | <i>Fagaceae</i> C Beech             | shingle oak                           | <i>Quercus imbricaria</i>                      | tree        | A                       |        |       | N              | 1    |
| Fagales         | <i>Fagaceae</i> C Beech             | Shumard oak                           | <i>Quercus shumardii</i>                       | tree        | O                       |        |       | N              | 1    |
| Utricales       | <i>Ulmaceae</i> C Elm               | sugarberry                            | <i>Celtis laevigata</i>                        | tree        | R                       |        |       | N              | 1    |
| Utricales       | <i>Ulmaceae</i> C Elm               | common hackberry                      | <i>Celtis occidentalis</i>                     | tree        | C                       |        |       | N              | 1    |
| Utricales       | <i>Ulmaceae</i> C Elm               | dwarf hackberry                       | <i>Celtis tenuifolia</i> var. <i>georgiana</i> | tree        | R                       |        |       | N              | 1    |
| Utricales       | <i>Ulmaceae</i> C Elm               | slippery elm [red elm]                | <i>Ulmus rubra</i>                             | tree        | O                       |        |       | N              | 1    |
| Utricales       | <i>Ulmaceae</i> C Elm               | American elm                          | <i>Ulmus americana</i>                         | tree        | C                       |        |       | N              | 1    |
| Utricales       | <i>Ulmaceae</i> C Elm               | winged elm                            | <i>Ulmus alata</i>                             | tree        | C                       |        |       | N              | 1    |
| Utricales       | <i>Moraceae</i> C Mulberry          | osage-orange [hedge-apple]            | <i>Maclura pomifera</i>                        | tree        | O                       |        |       | E              | 1    |
| Utricales       | <i>Moraceae</i> C Mulberry          | red mulberry                          | <i>Morus rubra</i>                             | tree        | O                       |        |       | N              | 1    |
| Utricales       | <i>Moraceae</i> C Mulberry          | white mulberry                        | <i>Morus alba</i>                              | tree        | O                       |        |       | E              | 1    |
| Utricales       | <i>Moraceae</i> C Mulberry          | paper-mulberry                        | <i>Broussonetia papyrifera</i>                 | shrub       | O                       |        |       | E              |      |
| Utricales       | <i>Urticaceae</i> C Nettle          | Canada wood nettle [wood nettle]      | <i>Laportea canadensis</i>                     |             | LA                      |        |       |                | 1    |
| Utricales       | <i>Urticaceae</i> C Nettle          | Pennsylvania pellitory                | <i>Parietaria pensylvanica</i>                 |             | U                       |        |       |                | 1    |
| Utricales       | <i>Urticaceae</i> C Nettle          | false nettle                          | <i>Boehmeria cylindrica</i>                    |             | LC                      |        |       |                | 1    |
| Utricales       | <i>Urticaceae</i> C Nettle          | Canada clearweed [coolwort, richweed] | <i>Pilea pumila</i>                            |             | LC                      |        |       |                | 1    |
| Aristolochiales | <i>Aristolochiaceae</i> C Birthwort | Virginia snakeroot [birthwort]        | <i>Aristolochia serpentaria</i>                |             | O                       |        |       |                | 1    |
| Aristolochiales | <i>Aristolochiaceae</i> C Birthwort | Canada wild ginger                    | <i>Asarum canadense reflexum</i>               |             | C-LA                    |        |       |                | 1    |
| Polygonales     | <i>Polygonaceae</i> C Buckwheat     | slender knotweed                      | <i>Polygonum tenue</i>                         |             | C                       |        |       |                | 1    |
| Polygonales     | <i>Polygonaceae</i> C Buckwheat     | knotweed                              | <i>Polygonum aviculare</i>                     |             | 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    | <i>Polygonaceae</i> C Buckwheat   | copse bindweed [false buckwheat]                   | <i>Polygonum cristatum</i> [ <i>P. scandens dumetorum</i> ] |             | O                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | Virginia knotweed                                  | <i>Polygonum virginianum</i>                                |             | C                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | curttop lady-s thumb [pale smartweed]              | <i>Polygonum lapathifolium</i>                              |             | O                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | Pennsylvania smartweed [common smartweed]          | <i>Polygonum pennsylvanicum laevigatum</i>                  |             | O                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | mild water pepper [swamp smartweed]                | <i>Polygonum hydropiperoides</i>                            |             | LA                      |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | bristly smartweed [smartweed]                      | <i>Polygonum setaceum interjectum</i>                       |             | U                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | dotted smartweed                                   | <i>Polygonum punctatum</i>                                  |             | LC                      |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | spotted lady-s thumb                               | <i>Polygonum persicaria</i>                                 |             | U                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | creeping smartweed                                 | <i>Polygonum cespitosum longisetum</i>                      |             | LC                      |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | common sorrel [red sorrel, sheep sorrel]           | <i>Rumex acetosella</i>                                     |             | LC                      |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | bitter dock [blunt-leaved dock, broad-leaved dock] | <i>Rumex obtusifolius</i>                                   |             | U                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | curly dock [sour dock, yellow dock]                | <i>Rumex crispus</i>  |             | O                       |        |       |                | 1    |
| Polygonales    | <i>Polygonaceae</i> C Buckwheat   | pale dock [smooth dock, water dock]                | <i>Rumex altissimus</i>                                     |             | R                       |        |       |                | 1    |
| Caryophyllales | <i>Chenopodiaceae</i> C Goosefoot | goosefoot  | <i>Chenopodium standleyanum</i> [ <i>C. boscianum</i> ]     |             | U                       |        |       |                | 1    |
| Caryophyllales | <i>Chenopodiaceae</i> C Goosefoot | lamb-s-quarters                                    | <i>Chenopodium album</i>                                    |             | O-LC                    |        |       |                | 1    |
| Caryophyllales | <i>Amaranthaceae</i> C Amaranth   | pigweed  | <i>Amaranthus sp.</i>                                       |             |                         |        |       |                |      |
| Caryophyllales | <i>Phytolaccaceae</i> C Pokeweed  | pokeweed   | <i>Phytolacca americana</i>                                 |             | O-LC                    |        |       |                | 1    |
| Caryophyllales | <i>Portulacaceae</i> C Purslane   | common garden purslane                             | <i>Portulaca oleracea</i>                                   |             | LC                      |        |       |                | 1    |
| Caryophyllales | <i>Portulacaceae</i> C Purslane   | spring beauty                                      | <i>Claytonia virginica</i>                                  |             | 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 | <i>Caryophyllaceae</i> C Pink     | nodding mouse-ear chickweed                     | <i>Cerastium nutans</i>                |             | O                       |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | mouse-ear chickweed                             | <i>Cerastium pumilum</i>               |             | O                       |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | common mouse-ear chickweed                      | <i>Cerastium vulgatum</i>              |             | LC                      |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | common chickweed                                | <i>Stellaria media</i>                 |             | LA                      |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | thyme-leaved sandwort                           | <i>Arenaria serpyllifolia</i>          |             | O                       |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | jagged chickweed                                | <i>Holosteum umbellatum</i>            |             | U                       |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | Debtford pink                                   | <i>Dianthus armeria</i>                |             | LC                      |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | sleepy catchfly                                 | <i>Silene antirrhina</i>               |             | O                       |        |       |                | 1    |
| Caryophyllales | <i>Caryophyllaceae</i> C Pink     | starry campion                                  | <i>Silene stellata</i>                 |             | O                       |        |       |                | 1    |
| Magnoliales    | <i>Magnoliaceae</i> C Magnolia    | yellow-poplar [tulip-tree, tulip-poplar]        | <i>Liriodendron tulipifera</i>         | tree        | O-LC                    |        |       | N              | 1    |
| Magnoliales    | <i>Annonaceae</i> C Custard-apple | common pawpaw [banana tree]                     | <i>Asimina triloba</i>                 | small tree  | LC                      |        |       | N              | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | wild columbine                                  | <i>Aquilegia canadensis</i>            |             | R                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | dwarf larkspur [wild larkspur]                  | <i>Delphinium tricorne</i>             |             | LC                      |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | virgin-s bower                                  | <i>Clematis virginiana</i>             |             | O                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | bristly buttercup                               | <i>Ranunculus hispidus</i>             |             | C                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | early buttercup                                 | <i>Ranunculus fascicularis</i>         |             | LC                      |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | hooked buttercup                                | <i>Ranunculus recurvatus</i>           |             | O                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | little-leaf buttercup [small-flowered crowfoot] | <i>Ranunculus abortivus abortivus</i>  |             | C                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | small-flowered crowfoot                         | <i>Ranunculus abortivus acrolasius</i> |             | U                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | small-flowered crowfoot                         | <i>Ranunculus micranthus</i>           |             | O                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | goldenseal                                      | <i>Hydrastis canadensis</i>            |             | LC                      |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | tall anemone                                    | <i>Anemone virginiana</i>              |             | O                       |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | doll-s-eyes [white baneberry]                   | <i>Actaea pachypoda</i>                |             | LC                      |        |       |                | 1    |
| Ranunculales   | <i>Ranunculaceae</i> C Buttercup  | false rue-anemone                               | <i>Isopyrum biternatum</i>             |             | 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 | <i>Berberidaceae</i> C Barberry    | mayapple  | <i>Podophyllum peltatum</i>       |             | LA                      |        |       |                | 1    |
| Ranunculales | <i>Berberidaceae</i> C Barberry    | blue cohosh                                       | <i>Caulophyllum thalictroides</i> |             | U                       |        |       |                | 1    |
| Ranunculales | <i>Berberidaceae</i> C Barberry    | Japanese barberry                                 | <i>Berberis thunbergii</i>        | shrub       | R                       |        |       | E              | 1    |
| Ranunculales | <i>Menispermaceae</i> C Moon-vine  | moonseed  | <i>Menispermum canadense</i>      |             | O                       |        |       |                | 1    |
| Ranunculales | <i>Menispermaceae</i> C Moon-vine  | cupseed   | <i>Calycocarpum lyonii</i>        |             | R                       |        |       |                | 1    |
| Nymphaeales  | <i>Nelumbonaceae</i> C Lotus       | American lotus [giant lotus lily]                 | <i>Nelumbo lutea</i>              |             | LC                      |        |       |                |      |
| Nymphaeales  | <i>Nymphaeaceae</i> C Waterlily    | spatterdock                                       | <i>Nuphar luteum</i>              |             | LA                      |        |       |                | 1    |
| Nymphaeales  | <i>Ceratophyllaceae</i> C Hornwort | coontail [hornwort]                               | <i>Ceratophyllum demersum</i>     |             | U                       |        |       |                | 1    |
| Magnoliales  | <i>Lauraceae</i> C Laurel          | common sassafras [red sassafras, white sassafras] | <i>Sassafras albidum</i>          | tree        | C                       |        |       | N              | 1    |
| Magnoliales  | <i>Lauraceae</i> C Laurel          | spicebush [feverbush, wild allspice]              | <i>Lindera benzoin</i>            | shrub       | LA                      |        |       | N              | 1    |
| Papaverales  | <i>Papaveraceae</i> C Poppy        | bloodroot   | <i>Sanguinaria canadensis</i>     |             | C                       |        |       | N              | 1    |
| Papaverales  | <i>Papaveraceae</i> C Poppy        | Celandine poppy [wood poppy]                      | <i>Stylophorum diphyllum</i>      |             | LA                      |        |       |                | 1    |
| Papaverales  | <i>Papaveraceae</i> C Poppy        | Celandine   | <i>Chelidonium majus</i>          |             |                         |        |       | E              | 2    |
| Papaverales  | <i>Fumariaceae</i> C Fumitory      | pale corydalis                                    | <i>Corydalis flavula</i>          |             | LA                      |        |       |                | 1    |
| Papaverales  | <i>Fumariaceae</i> C Fumitory      | squirrel-corn                                     | <i>Dicentra canadensis</i>        |             | LA                      |        |       |                | 1    |
| Papaverales  | <i>Fumariaceae</i> C Fumitory      | Dutchman-s-breeches                               | <i>Dicentra cucullaria</i>        |             | C                       |        |       |                | 1    |
| Capparales   | <i>Cruciferae</i> C Mustard        | mouse-eared cress                                 | <i>Arabidopsis thaliana</i>       |             | O                       |        |       |                | 1    |
| Capparales   | <i>Cruciferae</i> C Mustard        | smooth rock cress                                 | <i>Arabis laevigata</i>           |             | LC                      |        |       |                |      |
| Capparales   | <i>Cruciferae</i> C Mustard        | wintercress [yellow rocket]                       | <i>Barbarea vulgaris</i>          |             | O                       |        |       | E              | 1    |
| Capparales   | <i>Cruciferae</i> C Mustard        | bird-s rape [field mustard, turnip]               | <i>Brassica rapa</i>              |             | R                       |        |       |                | 1    |
| Capparales   | <i>Cruciferae</i> C Mustard        | shepherd-s-purse                                  | <i>Capsella bursa-pastoris</i>    |             | 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    | <i>Cruciferae</i> C Mustard         | Pennsylvania bitter cress                        | <i>Cardamine pensylvanica</i>           |             | LC                      |        |       |                | 1    |
| Capparales    | <i>Cruciferae</i> C Mustard         | hairy bitter cress                               | <i>Cardamine hirsuta</i>                |             | O                       |        |       | E              | 1    |
| Capparales    | <i>Cruciferae</i> C Mustard         | small-flowered bitter cress                      | <i>Cardamine parviflora arenicola</i>   |             | U                       |        |       |                | 1    |
| Capparales    | <i>Cruciferae</i> C Mustard         | toothwort [pepper-root]                          | <i>Dentaria laciniata</i>               |             | LA                      |        |       | N              | 1    |
| Capparales    | <i>Cruciferae</i> C Mustard         | short-fruited Whitlow-grass                      | <i>Draba brachycarpa</i>                |             | O                       |        |       |                | 1    |
| Capparales    | <i>Cruciferae</i> C Mustard         | mouse-eared Whitlow-grass [vernal Whitlow-grass] | <i>Eriophila verna</i>                  |             | O                       |        |       |                | 1    |
| Capparales    | <i>Cruciferae</i> C Mustard         | common peppergrass [poor-man-s pepper]           | <i>Lepidium virginicum</i>              |             | O-LA                    |        |       |                | 1    |
| Capparales    | <i>Cruciferae</i> C Mustard         | field peppergrass [field cress]                  | <i>Lepidium campestre</i>               |             | O                       |        |       |                | 1    |
| Hamamelidales | <i>Hamamelidaceae</i> C Witch-hazel | sweetgum [red gum]                               | <i>Liquidambar styraciflua</i>          | tree        | O-LA                    |        |       | N              | 1    |
| Hamamelidales | <i>Platanaceae</i> C Planetree      | American sycamore [button-wod]                   | <i>Platanus occidentalis</i>            | tree        | LC                      |        |       | N              | 1    |
| Rosales       | <i>Crassulaceae</i> C Stonecrop     | widow-s-cross [stonecrop]                        | <i>Sedum pulchellum</i>                 |             | LC                      |        |       |                | 1    |
| Rosales       | <i>Escalloniaceae</i>               | Virginia willow [sweet-spires]                   | <i>Itea virginica</i>                   | shrub       | ?                       |        |       |                |      |
| Rosales       | <i>Saxifragaceae</i> C Saxifrage    | ditch stonecrop                                  | <i>Penthorum sedoides</i>               |             | O                       |        |       |                | 1    |
| Rosales       | <i>Saxifragaceae</i> C Saxifrage    | wild hydrangea                                   | <i>Hydrangea arborescens</i>            | shrub       | O                       |        |       | N              |      |
| Rosales       | <i>Saxifragaceae</i> C Saxifrage    | Forbes- saxifrage                                | <i>Saxifraga forbesii</i>               |             | LA                      |        |       |                | 1    |
| Rosales       | <i>Saxifragaceae</i> C Saxifrage    | bishop-s-cap                                     | <i>Mitella diphylla</i>                 |             | R                       |        |       |                | 1    |
| Rosales       | <i>Saxifragaceae</i> C Saxifrage    | small-flowered alumroot [late alumroot]          | <i>Heuchera parviflora rugelii</i>      |             | LC                      |        |       |                | 1    |
| Rosales       | <i>Saxifragaceae</i> C Saxifrage    | tall alumroot                                    | <i>Heuchera americana hirsuticaulis</i> |             | C                       |        |       |                | 1    |
| Rosales       | <i>Rosaceae</i> C Rose              | Allegheny blackberry [common blackberry]         | <i>Rubus allegheniensis</i>             |             | C                       |        |       |                | 1    |
| Rosales       | <i>Rosaceae</i> C Rose              | blackberry                                       | <i>Rubus alumnus [R. orarius]</i>       |             | 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 | <i>Rosaceae</i> C Rose | arching dewberry [southern dewberry]          | <i>Rubus enslenii</i>             |             | U                       |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | dewberry                                      | <i>Rubus flagellaris</i>          |             | C                       |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | black raspberry [blackcap raspberry]          | <i>Rubus occidentalis</i>         |             | LC                      |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | blackberry                                    | <i>Rubus pennsylvanicus</i>       |             | C                       |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | velvet-leaved dewberry                        | <i>Rubus roribaccus</i>           |             | LC                      |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | hawthorn                                      | <i>Crataegus pruinosa</i>         |             | ?                       |        |       | N              |      |
| Rosales | <i>Rosaceae</i> C Rose | red haw                                       | <i>Crataegus mollis</i>           |             | C                       |        |       | N              |      |
| Rosales | <i>Rosaceae</i> C Rose | cock-spur hawthorn                            | <i>Crataegus crus-galli</i>       | small tree  | O                       |        |       | N              |      |
| Rosales | <i>Rosaceae</i> C Rose | serviceberry [shadbush, shad-blow, juneberry] | <i>Amelanchier arborea</i>        | small tree  | LC                      |        |       | N              | 1    |
| Rosales | <i>Rosaceae</i> C Rose | common apple                                  | <i>Malus pumila</i>               | tree        | R                       |        |       |                |      |
| Rosales | <i>Rosaceae</i> C Rose | wild sweet crabapple                          | <i>Malus coronaria</i>            | tree        | U                       |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | Iowa crabapple                                | <i>Malus ioensis</i>              | tree        | U                       |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | common pear                                   | <i>Pyrus communis</i>             | tree        | R                       |        |       |                |      |
| Rosales | <i>Rosaceae</i> C Rose | pasture rose                                  | <i>Rosa carolina</i>              | vine        | C                       |        |       | N              | 1    |
| Rosales | <i>Rosaceae</i> C Rose | swamp rose                                    | <i>Rosa palustris</i>             | vine        | O                       |        |       | N              |      |
| Rosales | <i>Rosaceae</i> C Rose | multiflora rose [Japanese rose]               | <i>Rosa multiflora</i>            | shrub       | A                       |        |       | E              | 1    |
| Rosales | <i>Rosaceae</i> C Rose | Illinois rose [prairie rose, climbing rose]   | <i>Rosa setigera</i>              |             | O-LC                    |        |       |                |      |
| Rosales | <i>Rosaceae</i> C Rose |   | <i>Rosa sp. (Hybrid cultivar)</i> |             |                         |        |       |                |      |
| Rosales | <i>Rosaceae</i> C Rose | black cherry                                  | <i>Prunus serotina</i>            | tree        | C                       |        |       | N              | 1    |
| Rosales | <i>Rosaceae</i> C Rose | American plum [wild plum]                     | <i>Prunus americana</i>           | shrub       | C                       |        |       | N              | 1    |
| Rosales | <i>Rosaceae</i> C Rose | Chickasaw plum                                | <i>Prunus angustifolia</i>        |             | LC                      |        |       |                | 1    |
| Rosales | <i>Rosaceae</i> C Rose | wild goose plum                               | <i>Prunus hortulana</i>           |             | 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                                      | <i>Prunus persica</i>   | tree        | R                       |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | swamp agrimony [small-flowered agrimony]   | <i>Agrimonia parviflora</i>                                     |             | LC                      |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | soft agrimony                              | <i>Agrimonia pubescens</i>                                      |             | U                       |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | woodland agrimony                          | <i>Agrimonia rostellata</i>                                     |             | C                       |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | wild strawberry                            | <i>Fragaria virginiana</i>                                      |             | LC                      |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | white avens                                | <i>Geum canadense</i>   |             | C                       |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | spring avens                               | <i>Geum vernum</i>  |             | LC                      |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | sulfur cinquefoil                          | <i>Potentilla recta</i>   |             | LC                      |        |       | E              | 1    |
| Rosales | Rosaceae C Rose          | common cinquefoil                          | <i>Potentilla simplex</i>                                       |             | C                       |        |       |                | 1    |
| Rosales | Rosaceae C Rose          | Indian physic [American ipleac]            | <i>Porteranthus stipulatus</i><br>[ <i>Gillenia stipulata</i> ] |             | C                       |        |       |                | 1    |
| Rosales | Caesalpiniaceae<br>pinia | CCaesal-<br>eastern redbud                 | <i>Cercis canadensis</i>  | tree        | O-C                     |        |       | N              | 1    |
| Rosales | Caesalpiniaceae<br>pinia | CCaesal-<br>honeylocust                    | <i>Gleditsia triacanthos</i>                                    | tree        | O                       |        |       | N              | 1    |
| Rosales | Caesalpiniaceae<br>pinia | CCaesal-<br>Kentucky coffeetree            | <i>Gymnocladus dioicus</i>                                      | tree        | O                       |        |       | N?             |      |
| Rosales | Caesalpiniaceae<br>pinia | CCaesal-<br>wild senna                     | <i>Cassia marilandica</i>                                       |             |                         |        |       |                |      |
| Rosales | Caesalpiniaceae<br>pinia | CCaesal-<br>partridge pea [locust-weed]    | <i>Cassia fasciculata</i>                                       |             |                         |        |       |                |      |
| Rosales | Fabaceae CBean           | kudzu-vine                                 | <i>Puereria lobata</i>  | vine        | R                       |        |       | E              |      |
| Rosales | Fabaceae CBean           | soybean                                    | <i>Glycine max</i>  |             | LA                      |        |       | E              |      |
| Rosales | Fabaceae CBean           | American wisteria                          | <i>Wisteria frutescens</i>                                      | vine        | ?                       |        |       |                |      |
| Rosales | Fabaceae CBean           | sesbania                                   | <i>Sesbania macrocarpa</i> [S.<br><i>exaltata</i> ]             |             | LC                      |        |       |                |      |
| Rosales | Fabaceae CBean           | dull-leaf indigobush [false<br>indigobush] | <i>Amorpha fruticosa</i>  | 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 | <i>Fabaceae</i> CBean | black-locust                                | <i>Robinia pseudoacacia</i>              | tree        | LC                      |        |       | N?             | 1    |
| Rosales | <i>Fabaceae</i> CBean | rattlebox                                   | <i>Crotalaria sagittalis</i>             |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | pencil-flower                               | <i>Stylosanthes biflora</i>              |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | low hop clover                              | <i>Trifolium campestre</i>               |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | Alsike clover                               | <i>Trifolium hybridum</i>                |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | red clover                                  | <i>Trifolium pratense</i>                |             | LC                      |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | white clover                                | <i>Trifolium repens</i>                  |             | LC                      |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | black medic                                 | <i>Medicago lupulina</i>                 |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | alfalfa                                     | <i>Medicago sativa</i>                   |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | butterfly-pea                               | <i>Clitoria mariana</i>                  |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | hoary tick trefoil                          | <i>Desmodium canescens</i>               |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | hairy tick trefoil                          | <i>Desmodium ciliare</i>                 |             | LC                      |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | beggar-s lice [pointed tick trefoil]        | <i>Desmodium glutinosum</i>              |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | glaucus tick trefoil                        | <i>Desmodium laevigatum</i>              |             | C                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | bare-stemmed tick trefoil                   | <i>Desmodium nudiflorum</i>              |             | LC                      |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | Nuttall-s tick trefoil                      | <i>Desmodium nuttallii</i>               |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | stiff tick trefoil                          | <i>Desmodium obtusum</i>                 |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | panicled tick trefoil                       | <i>Desmodium paniculatum</i>             |             | C                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | beggar-s lice [white-flowered tick trefoil] | <i>Desmodium pauciflorum</i>             |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | round-leaved tick trefoil                   | <i>Desmodium rotundifolium</i>           |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | sessile-leaved tick trefoil                 | <i>Desmodium sessilifolium</i>           |             | U                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | scurf-pea [Sampson-s snakeroot]             | <i>Psoralea psoralioides eglandulosa</i> |             | LC                      |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | wild bean                                   | <i>Strophostyles helvola</i>             |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | wild bean                                   | <i>Strophostyles leiosperma</i>          |             | O                       |        |       |                | 1    |
| Rosales | <i>Fabaceae</i> CBean | umbellate wild bean                         | <i>Strophostyles umbellata</i>           |             | 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    | <i>Fabaceae</i> CBean            | hog-peanut                                      | <i>Amphicarpa bracteata bracteata</i>           |             | U                       |        |       |                | 1    |
| Rosales    | <i>Fabaceae</i> CBean            | hog-peanut                                      | <i>Amphicarpa bracteata comosa</i>              |             | O                       |        |       |                | 1    |
| Rosales    | <i>Fabaceae</i> CBean            | hairy-fruited vetch                             | <i>Vicia dasycarpa</i>                          |             | LA                      |        |       |                | 1    |
| Rosales    | <i>Fabaceae</i> CBean            | ground nut                                      | <i>Apios americana</i>                          |             | LC                      |        |       |                | 1    |
| Rosales    | <i>Fabaceae</i> CBean            | goat-s-rue                                      | <i>Tephrosia virginiana</i>                     |             | O                       |        |       |                | 1    |
| Rosales    | Mimosaceae                       | mimosa  | <i>Albizia julibrissin</i>                      | tree        | R                       |        |       | E              |      |
| Rosales    | Mimosaceae                       | Illinois/prairie mimosa [Illinois bundleflower] | <i>Desmanthus illinoensis</i>                   |             |                         |        |       | N              |      |
| Geraniales | <i>Geraniaceae</i> C Geranium    | Carolina cranesbill                             | <i>Geranium carolinianum</i>                    |             | LC                      |        |       |                | 1    |
| Geraniales | <i>Geraniaceae</i> C Geranium    | wild geranium                                   | <i>Geranium maculatum</i>                       |             | C                       |        |       |                | 1    |
| Geraniales | <i>Oxalidaceae</i> C Wood-sorrel | upright yellow wood-sorrel                      | <i>Oxalis dillenii</i>                          |             | A                       |        |       |                | 1    |
| Geraniales | <i>Oxalidaceae</i> C Wood-sorrel | common wood-sorrel [yellow wood sorrel]         | <i>Oxalis stricta</i>                           |             | U                       |        |       |                | 1    |
| Geraniales | <i>Oxalidaceae</i> C Wood-sorrel | violet wood-sorrel [purple oxalis]              | <i>Oxalis violacea</i>                          |             | LC-O                    |        |       |                | 1    |
| Geraniales | <i>Balsaminaceae</i> C Balsam    | orange-spotted touch-me-not [jewelweed]         | <i>Impatiens capensis</i> [ <i>I. Biflora</i> ] |             | LA                      |        |       |                | 1    |
| Geraniales | <i>Balsaminaceae</i> C Balsam    | pale touch-me-not                               | <i>Impatiens pallida</i>                        |             | LA                      |        |       |                | 1    |
| Linales    | <i>Linaceae</i> C Flax           | flax  | <i>Linum medium</i>                             |             | LC                      |        |       |                | 1    |
| Linales    | <i>Linaceae</i> C Flax           | stiff yellow flax                               | <i>Linum striatum</i>                           |             | U-R                     |        |       |                | 1    |
| Sapindales | <i>Rutaceae</i> C Rue            | prickly-ash [toothache tree]                    | <i>Zanthoxylum americanum</i>                   |             | U-R                     |        |       |                | 1    |
| Sapindales | <i>Simarubaceae</i> C Quassia    | tree-of-heaven                                  | <i>Ailanthus altissima</i>                      | tree        | U-R                     |        |       | E              | 1    |
| Sapindales | <i>Anacardiaceae</i> C Sumac     | smooth sumac                                    | <i>Rhus glabra</i>                              | shrub       | C                       |        |       | N              | 1    |
| Sapindales | <i>Anacardiaceae</i> C Sumac     | winged [shining, dwarf] sumac                   | <i>Rhus copallina</i>                           | shrub       | C                       |        |       | N              | 1    |
| Sapindales | <i>Anacardiaceae</i> C Sumac     | fragrant sumac [aromatic sumac]                 | <i>Rhus aromatica</i>                           | 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                              | <i>Toxicodendron radicans</i>                                   | shrub, vine             | A      |       |                | N    | 1 |
| Sapindales   | Staphyleaceae | C Bladdernut   | American bladdernut                     | <i>Staphylea trifolia</i>                                       | shrub                   | LA     |       |                | N    | 1 |
| Sapindales   | Aceraceae     | C Maple        | sugar maple [hard maple, rock maple]    | <i>Acer saccharum</i>   | tree                    | C      |       |                | N    | 1 |
| Sapindales   | Aceraceae     | C Maple        | southern sugar maple                    | <i>Acer barbatum</i>  | tree                    | O      |       |                | N    |   |
| Sapindales   | Aceraceae     | C Maple        | silver maple [river, soft, white maple] | <i>Acer saccharinum</i>   | tree                    | C      |       |                | N    | 1 |
| Sapindales   | Aceraceae     | C Maple        | red maple                               | <i>Acer rubrum var. rubrum</i>                                  | tree                    | O      |       |                | N    | 1 |
| Sapindales   | Aceraceae     | C Maple        | red maple                               | <i>Acer rubrum var. trilobum</i>                                | tree                    | R      |       |                | N    | 1 |
| Sapindales   | Aceraceae     | C Maple        | boxelder [ash-leaved maple]             | <i>Acer negundo</i>   | tree                    | O-LA   |       |                | N    | 1 |
| Polygalales  | Polygalaceae  | C Milkwort     | red milkwort [field milkwort]           | <i>Polygala sanguinea</i>                                       |                         | O      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | nodding spurge [wartweed]               | <i>Chamaesyce maculata</i><br>[ <i>Euphorbia maculata</i> ]     |                         | C      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | milk spurge                             | <i>Chamaesyce supina</i><br>[ <i>Euphorbia supina</i> ]         |                         | LC     |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | milk spurge                             | <i>Chamaesyce humistrata</i><br>[ <i>Euphorbia humistrata</i> ] |                         | U      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | flowering spurge                        | <i>Euphorbia corollata</i>                                      |                         | C      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | wood spurge                             | <i>Euphorbia commutata</i>                                      |                         | LC     |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | wild poinsettia                         | <i>Euphorbia dentata</i> [ <i>Poinsettia dentata</i> ]          |                         | O      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | sand croton [rushfoil]                  | <i>Crotonopsis elliptica</i>                                    |                         | LC     |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | capitate croton [wooly croton]          | <i>Croton capitatus</i>   |                         | O      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | croton [prairie tea]                    | <i>Croton monanthogynus</i>                                     |                         | LC     |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | slender three-seeded mercury            | <i>Acalypha gracilens</i>                                       |                         | O      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | three-seeded mercury                    | <i>Acalypha rhomboidea</i>                                      |                         | C      |       |                |      | 1 |
| Euphorbiales | Euphorbiaceae | C Spurge       | Virginia three-seeded mercury           | <i>Acalypha virginica</i>                                       |                         | 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 | <i>Celastraceae</i> C Staff-tree      | bittersweet [climbing bitter-sweet] | <i>Celastrus scandens</i>                     | vine        | C                       |        |       | N              | 1    |
| Celastrales | <i>Celastraceae</i> C Staff-tree      | eastern wahoo [burningbush]         | <i>Euonymus atropurpureus</i>                 | shrub       | O                       |        |       | N              | 1    |
| Celastrales | <i>Celastraceae</i> C Staff-tree      | climbing euonymus [winter creeper]  | <i>Euonymus fortunei</i> var. <i>radicans</i> | vine        | O                       |        |       | E              |      |
| Celastrales | <i>Aquifoliaceae</i> C Holly          | deciduous holly [swamp holly]       | <i>Ilex decidua</i>                           | shrub       | R                       |        |       | N              | 1    |
| Celastrales | <i>Aquifoliaceae</i> C Holly          | American holly                      | <i>Ilex opaca</i>                             | shrub       | R                       |        |       | N              |      |
| Rhamnales   | <i>Rhamnaceae</i> C Buckthorn         | New-Jersey-tea [wild snowball]      | <i>Ceanothus americanus</i>                   | shrub       | O                       |        |       | N              | 1    |
| Rhamnales   | <i>Vitaceae</i> C Grape               | Virginia creeper                    | <i>Parthenocissus quinquefolia</i>            | vine        | C                       |        |       | N              | 1    |
| Rhamnales   | <i>Vitaceae</i> C Grape               | raccoon grape                       | <i>Ampelopsis cordata</i>                     | vine        | U                       |        |       | N              | 1    |
| Rhamnales   | <i>Vitaceae</i> C Grape               | summer grape                        | <i>Vitis aestivalis</i>                       | vine        | C                       |        |       | N              | 1    |
| Rhamnales   | <i>Vitaceae</i> C Grape               | winter grape                        | <i>Vitis cinerea</i>                          | vine        | U                       |        |       | N              | 1    |
| Rhamnales   | <i>Vitaceae</i> C Grape               | frost grape                         | <i>Vitis vulpina</i>                          | vine        | O                       |        |       | N              | 1    |
| Malvales    | <i>Tiliaceae</i> C Linden             | American linden [basswood]          | <i>Tilia americana</i>                        | tree        | U-R                     |        |       | N              | 1    |
| Malvales    | <i>Malvaceae</i> C Mallow             | prickly sida                        | <i>Sida spinosa</i>                           |             | O                       |        |       | E              | 1    |
| Theales     | <i>Hypericaceae</i> C St. John-s-wort | marsh St. John-s-wort               | <i>Triadenum walteri</i>                      |             | O                       |        |       |                | 1    |
| Theales     | <i>Hypericaceae</i> C St. John-s-wort | shrubby St. John's-wort             | <i>Hypericum prolificum</i>                   | shrub       | LC                      |        |       | N              | 1    |
| Theales     | <i>Hypericaceae</i> C St. John-s-wort | nits-and-lice                       | <i>Hypericum drummondii</i>                   |             | U                       |        |       |                | 1    |
| Theales     | <i>Hypericaceae</i> C St. John-s-wort | pineweed                            | <i>Hypericum gentianoides</i>                 |             | O                       |        |       |                | 1    |
| Theales     | <i>Hypericaceae</i> C St. John-s-wort | dwarf St. John-s-wort               | <i>Hypericum mutilum</i>                      |             | O                       |        |       |                | 1    |
| Theales     | <i>Hypericaceae</i> C St. John-s-wort | common St. John-s-wort              | <i>Hypericum perforatum</i>                   |             | U                       |        |       |                | 1    |
| Theales     | <i>Hypericaceae</i> C St. John-s-wort | spotted St. John-s-wort             | <i>Hypericum punctatum</i>                    |             | 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 |                |      |
| Myrtales       | <i>Onagraceae</i> C Evening Primrose    | common evening primrose                               | <i>Oenothera biennis</i>  |             | C                       |        |       |                | 1    |
| Myrtales       | <i>Onagraceae</i> C Evening Primrose    | ragged evening primrose                               | <i>Oenothera laciniata</i>  |             | U                       |        |       |                | 1    |
| Myrtales       | <i>Onagraceae</i> C Evening Primrose    | cinnamon willow herb                                  | <i>Epilobium coloratum</i>  |             | O                       |        |       |                | 1    |
| Caryophyllales | <i>Cactaceae</i> C Cactus               | prickly-pear  | <i>Opuntia humifusa</i> [ <i>O. rafinesquii</i> , <i>O. compressa</i> ] |             |                         |        |       |                | 1    |
| Haloragales    | <i>Haloragidaceae</i> C Water Milfoil   | spiked water milfoil                                  | <i>Myriophyllum exalbesces</i>  |             | LA                      |        |       |                | 1    |
| Lamiales       | <i>Callitrichaceae</i> C Water Starwort | terrestrial starwort [water starwort]                 | <i>Callitriche terestris</i>  |             | O                       |        |       |                | 1    |
| Cornales       | <i>Cornaceae</i> C Dogwood              | blackgum [sour gum, black tupelo]                     | <i>Nyssa sylvatica</i>  | tree        | O                       |        |       | N              |      |
| Cornales       | <i>Cornaceae</i> C Dogwood              | flowering dogwood [white dogwood]                     | <i>Cornus florida</i>   | small tree  | C                       |        |       | N              | 1    |
| Cornales       | <i>Cornaceae</i> C Dogwood              | rough-leaved dogwood                                  | <i>Cornus drummondii</i>  | shrub       | O                       |        |       | N              | 1    |
| Cornales       | <i>Cornaceae</i> C Dogwood              | gray [panicled] dogwood                               | <i>Cornus racemosa</i>  | shrub       | O                       |        |       | N              |      |
| Umbellales     | <i>Araliaceae</i> C Ginseng             | devil's-walking-stick [Hercules'-club, angelica-tree] | <i>Aralia spinosa</i>   | small tree  | O                       |        |       | N              | 1    |
| Umbellales     | <i>Araliaceae</i> C Ginseng             | American spikenard                                    | <i>Aralia racemosa</i>  |             | R                       |        |       |                | 1    |
| Umbellales     | <i>Araliaceae</i> C Ginseng             | ginseng   | <i>Panax quinquefolium</i>  |             | U                       |        |       |                | 1    |
| Umbellales     | <i>Apiaceae</i> C Carrot or Parsley     | rattlesnake master                                    | <i>Eryngium yuccifolium</i>   |             |                         |        |       |                | 1    |
| Umbellales     | <i>Apiaceae</i> C Carrot or Parsley     | Queen Anne's lace [wild carrot]                       | <i>Daucus carota</i>  |             |                         |        |       | E              | 1    |
| Umbellales     | <i>Apiaceae</i> C Carrot or Parsley     | water hemlock   | <i>Cicuta maculata</i>  |             |                         |        |       |                | 1    |
| Umbellales     | <i>Apiaceae</i> C Carrot or Parsley     | wood angelica   | <i>Angelica venenosa</i>  |             | R                       |        |       |                | 1    |
| Umbellales     | <i>Apiaceae</i> C Carrot or Parsley     | wild chervil  | <i>Chaerophyllum procumbens</i>   |             | LC                      |        |       |                | 1    |
| Umbellales     | <i>Apiaceae</i> C Carrot or Parsley     | wild chervil  | <i>Chaerophyllum tainturieri</i>  |             | U                       |        |       |                | 1    |
| Umbellales     | <i>Apiaceae</i> C Carrot or Parsley     | honewort  | <i>Cryptotaenia canadensis</i>  |             | 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      | <i>Apiaceae</i> C       | Carrot or Parsley | harbinger-of-spring [pepper-and-salt]                | <i>Eriogenia bulbosa</i>                            |                         | C      |       |                |      | 1 |
| Umbellales      | <i>Apiaceae</i> C       | Carrot or Parsley | anise-root   | <i>Osmorhiza longistylis</i>                        |                         |        |       |                |      | 1 |
| Umbellales      | <i>Apiaceae</i> C       | Carrot or Parsley | Canadian black snakeroot [short-styled snakeroot]    | <i>Sanicula canadensis</i>                          |                         | C      |       |                |      | 1 |
| Umbellales      | <i>Apiaceae</i> C       | Carrot or Parsley | yellow meadow parsnip                                | <i>Thaspium trifoliatum</i> var. <i>flavum</i>      |                         | R      |       |                |      | 1 |
| Umbellales      | <i>Apiaceae</i> C       | Carrot or Parsley | meadow parsnip                                       | <i>Thaspium trifoliatum</i> var. <i>trifoliatum</i> |                         | O      |       |                |      | 1 |
| Umbellales      | <i>Apiaceae</i> C       | Carrot or Parsley | hedge parsley  | <i>Torilis japonica</i>                             |                         | LC     |       |                |      | 1 |
| Ericales        | <i>Ericaceae</i> C      | Heath             | farkleberry  | <i>Vaccinium arboreum</i>                           | shrub                   | C      |       |                | N    | 1 |
| Primulales      | <i>Primulaceae</i> C    | Primrose          | shooting-star  | <i>Dodecatheon meadia</i>                           |                         | LC     |       |                |      | 1 |
| Primulales      | <i>Primulaceae</i> C    | Primrose          | French-s shooting-star                               | <i>Dodecatheon frenchii</i>                         |                         | LC     |       |                |      | 1 |
| Primulales      | <i>Primulaceae</i> C    | Primrose          | brookweed [water pimpernel]                          | <i>Samolus valerandii</i>                           |                         | U      |       |                |      | 1 |
| Primulales      | <i>Primulaceae</i> C    | Primrose          | fringed loosestrife                                  | <i>Lysimachia ciliata</i>                           |                         | LC     |       |                |      | 1 |
| Primulales      | <i>Primulaceae</i> C    | Primrose          | lance-leaved loosestrife [narrow-leaved loosestrife] | <i>Lysimachia lanceolata</i>                        |                         | O      |       |                |      | 1 |
| Ebenales        | <i>Ebenaceae</i> C      | Ebony             | common persimmon [possum-wood]                       | <i>Diospyros virginiana</i>                         | tree                    | A      |       |                | N    | 1 |
| Scrophulariales | <i>Oleaceae</i> C       | Olive             | white ash  | <i>Fraxinus americana</i>                           | tree                    | O      |       |                | N    | 1 |
| Scrophulariales | <i>Oleaceae</i> C       | Olive             | green ash  | <i>Fraxinus pennsylvanica</i>                       | tree                    | A      |       |                | N    | 1 |
| Scrophulariales | <i>Oleaceae</i> C       | Olive             | Forsythia  | <i>Forsythia</i> spp.                               | shrub                   | R      |       |                |      |   |
| Scrophulariales | <i>Oleaceae</i> C       | Olive             | common lilac   | <i>Syringa vulgaris</i>                             | shrub                   | R      |       |                |      |   |
| Scrophulariales | <i>Oleaceae</i> C       | Olive             | European privet                                      | <i>Ligustrum vulgare</i>                            | shrub                   | R      |       |                | E    |   |
| Gentianales     | <i>Gentianaceae</i> C   | Gentian           | American columbo                                     | <i>Frasera caroliniensis</i>                        |                         | O      |       |                |      | 1 |
| Gentianales     | <i>Gentianaceae</i> C   | Gentian           | rose gentian [rose pink, marsh pink]                 | <i>Sabatia angularis</i>                            |                         | O      |       |                |      | 1 |
| Gentianales     | <i>Apocynaceae</i> C    | Dogbane           | dogbane [Indian hemp]                                | <i>Apocynum cannabinum</i>                          |                         | LC     |       |                |      | 1 |
| Gentianales     | <i>Asclepiadaceae</i> C | Milkweed          | tall green milkweed                                  | <i>Asclepias hirtella</i>                           |                         | 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  | <i>Asclepiadaceae</i> C Milkweed      | swamp milkweed                        | <i>Asclepias incarnata</i>                     |             | LC                      |        |       |                | 1    |
| Gentianales  | <i>Asclepiadaceae</i> C Milkweed      | purple milkweed                       | <i>Asclepias purpurascens</i>                  |             | O                       |        |       |                | 1    |
| Gentianales  | <i>Asclepiadaceae</i> C Milkweed      | common milkweed                       | <i>Asclepias syriaca</i>                       |             | C                       |        |       |                | 1    |
| Gentianales  | <i>Asclepiadaceae</i> C Milkweed      | butterfly-weed                        | <i>Asclepias tuberosa</i> var. <i>interior</i> |             | C                       |        |       |                | 1    |
| Gentianales  | <i>Asclepiadaceae</i> C Milkweed      | variegated milkweed [white milkweed]  | <i>Asclepias variegata</i>                     |             | O                       |        |       |                | 1    |
| Gentianales  | <i>Asclepiadaceae</i> C Milkweed      | horsetail milkweed [whorled milkweed] | <i>Asclepias verticillata</i>                  |             | O                       |        |       |                | 1    |
| Gentianales  | <i>Asclepiadaceae</i> C Milkweed      | blue vine                             | <i>Cynanchum laeve</i>                         |             | O                       |        |       |                | 1    |
| Polemoniales | <i>Convolvulaceae</i> C Morning-glory | small white morning-glory             | <i>Ipomoea lacunosa</i>                        |             | O                       |        |       |                | 1    |
| Polemoniales | <i>Convolvulaceae</i> C Morning-glory | wild sweet potato vine                | <i>Ipomoea pandurata</i>                       |             | U                       |        |       |                | 1    |
| Polemoniales | <i>Polemoniaceae</i> C Phlox          | cleft phlox                           | <i>Phlox bifida</i>                            |             | LC                      |        |       |                | 1    |
| Polemoniales | <i>Polemoniaceae</i> C Phlox          | blue phlox                            | <i>Phlox divaricata</i> ssp. <i>laphamii</i>   |             | C                       |        |       |                | 1    |
| Polemoniales | <i>Polemoniaceae</i> C Phlox          | garden phlox                          | <i>Phlox paniculata</i>                        |             | O-LC                    |        |       |                | 1    |
| Polemoniales | <i>Polemoniaceae</i> C Phlox          | Jacob-s-ladder                        | <i>Polemonium reptans</i>                      |             | C                       |        |       |                | 1    |
| Polemoniales | <i>Hydrophyllaceae</i> C Water-leaf   | broad-leaved waterleaf                | <i>Hydrophyllum canadense</i>                  |             | LA                      |        |       |                | 1    |
| Polemoniales | <i>Hydrophyllaceae</i> C Water-leaf   |                                       | <i>Phacelia bipinnatifida</i>                  |             | C                       |        |       |                | 1    |
| Lamiales     | <i>Boraginaceae</i> C Borage          | wild comfrey                          | <i>Cynoglossum virginianum</i>                 |             | O                       |        |       |                | 1    |
| Lamiales     | <i>Boraginaceae</i> C Borage          | stickseed                             | <i>Hackelia virginiana</i>                     |             | LC                      |        |       |                | 1    |
| Lamiales     | <i>Boraginaceae</i> C Borage          | bluebells [Virginia cowslip]          | <i>Mertensia virginica</i>                     |             | LA                      |        |       |                | 1    |
| Lamiales     | <i>Boraginaceae</i> C Borage          | scorpion-grass                        | <i>Myosotis macrosperma</i>                    |             | O                       |        |       |                | 1    |
| Lamiales     | <i>Verbenaceae</i> C Verbena          | blue vervain                          | <i>Verbena hastata</i>                         |             | O                       |        |       |                | 1    |
| Lamiales     | <i>Verbenaceae</i> C Verbena          |                                       | <i>Verbena X illicita</i>                      |             | 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             | <i>Verbena simplex</i>                                  |                         | U      |       |                | 1    |
| Lamiales | Verbenaceae | C Verbena      | white vervain                     | <i>Verbena urticifolia</i>                              |                         | O      |       |                | 1    |
| Lamiales | Verbenaceae | C Verbena      | fog-fruit                         | <i>Phyla lanceolata</i>                                 |                         | LC     |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | lyre-leaved sage [cancer-weed]    | <i>Salvia lyrata</i>                                    |                         | O      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | downy skullcap                    | <i>Scutellaria incana</i>                               |                         | LC     |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | mad-dog skullcap                  | <i>Scutellaria lateriflora</i>                          |                         | O      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | small skullcap                    | <i>Scutellaria leonardii</i>                            |                         | U      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | ground ivy [gill-over-the-ground] | <i>Glechoma hederacea</i> var. <i>micrantha</i>         |                         | LC     |       | E              | 1    |
| Lamiales | Lamiaceae   | C Mint         | burgamot mint [Monarda, bee balm] | <i>Monarda bradburiana</i>                              |                         | LC     |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | wild bergamot                     | <i>Monarda fistulosa</i>                                |                         | O      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | henbit                            | <i>Lamium amplexicaule</i>                              |                         | O      |       | E              | 1    |
| Lamiales | Lamiaceae   | C Mint         | purple dead nettle                | <i>Lamium purpureum</i>                                 |                         | LA     |       | E              | 1    |
| Lamiales | Lamiaceae   | C Mint         | pagoda plant [wood mint]          | <i>Blephilia ciliata</i>                                |                         | O      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | pagoda plant                      | <i>Blephilia hirsuta</i>                                |                         | LC     |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | stone mint [dittany]              | <i>Cunila origanoides</i>                               |                         | C-O    |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | common water horehound            | <i>Lycopus americanus</i>                               |                         | O      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | bugle weed                        | <i>Lycopus virginicus</i>                               |                         | LC     |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | self heal [heal-all]              | <i>Prunella vulgaris</i> var. <i>elongata</i>           |                         | LC     |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | mountain mint                     | <i>Pycnanthemum pycnanthemoides</i>                     |                         | O      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | slender mountain mint             | <i>Pycnanthemum tenuifolium</i> [ <i>P. flexuosum</i> ] |                         | C      |       |                | 1    |
| Lamiales | Lamiaceae   | C Mint         | American germander [wood sage]    | <i>Teucrium canadense</i> var. <i>virginicum</i>        |                         | 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        | <i>Lamiaceae</i> C Mint           | richweed [citronella horse balm]               | <i>Collinsonia canadensis</i>   |             | U                       |        |       |                | 1    |
| Lamiales        | <i>Lamiaceae</i> C Mint           | yellow giant hyssop                            | <i>Agastache nepetoides</i>     |             | R                       |        |       |                | 1    |
| Lamiales        | <i>Lamiaceae</i> C Mint           | beefsteak plant                                | <i>Perilla frutescens</i>       |             | LC                      |        |       |                | 1    |
| Lamiales        | <i>Lamiaceae</i> C Mint           | hairy synandra [white-flowered mint, synandra] | <i>Synandra hispidula</i>       |             | R                       |        | E     |                |      |
| Lamiales        | <i>Lamiaceae</i> C Mint           | false pennyroyal                               | <i>Trichostema brachiatum</i>   |             | LC                      |        |       |                | 1    |
| Polemoniales    | <i>Solanaceae</i> C Nightshade    | ground-cherry                                  | <i>Physalis heterophylla</i>    |             | U                       |        |       |                | 1    |
| Polemoniales    | <i>Solanaceae</i> C Nightshade    | annual ground-cherry                           | <i>Physalis pubescens</i>       |             | R                       |        |       |                | 1    |
| Polemoniales    | <i>Solanaceae</i> C Nightshade    | horse-nettle                                   | <i>Solanum carolinense</i>      |             | O                       |        |       |                | 1    |
| Polemoniales    | <i>Solanaceae</i> C Nightshade    | black nightshade                               | <i>Solanum ptycanthum</i>       |             | U                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | moth mullein                                   | <i>Verbascum blattaria</i>      |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | wooly mullein                                  | <i>Verbascum thapsus</i>        |             | C                       |        |       | E              | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | candelabra plant [Culver-root]                 | <i>Veronicastrum virginicum</i> |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | corn speedwell [blue speedwell]                | <i>Veronica arvensis</i>        |             | C                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | purslane speedwell [white speedwell]           | <i>Veronica peregrina</i>       |             | C                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | false pimpernel                                | <i>Lindernia dubia</i>          |             | U                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | clammy hedge-hyssop [common hedge-hyssop]      | <i>Gratiola neglecta</i>        |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort |  | <i>Leucospora multifida</i>     |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | smooth false foxglove                          | <i>Aureolaria flava</i>         |             | LC                      |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | water hyssop                                   | <i>Bacopa rotundifolia</i>      |             | LC                      |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | smooth beard-tongue                            | <i>Penstemon calycosus</i>      |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | foxglove beard-tongue [foxglove penstemon]     | <i>Penstemon digitalis</i>      |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort | pale beard-tongue                              | <i>Penstemon pallidus</i>       |             | 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 | <i>Scrophulariaceae</i> C Figwort     | winged monkey-flower [common monkey-flower]        | <i>Mimulus alatus</i>            |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort     | blue-eyed Mary                                     | <i>Collinsia verna</i>           |             | LA                      |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort     | late figwort                                       | <i>Scrophularia marilandica</i>  |             | LC                      |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort     | false foxglove                                     | <i>Agalinis fasciculata</i>      |             | U                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort     | false foxglove                                     | <i>Agalinis paupercula</i>       |             | U                       |        |       |                | 1    |
| Scrophulariales | <i>Scrophulariaceae</i> C Figwort     | slender false foxglove                             | <i>Agalinis tenuifolia</i>       |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Acanthaceae</i> C Acanthus         | water-willow                                       | <i>Justicia americana</i>        |             | LC                      |        |       |                | 1    |
| Scrophulariales | <i>Acanthaceae</i> C Acanthus         | hairy ruellia [wild petunia]                       | <i>Ruellia humilis</i>           |             | O                       |        |       |                | 1    |
| Scrophulariales | <i>Acanthaceae</i> C Acanthus         | stalked ruellia [wild petunia]                     | <i>Ruellia pedunculata</i>       |             | C                       |        |       |                | 1    |
| Scrophulariales | <i>Bignoniaceae</i> C Trumpet Creeper | trumpet-creeper [trumpet-vine]                     | <i>Campsis radicans</i>          | vine        | C                       |        |       | N              | 1    |
| Scrophulariales | <i>Bignoniaceae</i> C Trumpet Creeper | northern [hardy] catalpa [cigar tree, Indian bean] | <i>Catalpa speciosa</i>          | tree        | O                       |        |       | N              | 1    |
| Scrophulariales | <i>Bignoniaceae</i> C Trumpet Creeper | southern [common] catalpa [lady cigar tree]        | <i>Catalpa bignonioides</i>      | tree        | R                       |        |       | E              |      |
| Plantaginales   | <i>Plantaginaceae</i> C Plantain      | bracted plantain                                   | <i>Plantago aristata</i>         |             | LA                      |        |       |                | 1    |
| Plantaginales   | <i>Plantaginaceae</i> C Plantain      | buckhorn [English plantain]                        | <i>Plantago lanceolata</i>       |             | LC                      |        |       | E              | 1    |
| Plantaginales   | <i>Plantaginaceae</i> C Plantain      | common plantain                                    | <i>Plantago major</i>            |             | LC                      |        |       | E              | 1    |
| Plantaginales   | <i>Plantaginaceae</i> C Plantain      | small plantain                                     | <i>Plantago pusilla</i>          |             | O                       |        |       |                | 1    |
| Plantaginales   | <i>Plantaginaceae</i> C Plantain      | red-stalked plantain [Rugel's plantain]            | <i>Plantago rugelli</i>          |             | LC                      |        |       | N              | 1    |
| Plantaginales   | <i>Plantaginaceae</i> C Plantain      | dwarf plantain                                     | <i>Plantago virginica</i>        |             | LC                      |        |       |                | 1    |
| Rubiales        | <i>Rubiaceae</i> C Madder             | common buttonbush                                  | <i>Cephalanthus occidentalis</i> | shrub       | O                       |        |       | N              | 1    |
| Rubiales        | <i>Rubiaceae</i> C Madder             | annual bedstraw [goosegrass, cleavers]             | <i>Galium aparine</i>            |             | LA                      |        |       |                | 1    |
| Rubiales        | <i>Rubiaceae</i> C Madder             | wild licorice                                      | <i>Galium circaezans</i>         |             | C                       |        |       |                | 1    |
| Rubiales        | <i>Rubiaceae</i> C Madder             | shining bedstraw                                   | <i>Galium concinnum</i>          |             | 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   | <i>Rubiaceae</i> C Madder            | hairy bedstraw [purple bedstraw]          | <i>Galium pilosum</i>                                       |             | O                       |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | sweet-scented bedstraw                    | <i>Galium triflorum</i>                                     |             | O                       |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | rough buttonweed [poorjoe]                | <i>Diodia teres</i>   |             | LC                      |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | large buttonweed [Virginia buttonweed]    | <i>Diodia virginiana</i>                                    |             | R                       |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | tiny bluets                               | <i>Hedyotis crassifolia</i> [ <i>Houstonia minima</i> ]     |             | LC                      |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | long-leaved bluets                        | <i>Hedyotis longifolia</i> [ <i>Houstonia longifolia</i> ]  |             | O                       |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | slender-leaved bluets                     | <i>Hedyotis nuttalliana</i> [ <i>Houstonia tenuifolia</i> ] |             | O                       |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | broad-leaved bluets                       | <i>Hedyotis purpurea</i> [ <i>Houstonia purpurea</i> ]      |             | U                       |        |       |                | 1    |
| Rubiales   | <i>Rubiaceae</i> C Madder            | small bluets [star violet]                | <i>Hedyotis pusilla</i> [ <i>Houstonia pusilla</i> ]        |             | LC                      |        |       |                | 1    |
| Dipsacales | <i>Caprifoliaceae</i> C Honey-suckle | arrowwood                                 | <i>Viburnum dentatum</i> [ <i>recognitum</i> ]              | shrub       | C                       |        |       | N              |      |
| Dipsacales | <i>Caprifoliaceae</i> C Honey-suckle | southern wild-raisin                      | <i>Viburnum nudum</i>                                       | shrub       | ?                       |        |       |                |      |
| Dipsacales | <i>Caprifoliaceae</i> C Honey-suckle | smooth arrowwood                          | <i>Viburnum recognitum</i>                                  |             | ?                       |        |       |                |      |
| Dipsacales | <i>Caprifoliaceae</i> C Honey-suckle | nannyberry                                | <i>Viburnum lentago</i>                                     | shrub       | ?                       |        |       |                |      |
| Dipsacales | <i>Caprifoliaceae</i> C Honey-suckle | rusty nannyberry [southern blackhaw]      | <i>Viburnum rufidulum</i>                                   | shrub       | U                       |        |       | N              | 1    |
| Dipsacales | <i>Caprifoliaceae</i> C Honey-suckle | blackhaw [nannyberry]                     | <i>Viburnum prunifolium</i>                                 | shrub       | O                       |        |       |                | 1    |
| Dipsacales | <i>Caprifoliaceae</i> C Honey-suckle | American elder [elderberry, golden elder] | <i>Sambucus canadensis</i>                                  | 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 Honey-  | coralberry [Indian-currant, buck-brush]        | <i>Symphoricarpos orbiculatus</i>              | shrub       | LC                      |        |       | N              | 1    |
| Dipsacales   | Caprifoliaceae C Honey-  | Japanese honeysuckle                           | <i>Lonicera japonica</i> var. <i>japonica</i>  | vine        | A                       |        |       | E              | 1    |
| Dipsacales   | Caprifoliaceae C Honey-  | Japanese honeysuckle                           | <i>Lonicera japonica</i> var. <i>chin-ense</i> | vine        | R                       |        |       | E              | 1    |
| Dipsacales   | Caprifoliaceae C Honey-  | Amur honeysuckle                               | <i>Lonicera maackii</i>                        |             | U                       |        |       |                | 1    |
| Dipsacales   | Caprifoliaceae C Honey-  | trumpet honeysuckle [fire-cracker honeysuckle] | <i>Lonicera sempervirens</i>                   | vine        | U                       |        |       | N              | 1    |
| Dipsacales   | Caprifoliaceae C Honey-  | Illinois horse gentian                         | <i>Triosteum illinoense</i>                    |             | O                       |        |       |                | 1    |
| Dipsacales   | Caprifoliaceae C Honey-  | late horse gentian                             | <i>Triosteum perfoliatum</i>                   |             | O                       |        |       |                | 1    |
| Dipsacales   | Valerianaceae C Valerian | pink valerian                                  | <i>Valeriana pauciflora</i>                    |             | LC                      |        |       |                | 1    |
| Dipsacales   | Valerianaceae C Valerian | corn salad [lamb-s lettuce]                    | <i>Valerianella radiata</i>                    |             | LC                      |        |       |                | 1    |
| Dipsacales   | Dipsacaceae C Teasel     | common teasel                                  | <i>Dipsacus sylvestris</i>                     |             | O                       |        |       | E              | 1    |
| Cucurbitales | Cucurbitaceae C Gourd    | bur cucumber                                   | <i>Sicyos angulatus</i>                        | vine        |                         |        |       |                |      |
| Campanulales | Campanulaceae C Bell-    | Venus-looking glass                            | <i>Triodanis perfoliata</i>                    |             | LC                      |        |       |                | 1    |
| Campanulales | Campanulaceae C Bell-    | American bellflower                            | <i>Campanula americana</i>                     |             | C                       |        |       |                | 1    |
| Campanulales | Campanulaceae C Bell-    | cardinal-flower                                | <i>Lobelia cardinalis</i>                      |             | U                       |        |       |                | 1    |
| Campanulales | Campanulaceae C Bell-    | Indian tobacco                                 | <i>Lobelia inflata</i>                         |             | LC                      |        |       |                | 1    |
| Campanulales | Campanulaceae C Bell-    | blue cardinal-flower                           | <i>Lobelia siphilitica</i>                     |             | O                       |        |       |                | 1    |
| Asterales    | Asteraceae C Aster       | common milfoil [common yar-row, nosebleed]     | <i>Achillea millefolium</i>                    |             | 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]          | <i>Ambrosia artemisiifolia</i>                                   |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | lanceleaf ragweed [southern ragweed]                 | <i>Ambrosia bidentata</i>  |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | giant ragweed [buffalo weed, horse weed]             | <i>Ambrosia trifida</i>  |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | everlasting [ladies- tobacco]                        | <i>Antennaria plantaginifolia</i><br>var. <i>plantaginifolia</i> |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | everlasting [ladies- tobacco, pussytoes]             | <i>Antennaria plantaginifolia</i><br>var. <i>ambigens</i>        |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | common burdock [smaller burdock]                     | <i>Arctium minus</i>   |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | Drummond-s aster                                     | <i>Aster drummondii</i>  |             | O-LC                    |        |       |                | 1    |
| Asterales | Asteraceae C Aster | side-flowered aster [white woodland aster]           | <i>Aster lateriflorus</i>  |             | LA                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | New England aster                                    | <i>Aster novae-angliae</i>                                       |             | R                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | purple daisy [spreading aster]                       | <i>Aster patens</i>  |             | C-O                     |        |       |                | 1    |
| Asterales | Asteraceae C Aster | hairy aster  | <i>Aster pilosus</i>   |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | arrow aster [arrow-leaved aster]                     | <i>Aster X sagittifolius</i>                                     |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | Short-s aster  | <i>Aster shortii</i>   |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | panicled aster [tall white aster, white field aster] | <i>Aster simplex</i>   |             | R                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | aster  | <i>Aster turbinellus</i>   |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | swamp marigold [tickseed sunflower]                  | <i>Bidens aristosa</i>   |             | LA                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | Spanish needles                                      | <i>Bidens bipinnata</i>  |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | nodding beggar-ticks [stick-tight]                   | <i>Bidens cernua</i>   |             | 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]             | <i>Bidens tripartita</i>         |             | O                       |        |       | E              | 1    |
| Asterales | Asteraceae C Aster | false aster  | <i>Boltonia asteroides</i>       |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | false boneset                                      | <i>Brickellia eupatorioides</i>  |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | pale Indian plantain                               | <i>Cacalia atriplicifolia</i>    |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | great Indian plantain                              | <i>Cacalia muhlbergii</i>        |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | common chicory [blue sailors]                      | <i>Cichorium intybus</i>         |             | R                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | field thistle [pasture thistle]                    | <i>Cirsium discolor</i>          |             | O-LC                    |        |       |                | 1    |
| Asterales | Asteraceae C Aster | bull thistle                                       | <i>Cirsium vulgare</i>           |             | R                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | horseweed [mule weed]                              | <i>Conyza canadensis</i>         |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | tall coreopsis                                     | <i>Coreopsis tripteris</i>       |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | yerba de tajo                                      | <i>Eclipta prostrata</i>         |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | elephant-s-foot                                    | <i>Elephantopus carolinianum</i> |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | fire weed  | <i>Erechtites hieracifolia</i>   |             | O-LC                    |        |       |                | 1    |
| Asterales | Asteraceae C Aster | annual fleabane                                    | <i>Erigeron annuus</i>           |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | marsh fleabane [Philadelphia fleabane]             | <i>Erigeron philadelphicus</i>   |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | daisy fleabane [rough fleabane, whitetop fleabane] | <i>Erigeron strigosus</i>        |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | tall boneset [tall thoroughwort]                   | <i>Eupatorium altissimum</i>     |             | R                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | blue boneset [mistflower, wild ageratum]           | <i>Eupatorium coelestinum</i>    |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | hollow joe-pye weed [trumpet weed]                 | <i>Eupatorium fistulosum</i>     |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | common boneset [thoroughwort]                      | <i>Eupatorium perfoliatum</i>    |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | white snakeroot                                    | <i>Eupatorium rugosum</i>        |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | late boneset                                       | <i>Eupatorium serotinum</i>      |             | 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                           | <i>Euthamia graminifolia</i>                  |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | catfoot [old-field balsam, sweet everlasting] | <i>Gnaphalium obtusifolium</i>                |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | early cudweed [purple cudweed]                | <i>Gnaphalium purpureum</i>                   |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | purple-headed sneezeweed                      | <i>Helenium flexuosum</i>                     |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | pale sunflower [ten-petal sunflower]          | <i>Helianthus decapetalus</i>                 |             | R                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | divergent sunflower [woodland sunflower]      | <i>Helianthus divaricatus</i>                 |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | small wood sunflower                          | <i>Helianthus microcephalus</i>               |             | O-LC                    |        |       |                | 1    |
| Asterales | Asteraceae C Aster | Jerusalem artichoke                           | <i>Helianthus tuberosus var. subcanescens</i> |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | false sunflower [sunflower heliopsis]         | <i>Heliopsis helianthoides</i>                |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | hairy hawkweed                                | <i>Hieracium gronovii</i>                     |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | marsh elder [sumpweed]                        | <i>Iva annua</i>                              |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | false dandelion                               | <i>Krigia biflora</i>                         |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | dwarf dandelion [potato dandelion]            | <i>Krigia dandelion</i>                       |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | Canada lettuce [horseweed, wild lettuce]      | <i>Lactuca canadensis</i>                     |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | blue lettuce [woodland lettuce]               | <i>Lactuca floridana</i>                      |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | willow-leaved lettuce                         | <i>Lactuca saligna</i>                        |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | compass plant [prickly lettuce]               | <i>Lactuca serriola</i>                       |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | common tansy [ox-eye daisy, white daisy]      | <i>Leucanthemum vulgare</i>                   |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | blazing star                                  | <i>Liatris scabra</i>                         |             | 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]   | <i>Liatris spicata</i>           |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | pineapple weed                          | <i>Matricaria matricarioides</i> |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | American feverfew [wild quinine]        | <i>Parthenium integrifolium</i>  |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | leafcup                                 | <i>Polymnia canadensis</i>       |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | bears foot [leafcup, yellow-flower]     | <i>Polymnia uvedalia</i>         |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | tall white lettuce                      | <i>Prenanthes altissima</i>      |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | great white lettuce                     | <i>Prenanthes crepidinea</i>     |             | LA                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | false dandelion                         | <i>Pyrrophappus carolinianus</i> |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | black-eyed Susan                        | <i>Rudbeckia hirta</i>           |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | cutleaf coneflower [wild golden glow]   | <i>Rudbeckia laciniata</i>       |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | golden ragwort [groundsel, squaw-weed]  | <i>Senecio aureus</i>            |             | LA                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | butterweed [groundsel, ragwort]         | <i>Senecio glabellus</i>         |             | LC                      |        |       |                | 1    |
| Asterales | Asteraceae C Aster | wholeleaf rosinweed                     | <i>Silphium integrifolium</i>    |             |                         |        |       |                | 1    |
| Asterales | Asteraceae C Aster | cup plant [cup rosinweed]               | <i>Silphium perfoliatum</i>      |             | O                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | tall goldenrod                          | <i>Solidago altissima</i>        |             | A                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | Buckley-s goldenrod                     | <i>Solidago buckleyi</i>         |             | U                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | bluestem goldenrod [woodland goldenrod] | <i>Solidago caesia</i>           |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | early goldenrod                         | <i>Solidago juncea</i>           |             | C                       |        |       |                | 1    |
| Asterales | Asteraceae C Aster | Dyersweed goldenrod [gray goldenrod]    | <i>Solidago nemoralis</i>        |             | C-O                     |        |       |                | 1    |
| Asterales | Asteraceae C Aster | elm-leaved goldenrod                    | <i>Solidago ulmifolia</i>        |             | 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  | <i>Asteraceae</i> C Aster | red-seeded dandelion [smooth dandelion] | <i>Taraxacum laevigatum</i>                       |             | R                       |        |       |                | 1    |
| Asterales  | <i>Asteraceae</i> C Aster | common dandelion                        | <i>Taraxacum officinale</i>                       |             | LC                      |        |       |                | 1    |
| Asterales  | <i>Asteraceae</i> C Aster | goat-s beard [sand goat-s beard]        | <i>Tragopogon dubius</i>                          |             | O                       |        |       |                | 1    |
| Asterales  | <i>Asteraceae</i> C Aster | wing stem [yellow iron weed]            | <i>Verbesina alternifolia</i>                     |             | LA                      |        |       |                | 1    |
| Asterales  | <i>Asteraceae</i> C Aster | yellow crownbeard                       | <i>Verbesina helianthoides</i>                    |             | O                       |        |       |                | 1    |
| Asterales  | <i>Asteraceae</i> C Aster | tall iron weed                          | <i>Vernonia gigantea</i>                          |             | O                       |        |       |                | 1    |
| Asterales  | <i>Asteraceae</i> C Aster | Missouri ironweed                       | <i>Vernonia missurica</i>                         |             | U                       |        |       |                | 1    |
| Asterales  | <i>Asteraceae</i> C Aster | cocklebur                               | <i>Xanthium strumarium</i> var. <i>canadensis</i> |             | O-LA                    |        |       |                | 1    |
| <p>Frequency of Occurrence Key</p> <p>A = abundant</p> <p>LA = locally abundant</p> <p>C = common</p> <p>LC = locally common</p> <p>O = occasional</p> <p>R = rare? = undocumented</p>   |                           |   |   |             |                         |        |       |                |      |
| <p>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 <a href="http://www.fs.fed.us/ne/delaware/ilpin.html">http://www.fs.fed.us/ne/delaware/ilpin.html</a>. 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.</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         |
|--|------------|-------------------------|
| <b>Birds</b>   |            |                         |
| Pied-billed Grebe ( <i>Podilymbus podiceps</i> )           | Threatened | Migrant                 |
| American Bittern ( <i>Botaurus lentiginosus</i> )          | Endangered | Migrant; former breeder |
| Least Bittern ( <i>Ixobrychus exilis</i> )                 | Threatened | Migrant; former breeder |
| Snowy Egret ( <i>Egretta thula</i> )                       | Endangered | Migrant                 |
| Little Blue Heron ( <i>Egretta caerulea</i> )              | Endangered | Migrant                 |
| Black-crowned Night Heron ( <i>Nyctanassa nycticorax</i> ) | Endangered | Migrant                 |
| Yellow-crowned Night Heron ( <i>Nyctanassa violacea</i> )  | Endangered | Migrant                 |
| Northern Harrier ( <i>Circus cyaneus</i> )                 | Endangered | Migrant                 |
| Mississippi kite ( <i>Ictinia mississippiensis</i> )       | Endangered | Migrant                 |
| Red-shouldered Hawk ( <i>Buteo lineatus</i> )              | Threatened | Breeder                 |
| Bald Eagle ( <i>Haliaeetus leucocephalus</i> )             | Threatened | Breeder                 |
| Osprey ( <i>Pandion haliaetus</i> )                        | Endangered | Migrant; former breeder |
| Peregrine Falcon ( <i>Falco peregrinus</i> )               | Endangered | Migrant                 |
| Common Moorhen ( <i>Gallinula chloropus</i> )              | Threatened | Migrant                 |
| Sandhill Crane ( <i>Grus Canadensis</i> )                  | Threatened | Migrant                 |
| Upland Sandpiper ( <i>Bartramia longicauda</i> )           | Endangered | Migrant; former breeder |
| Wilson's Phalarope ( <i>Phalaropus tricolor</i> )          | Endangered | Migrant                 |
| Forster's Tern ( <i>Sterna forsteri</i> )                  | Endangered | Migrant                 |
| Least Tern ( <i>Sterna antillarum</i> )                    | Endangered | Migrant                 |
| Black Tern ( <i>Chlidonias niger</i> )                     | Endangered | Migrant                 |
| Barn Owl ( <i>Tyto alba</i> )                              | Endangered | Migrant                 |
| Short-eared Owl ( <i>Asio flammeus</i> )                   | Endangered | Migrant                 |
| Loggerhead Shrike ( <i>Lanius ludovicianus</i> )           | Threatened | Breeder                 |
| Brown Creeper ( <i>Certhia americana</i> )                 | Threatened | Migrant                 |
| Bewick's Wren ( <i>Thryomanes bewickii</i> )               | Endangered | Migrant                 |
| Henslow's Sparrow ( <i>Ammodramus henslowii</i> )          | Endangered | Breeder                 |
| <b>Mammals</b>   |            |                         |
| Indiana bat ( <i>Myotis sodalis</i> )                      | Endangered | Status Unknown          |
| Golden mouse ( <i>Ochrotomys nuttalli</i> )                | Threatened | Breeder                 |
| Marsh rice rat ( <i>Oryzomys palustris</i> )               | Threatened | Breeder                 |
| River otter ( <i>Lontra canadensis</i> )                   | Threatened | Status Unknown          |
| <b>Plants</b>  |            |                         |
| Hairy synandra ( <i>Synandra hispidula</i> )               | Endangered |                         |





# **Appendix F: Bibliography**



## 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

camp, 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 near-shore 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 peo-

ple 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**





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.

Mr. Freitsche  
Page Two  
July 9, 2002

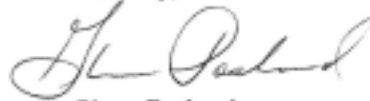
4. Look Out Point

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

- # Biking/Jogging and Footraces – 295
- # Boating – 297
- # Camping, Swimming and Picnicking – 299
- # Cemetery Operations – 301
- # Collection of Wild Plant Foods for Personal Use – 303
- # Cooperative Farming – 305
- # Fire Department Training – 307
- # Fishing (Competitive Events) – 309
- # Fishing (Recreational) – 311
- # Grazing of Livestock – 313
- # The Haven Operations – 315
- # Haying – 317
- # Horseback Riding – 319
- # Hunting of Fox – 321
- # Hunting of Migratory Waterfowl and Game Birds, Resident Game and Furbearers (Recreational) – 323
- # Industrial Operations – 326
- # Installation of Nesting Structures by Public or Groups – 328
- # Interpretation and Environmental Education – 330
- # Priority Wildlife-dependent Recreational Uses on Lands Proposed to be Acquired – 332
- # Sewage Collection System Replacement by the City of Marion – 334
- # Trapping of Furbearers – 335
- # Waterskiing – 337
- # Wildlife Observation and Interpretation – 339
- # Wood Cutting and Timber Harvest – 341
- # Youth Camp Operations – 343



## Compatibility Determination

**Uses:** Biking, Jogging, and Foot Races

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purposes:** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for – (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. ' 460k-1 "... the Secretary... may accept and use... real... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Uses:** Biking currently is allowed only on roads open to motorized vehicles. In the future the refuge may establish trails specifically for bicycle and foot traffic.

Jogging and running are allowed anywhere open to general public use. Most of this type of use occurs on the public roadways and hiking trails.

Organized foot races require a special use permit issued by the Refuge Manager. The permit may authorize runners access to roads within the restricted use area.

The amount of biking and jogging use is relatively trivial, but probably would increase if trails were designated for these activities. The refuge typically issues permits for two to five foot races per year. These uses occur year-round.

These activities can occur at other locations outside of the refuge. Allowing these activities on the refuge without adversely impacting wildlife or priority recreational uses fosters good community relations. Poor relations between the refuge and the public has been cited as an area of concern by the public at informational meetings held during preparation of the refuge's Comprehensive Conservation Plan.

These activities are not priority wildlife-dependent recreational uses identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

**Availability of Resources:** The refuge provides access roads, hiking trails, parking lots, signs, restroom facilities and staff to maintain these facilities and enforce regulations. These facilities will be maintained to meet the needs of the public engaged primarily in other activities. These uses require minor expenditures of funds and personnel for administration, maintenance, and law enforcement. The activity of jogging does not require any expenditure of refuge funds. Foot races are managed by not-for-profit organizations and require little expenditure of refuge funds or staff time. If funds, likely less than \$1,000 per fiscal year, are required they are available from the refuge user fee program. Bicycling on refuge roads does not require expenditure of refuge funds. If bicycling paths are constructed they would be funded through special programs such as T-21 (a Federal Highway Administration program), friends groups, and the Refuge Operating Needs System. Operation and management of bicycle trails would be funded through the recreational fee program.

**Anticipated Impacts of the Use:** Short-term disturbance to wildlife may occur during these activities, but would be limited and localized. These activities

should not result in short- or long-term impacts that adversely affect the purposes of the refuge or the mission of the National Wildlife Refuge System.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

Use is Not Compatible

X Use is Compatible With Following Stipulations

1. Biking is permitted only on public roads open to motorized vehicles.
2. Jogging and running are permitted in areas open to general public use.
3. Organizers of foot races must have a valid special use permit and pay any associated fees prior to holding an event.
4. All biking, jogging, running, fitness walking, and foot racing activities must comply with applicable policies and regulations.
5. Bicycles are not allowed in Crab Orchard Wilderness.

**Justification:** While biking, jogging, and foot races are not priority wildlife-dependent recreational uses of Refuge System lands, these activities support the general recreation purpose for which the refuge was established. These uses should have limited and localized negative impacts when conducted with the stipulations above. Providing these opportunities with local service organizations promotes the refuge's image as a good neighbor to the surrounding communities. Administration of these uses will require minor amounts of administrative time and funding.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Boating

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purposes:** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System A... administered for the use and enjoyment of the American people in such a 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...@ (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge allows various forms of boating on the three large lakes. The types of boats commonly used range from canoes and kayaks to jon boats, personal watercraft (commonly known as 'jet skis'), runabouts, bass boats and sailboats to pontoon boats and massive house boats. Most of the boating activity occurs on Crab Orchard

Lake, which is divided at the Wolf Creek Road causeway into two areas; the eastern portion being seasonally closed to boating to provide a sanctuary for wintering waterfowl. Several coves and bays of Crab Orchard Lake have been designated as no-wake or no-skiing zones. There is a 10-horsepower motor limit on Little Grassy Lake and Devils Kitchen Lake.

Boating is a very popular, year-round activity, with most use occurring between Memorial Day and Labor Day. Most of the boating use is associated with fishing. Other activities include waterfowl hunting, waterskiing, sailing and pleasure cruising. Little Grassy Lake receives significant non-motorized boat use from the four refuge youth camps and SIU Touch of Nature Environmental Center. There are twenty boat launching ramps and parking lots to accommodate this use on the three lakes.

There are three marinas on Crab Orchard Lake offering permanent boat docking facilities and other services, and Little Grassy Lake and Devils Kitchen Lake each have a concession-operated marina. Playport Marina, which is operated by the refuge, offers separate docks with slips for houseboats, runabouts and sailboats, as well as restrooms, fueling and sewage disposal services on Crab Orchard Lake. Images Marina is a smaller boat docking facility on Crab Orchard Lake which is also operated by the refuge. The refuge arranges for volunteer hosts to stay on-site at Playport and Images marinas during the summer peak-use season. The third marina on Crab Orchard Lake is operated by the Crab Orchard Boat & Yacht Club, a private organization, through a lease contract with the refuge.

Boating is not a priority wildlife-dependent recreational use identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. However, most boating use occurs in conjunction with fishing, hunting, or wildlife observation. Pleasure boating was instituted on Crab Orchard Lake by the USDA Soil Conservation Service before the refuge was established in 1947, and has been allowed ever since.

**Availability of Resources:** The refuge provides three large lakes (covering almost 9,000 acres) along with marinas, boat ramps, courtesy docks, parking lots, access roads, signs, restroom facilities, boat fueling station, sewage collection system, and staff to maintain these facilities and enforce regulations. These facilities will be maintained to meet the needs

of the public engaged in boating, as well as other uses. The refuge staff includes personnel who perform contract compliance, administrative, maintenance, and law enforcement functions. The annual cost of administering and managing this use and associated facilities is about \$250,000.

**Anticipated Impacts of the Use:** Short-term disturbance to wildlife may occur as a result of this activity, but usually is limited and localized. Disturbance to wintering waterfowl is minimized by the seasonal closure of the eastern portion of Crab Orchard Lake. Boating causes some shoreline erosion and water turbidity, but is relatively minor as compared to that caused by natural wave action. Sometimes there are conflicts between the various types of boat users, such as those in powerboats versus sailboats or in jet skis versus fishing boats. There is some undetermined level of water pollution caused by boat motors, particularly the ubiquitous 2-cycle engines, and by improper disposal of sewage from houseboats. This activity should not result in short- or long-term impacts that adversely affect fulfilling the purposes of the refuge or the mission of the National Wildlife Refuge System.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open houses and focus group meetings were held to discuss and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This determination is being made as part of a Comprehensive Conservation Plan. Additional review will occur as part of the public review of the Draft Comprehensive Conservation Plan.

**Determination:**

**Stipulations Necessary to Ensure Compatibility:**

Use is Not Compatible

X Use is Compatible With Following Stipulations

1. Crab Orchard Lake east of Wolf Creek Road causeway is closed to boating during the wintering waterfowl season.
2. Boating activities must comply with all appropriate Service policies and refuge regulations.
3. Motorboating activities must comply with policy contained in Service Manual Chapter 632 FW 3, Motorboats and Waterskiing.

**Justification:** While boating is not a priority wild-life-dependent recreational use of Refuge System lands, this activity supports the general recreation purpose for which the refuge was established. This use should have limited and localized negative impacts when conducted with the stipulations above. Administration of this use will require significant, but manageable, amounts of administrative time and funding. When conducted under the stipulations above, boating will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the refuge.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Uses:** Camping, Swimming, and Picnicking

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purposes:** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Uses:** Camping is allowed only in designated campgrounds. There are three campgrounds:

1. Crab Orchard Campground, located on Crab Orchard Lake, has 250 campsites and is operated under a concession contract.

2. Little Grassy Campground and Marina, located on Little Grassy Lake, has 130 campsites and is operated under a concession contract.
3. Crab Orchard Boat & Yacht Club Campground and Marina, located on Crab Orchard Lake, has 40 campsites and is operated under a lease contract. This facility is not open to the general public, only to members of the club.

Swimming is generally allowed in Crab Orchard Lake and Little Grassy Lake, but prohibited in all other bodies of water including Devils Kitchen Lake. There is a public beach in both the Crab Orchard Campground and Little Grassy Campground operated under the campground contracts.

Picnicking is allowed in several scattered areas where the refuge has installed tables, grills, trash receptacles and restroom facilities. There is a picnic shelter located at Playport Marina available for public use by reservation.

Camping, swimming, and picnicking are popular summer activities with most use occurring between Memorial Day and Labor Day. Some camping, especially by hunters, extends into the spring and fall.

Camping, swimming, and picnicking are not priority wildlife-dependent recreational uses identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. For many people, these are traditional, family-oriented activities which provide an opportunity for those participating to enjoy the natural environment. Swimming and picnicking were instituted by the USDA Soil Conservation Service before the refuge was established and have been allowed, to greater or lesser degrees, since. The refuge made a transition from dispersed camping to an aggregated form when Crab Orchard Campground opened in 1964. These long established activities are considered to be generally consistent with the Recreation@ purpose of the refuge.

**Availability of Resources:** The refuge provides campgrounds, lakes with beaches, and picnic areas, as well as access trails, parking lots, signs, plus restroom, shower and fish cleaning facilities, and staff to maintain these facilities and enforce regulations. These facilities will be maintained to meet the needs of the public engaged in camping, swimming, and picnicking, as well as other uses. Funding for the staff that manage these activities is appropriated annually and is approximately \$58,000. Operations and maintenance costs are estimated to be

\$6,000 per year. Funding from the recreational fee program for rehabilitation, replacement and major repairs varies from \$2,000 to \$20,000 annually. The refuge will manage campgrounds and beach facilities through concession contracts.

Camping, swimming, and picnicking opportunities are offered in nearby state parks, municipal parks, and at Rend Lake.

**Anticipated Impacts of the Use:** Campgrounds occupy approximately 125 acres of the refuge. Birds that use understory vegetation are impacted by the loss of this habitat. In addition, birds and other animals that are disturbed by the activities associated with camping will be excluded from these areas. Soil erosion and compaction can also occur with this concentrated activity. Short-term disturbance to wildlife may occur during these activities, but will be limited and localized. These activities should not result in short- or long-term impacts that adversely affect the purposes of the refuge or the mission of the National Wildlife Refuge System.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

Determination:

Use is Not Compatible

X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Camping is allowed only in designated campgrounds where appropriate facilities permit intensive use without inordinate impacts to refuge resources.
2. Swimming is allowed only in Crab Orchard Lake and Little Grassy Lake.

**Justification:** While camping, swimming, and picnicking are not priority wildlife-dependent recreational uses of Refuge System lands, these activities support the recreation purpose for which the refuge

was established. These uses should have limited and localized negative impacts on natural resources when conducted with the stipulations above. Administration of these uses will require significant, but manageable, amounts of administrative time and funding.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015



## COMPATIBILITY DETERMINATION

**Use:** Activities Associated with Refuge Cemeteries

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purposes:** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** There are 38 known cemeteries located on the refuge. The number of graves in each ranges from 1 to well over 200. Most of the cemeteries are not maintained, but several are maintained by relatives or volunteers who perform regular mowing and brush removal. Several ceme-

teries have had interments in recent years. Some cemeteries receive visitors regularly, usually around the Memorial Day and Veterans Day holidays; most do not. Over the Memorial Day weekend the refuge opens the gates to several cemeteries in the restricted use area. The refuge issues gate keys on request to people who wish to visit cemeteries in the restricted use area at other times.

**Availability of Resources:** The refuge is not responsible for maintaining the cemeteries; however, refuge volunteers sometimes perform mowing and brush removal. Refuge personnel and volunteers working at the visitor information center are available to open and close gates over the Memorial Day weekend and issue gate keys to people who wish to visit cemeteries in the restricted use area at other times. Refuge personnel are available to handle the relatively rare requests for new interments.

Management of this activity will need to be brought into compliance with certain laws and policies governing historic and cultural resources. The administration of this program will require approximately \$5,000 to \$10,000 staff time to bring into compliance. Costs to administer the program on an annual basis are less than \$1,000.

**Anticipated Impacts of the Use:** Cemetery activities have minimal impact on the natural resources of the refuge. Mowing reduces ground cover and produces noise. In some cases the understory is removed which adversely impacts birds that use this type of cover. Interments involve temporary soil disturbance.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

### Determination:

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Future burials are permitted only in designated cemeteries for individuals who:
  - # 9 were former owners of land now owned by the refuge fee title
  - # 9 are immediate family members of families already buried there, or
  - # 9 possess a legally binding document such as a deed to a burial plot.
2. For each approved burial, the refuge will issue a special use permit (with appropriate special conditions) authorizing a responsible party to conduct the burial.
3. No cemeteries will be expanded beyond their current boundaries.

**Justification:** All of the cemeteries were established before the Fish and Wildlife Service assumed control of the lands now in the refuge. The personnel time required to administer cemetery maintenance, visitation, and use is minimal. Permitting visitation, grounds maintenance, and family burials promotes good relations with the public.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Collection of Wild Plant Foods for Personal Use

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purposes:** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge allows the public to collect various wild plant food products for personal use.

Some plants growing on the refuge produce edible products such as fruits and nuts. Blackberries,

raspberries, grapes, plums, persimmons, mulberries, pawpaws, pecans, hazelnuts and walnuts are examples of these products. Harvest occurs during the daylight hours, usually in the summer or fall and typically is of short duration. These foods are hand harvested by picking the products from the plant or gathering what has fallen to the ground.

Mushrooms, asparagus, and poke weed are examples of plant parts that are collected and consumed. These are usually picked or cut by hand in the spring.

Access to harvest sites is typically accomplished by walking from a parking area or public roadway. Access may also be made by boat.

Collection of these plant foods is not a priority wildlife-dependent recreational use identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. For some people, this is a traditional, family-oriented activity which provides an opportunity for those participating to collect wholesome foods while enjoying the natural environment.

**Availability of Resources:** About half of the refuge land has been open to collecting wild plant foods since it was acquired. Access trails, parking lots, signs and other facilities as well as staff to enforce regulations and maintain these facilities have been provided by the refuge. These facilities will be maintained primarily to meet the needs of the public engaged in hunting, fishing, and other activities, and will be used incidentally by those collecting wild plant foods. This use will not require a significant increase in additional maintenance or enforcement staff expenditures. The refuge will not have to provide special equipment. The management of this activity requires less than \$2,000 per year.

**Anticipated Impacts of the Use:** Historically, public participation in the collection of plant food products on the refuge has been low, and future participation is also expected to be low. The quantity and frequency of plant food products removed is not expected to significantly diminish wildlife food sources or jeopardize wildlife survival.

Short-term disturbance to wildlife may occur during these activities, but will be insignificant. This activity should not result in short- or long-term impacts that adversely affect the purposes of the refuge or the mission of the National Wildlife Refuge System.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Collection of the following plants, or parts and products thereof, is prohibited: ginseng, Solomon's seal, goldenseal, wild ginger, St. John's wort, prickly pear cactus, and maples.
2. Digging of plants or their roots is prohibited.
3. Plant food products are for personal use only and cannot be sold or traded.
4. Damaging trees, shrubs or any other vegetation is prohibited.

**Justification:** This use supports the recreation purpose for which the refuge was established. The collection of wild plant foods for personal use will have limited and localized impacts when conducted with the stipulations above.

**Signature:**Refuge Manager:\_\_\_\_\_

**Concurrence:**Regional Chief:\_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Cooperative Farming

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** Cooperative farming is the term used for agricultural cropping activities done by local farmers as directed and authorized by the refuge. The cropping is done under the terms and conditions of Cooperative Farming Agreements issued by the Refuge Manager. The terms of the agreements ensure that all current Service and ref-

uge policies are followed. The primary reasons for growing crops are to satisfy the refuge's legislated agricultural purpose and to provide grain and forage for wintering Canada geese. In addition, numerous other wildlife species take advantage of the crops.

Currently the refuge has 8 cooperators who farm about 4,500 acres. The crop rotation on upland fields is corn/soybeans/corn/clover/clover. The rotation on bottomland fields is corn/soybeans. During the years that corn is grown, 25 percent is left standing in the field for wildlife use. The cooperators are required to cut the clover in the fall to provide suitable conditions for Canada geese to loaf and browse in the fields. Cooperators are allowed to cut and harvest second year clover crops for hay. Cooperators practice standard commercial agriculture typical for this region: sometimes tilling, sometimes planting "no-till," applying a variety of fertilizers and herbicides, and harvesting—all using large specialized machinery. Some of the corn and soybean seeds planted are genetically modified varieties. Normally no money changes hands in the operation of the cooperative farming program. The refuge receives: a 25 percent share of the corn, winter wheat planted following soybeans, and clover fields cut short in the fall. Stipulations of the agreements require cooperators to maintain recommended soil fertility and pH levels. Occasionally and on a limited basis, surplus corn is harvested in the spring for which the cooperator pays one half of the proceeds to the government. Proposed changes in future farming operations would prohibit the mowing of clover until August 1 each year.

**Availability of Resources:** The staff time for administration of the cooperative farming program is already committed and available. The time needed to coordinate issuance and oversight of the needed Cooperative Farming Agreements is rather significant, but within existing refuge resources. The refuge wildlife biologist and a biological sciences technician administer the farm program along with their other duties. Cooperators use the existing network of state, county, and refuge roads to access the fields. Occasionally the refuge does work to facilitate access, such as road improvement or bridge repair. The refuge expends about \$10,000 per fiscal year in administrative and maintenance activities related to cooperative farming.

**Anticipated Impacts of the Use:** Cooperative farming will result in both positive and negative impacts to resident and migratory wildlife. Short-term

impacts include disturbance and displacement during operation of heavy equipment and following changes in ground cover. Long-term benefits are primarily to wintering Canada geese, but some other migratory and resident species that use open habitats are served. Many forest-dwelling migratory birds will be negatively impacted because farmed land often increases numbers of potential nest predators (e.g., raccoon) and nest parasites (e.g., brown-headed cowbird). Other negative impacts associated with farming are increased soil erosion and pesticide residue loads, both of which can degrade soil and water quality. All cooperative farming agreements include stipulations to emphasize conservation benefits and minimize negative impacts.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

Determination:

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Cooperative farming agreements will comply with all appropriate Service policies and regulations.

**Justification:** Cooperative farming directly supports the agriculture and wildlife conservation purposes for which the refuge was established, and indirectly supports the recreation purpose. Farming will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Fire Department Training

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the Refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** Local fire departments conduct training exercises involving drafting water from Crab Orchard Lake and either spraying it directly back into the lake or transporting the water less than one mile and dumping it. This activity helps fire personnel become familiar with their equipment to maintain readiness to respond to

emergencies. The sites normally used are Take Pride Point boat ramp and Wolf Creek Road recreation area. In the past, this activity has taken place one to three times per year.

Fire department training is not a purpose of the Refuge, nor is it a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. However, this use indirectly supports all the purposes of the Refuge.

**Availability of Resources:** The annual cost of administering this use is minimal. Refuge staff is available to issue special use permits. Monitoring this use is not necessary.

**Anticipated Impacts of the Use:** There would be minimal, short-term disturbance to fish and wildlife in the immediate area of activity lasting one to four hours. Visitors engaged in recreational activities would be minimally affected, if at all.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

### Determination:

Use is Not Compatible

X Use is Compatible With Following Stipulations

### Stipulations Necessary to Ensure Compatibility:

1. Training exercises will be conducted under the terms of a special use permit issued by the Refuge Manager.
2. Permittee will not introduce any foreign substances, such as foam concentrates, to the water or lands.
3. Permittee will not transport water from one body of water to another.

**Justification:** Fire department training indirectly supports all the legislated purposes of the Refuge by maintaining a local force to protect the Refuge's natural resources and improvements from fire. Anticipated negative impacts are minimal. The cost of administering this use is minimal.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015



## COMPATIBILITY DETERMINATION

**Use:** Competitive Fishing Events

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge annually allows three sanctioned bass fishing tournaments on Crab Orchard Lake, one each on Devils Kitchen and Little Grassy lakes, and many smaller scale "fish offs" on these three lakes. The tournaments, proceeds from which go to the winners and charities, are conducted by organizations under a special use permit

issued by the refuge. Tournaments are typically two-day events involving an average of 100 boats. Fish offs, which are events with fewer than 20 boats organized by fishing clubs, distribute the proceeds among the winners. The refuge issues special use permits for about 130 fish offs per year and many more fish offs occur without a permit. All boats are required to be equipped with aerated live wells and all the fish caught must be returned to the water following the weigh-in.

**Availability of Resources:** Competitive anglers use the existing network of roads to access the various bodies of water for fishing. The refuge provides an area (Take Pride Point) for the exclusive use of tournament participants to launch their boats. The refuge also furnishes numerous parking lots, boat ramps, docks, piers, restrooms, signs and other facilities primarily for use by anglers. The refuge provides staff to maintain these facilities, disseminate information to visitors, and enforce regulations. All of the bodies of water open to competitive fishing are artificial impoundments maintained and managed by the refuge. The refuge maintains game fish rearing ponds to enhance fishing opportunities. Fisheries management is conducted in cooperation with Illinois Department of Natural Resources. This activity has occurred on the refuge since the 1960s and is considered to be generally consistent with the "recreation" purpose of the refuge.

Funding for staffing this activity is approximately \$2,000. Costs associated with other activities such as boating capture the operation and maintenance of facilities mentioned above. The Take Pride in America Organization is responsible for the operation and maintenance of "Take Pride Point" and the maintenance of the fish rearing ponds.

**Anticipated Impacts of the Use:** Competitive fishing activities may cause temporary disturbance to waterfowl and other wildlife. There is some concern that catch-and-release bass fishing stresses and kills fish, especially during summer, but the magnitude is unknown at this time. Fish offs may have greater impacts to the fishery resource assuming precautions designed to reduce post-release mortality may not followed by the fish offs conducted without permits. Undoubtedly some shoreline erosion is caused by boat wakes, but is relatively minor compared to that caused by wind-driven wave action. The potential exists for conflicts between competitive anglers and purely recreational anglers, especially for coveted fishing spots. In addition, conflicts with other boaters could arise from inconsiderate boat opera-

tion. With reasonable use restrictions in effect, competitive fishing should not result in short- or long-term impacts that adversely affect the purposes of the refuge or the mission of the National Wildlife Refuge System.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

Determination:

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. All applicable State and Federal regulations apply. Regulations and monitoring help ensure that harvest levels of fish do not harm long-term populations.
2. Competitive fishing events will be regulated to have a minimal impact on other lake users.
3. All sponsors of competitive fishing events must have a valid special use permit and pay any associated fees prior to conducting the event.

**Justification:** Competitive fishing events support the general recreation purpose for which the refuge was established. Recreational fishing is a priority wildlife-dependent recreational use, as defined by the National Wildlife Refuge System Administration Act of 1966 (as amended by the National Wildlife Refuge System Improvement Act of 1997). Fishing and its impacts on fishery resources are monitored by the Illinois Department of Natural Resources and refuge-specific regulations are implemented to properly manage the sport fishing resource.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Recreational Fishing

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge allows public fishing in accordance with State and refuge regulations and seasons. Illinois recreational fishing regulations allow the traditional taking of game fish species with rod and reel from shore, a boat or through the ice, using trotlines and jugs, removal of rough fish by spear, archery and dip net, as well as the taking of

limited quantities of mussels, crayfish, frogs, minnows and turtles for personal use.

**Availability of Resources:** Anglers use the existing network of roads to access the various bodies of water for fishing. The refuge provides numerous parking lots, boat ramps, docks, piers, restrooms, signs and other facilities primarily for use by anglers. The refuge provides staff to maintain these facilities, disseminate information to visitors, and enforce regulations. All of the bodies of water open to fishing are artificial impoundments maintained and managed by the refuge. The refuge maintains game fish rearing ponds to enhance recreational fishing opportunities. Fisheries management is conducted in cooperation with Illinois Department of Natural Resources.

Funding for staffing this activity is approximately \$10,000 annually. Operations and maintenance is an additional \$2,000. Recreational fee program funding of \$500 to \$10,000 may be spent annually for rehabilitation, major repairs, or replacement of facilities associated with recreational fishing. Some of the costs associated with this activity are covered with other activities such as boating.

**Anticipated Impacts of the Use:** Fishing activities and harvest of other aquatic species may cause temporary disturbance to waterfowl and other wildlife. To minimize disturbance some areas are closed to fishing during fall and winter when waterfowl concentrate. There is some concern that catch-and-release bass fishing stresses and kills fish, especially during summer, but the magnitude is unknown at this time. Undoubtedly some shoreline erosion is caused by boat wakes, but is relatively minor compared to that caused by wind-driven wave action.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. All applicable State and Federal regulations apply. Regulations and monitoring help ensure that harvest levels of fish do not have harmful long-term impact on fish populations.

**Justification:** Fishing supports the recreation purpose for which the refuge was established. Fishing is a priority wildlife-dependent recreational use, as defined by the National Wildlife Refuge System Administration Act of 1966 (as amended by the National Wildlife Refuge System Improvement Act of 1997). Fishing and its impacts on fishery resources are monitored by the Illinois Department of Natural Resources and refuge-specific regulations are implemented to properly manage the sport fishing resource.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2020

## COMPATIBILITY DETERMINATION

**Use:** Livestock Grazing

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** Local farmers graze their cattle as directed and authorized by the refuge. Grazing is done under the terms and conditions of special use permits issued by the Refuge Manager. The terms of the permits ensure that current Service and refuge policies are followed. Grazing is recognized as a valuable tool to remove standing vegeta-

tion, reduce excess vegetative litter, and suppress woody vegetation. The primary reasons for grazing are to satisfy the refuge's legislated agricultural purpose and to provide open habitat suitable for browsing and loafing by wintering Canada geese.

Currently the refuge has 7 permit holders who graze about 1,000 acres of tall fescue pasture. The grazing season extends from April 15 through October. There are about 21 miles of perimeter and cross fences around and within the grazing units. The refuge initially constructs fences and gates for each pasture unit and provides materials for repairs. Fence maintenance and control of livestock are the responsibility of the permittees. The refuge charges permittees market rate grazing fees and gives credit for fertilizing and mowing the pastures. Permittees are required to mow the pastures in the fall to make them attractive to wintering Canada geese. Proposed changes to grazing practices include: 1) conversion of fescue to native, warm-season grasses or cool-season grasses that are more beneficial to wildlife, 2) reduction or elimination of fall mowing, and 3) possible reduction in grazing pressure. The goal of these changes is to improve habitat for nesting migratory grassland birds.

Grazing is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. As an economic use of Refuge System lands, a compatibility determination for grazing is mandatory.

**Availability of Resources:** Administering the grazing program, which includes constructing fences, issuing permits, and monitoring compliance, requires using refuge funds and personnel. The refuge wildlife biologist and a biological science technician administer the grazing program along with their other duties. The funds necessary to administer this program are normally available through the refuge's staffing and operations and maintenance accounts. The refuge expends about \$40,000 per fiscal year in administrative and maintenance activities related to grazing.

**Anticipated Impacts of the Use:** Grazing will result in both positive and negative impacts to resident and migratory wildlife. Grazing will be used to maintain and improve healthy grassland communities to benefit grassland birds. Some forest-dwelling migratory birds will be negatively impacted because pastures often increase numbers of brown-headed cowbirds, a nest parasite.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Grazing is allowed only from April 15 to October 31 to minimize disturbance to wintering geese.
2. To ensure sustainability, the refuge will determine and set prudent limits on the number of animal unit months (AUM) allowable for each pasture unit according to its size, vegetation health and composition, and any other pertinent factors.
3. Permittees must mow pastures in the fall if the refuge determines mowing is necessary to provide desirable conditions for wintering geese.
4. Grazing activities must comply with all appropriate Service policies and regulations.

**Justification:** Grazing by domestic livestock, with appropriate stipulations, supports the agriculture and wildlife conservation purposes for which the refuge was established. Limited livestock grazing creates temporary disturbances to vegetation, many of which are desirable for proper grassland management. Grazing produces some undesirable, but short-term, impacts to grassland bird nesting, public recreational use, and site aesthetics. Grazing is a cost-effective management tool that can be used to replace or complement prescribed burning, mowing, or haying on grasslands. Without regular disturbance caused by mowing, haying, burning, or grazing, the health of the grassland community and its potential as wildlife habitat would decline. The grazing program provides wintering habitat suitable for browsing and loafing by the Canada goose, which is

a Service trust species and a primary focus for refuge management.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** “The Haven” Operations

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 “... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ...” (61 Stat. 770, dated Aug. 5, 1947)

“... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...” 16 U.S.C. § 460k-1 “... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ...” 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the Refuge one of many wilderness areas of the National Wilderness Preservation System “... administered for the use and enjoyment of the American people in such a 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...” (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The Haven is a 10-acre site located on the north shore of Crab Orchard Lake, near the intersection of Highway 13 and Cambria Road. The Refuge has leased the site to the Egyptian Past Commanders Club of the American Legion since 1948, for the benefit and enjoyment of disabled veterans, primarily from the Veterans

Affairs Hospital in Marion and the Anna State Hospital. The Haven’s facilities include a one-story lodge and several outdoor patios, which are used for day visits by veterans for recreation and socializing. A resident caretaker, employed by the Egyptian Past Commanders Club, coordinates events and maintains the buildings and grounds.

The Haven operations support the general recreation purpose of the Refuge, but do not directly support the priority wildlife-dependent recreational uses as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. The Refuge will evaluate ongoing activities at The Haven and make recommendations to provide opportunities for priority wildlife-dependent recreation to existing clients as well as the general public.

**Availability of Resources:** The Refuge provides the facilities and adjacent lands; the Egyptian Past Commanders Club is responsible for general operations and maintenance. The annual cost to the refuge for administering and managing The Haven operations lease contract is minimal. The Refuge staff includes a contract compliance specialist who administers and manages this and other lease contracts. The Refuge currently receives no compensation from The Haven for the use of the facilities, but is proposing to assess nominal fees to help cover its administrative expenses.

**Anticipated Impacts of the Use:** The Haven operations provide visitor services to a select clientele. The general public is excluded from using the facilities, except for a minimal amount of bank fishing use. This amounts to an exclusive use of government property for which no compensation is received.

For the most part, the current activities that occur at The Haven are non-wildlife-dependent. A minimal amount of use may involve priority wildlife-dependent recreation, such as fishing and wildlife observation. The lands occupied by these facilities are developed for human uses, and thus provide poor habitat for wildlife. The Refuge proposes to partially mitigate these issues by initiating priority wildlife-dependent recreational activities, which would be available to veterans and the general public, and charging a nominal fee to help recover administrative costs.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues fac-

ing the Refuge. Written comments were solicited from the public about Refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Lessee must operate under the terms of its lease contract.
2. During the 15-year period following approval of the Comprehensive Conservation Plan, the Refuge will collaborate with the lessee to make the facilities available to a wider portion of the public.
3. The Refuge will assess and collect a nominal fee from The Haven to help recover its administrative expenses.

**Justification:** The Haven operations support the general recreation purpose of the Refuge. In the future, the Refuge will work cooperatively with The Haven to provide more priority wildlife-dependent recreational opportunities, as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, to a wider portion of the general public.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015



## COMPATIBILITY DETERMINATION

**Use:** Haying

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** Local farmers cut and remove hay as directed and authorized by the refuge. Haying is done under the terms and conditions of special use permits issued by the Refuge Manager. The terms of the permits ensure that current Service and refuge policies are followed. (Haying by cooperative farmers as part of the agricultural crop rota-

tion is not included in this compatibility determination.) The primary reasons for haying are to satisfy the refuge's legislated agricultural purpose and to provide open habitat suitable for browsing and loafing by wintering Canada geese.

Haying can be a useful tool in an overall management program to improve and maintain refuge grasslands for the benefit of wildlife. Currently the refuge has 5 permit holders who cut hay on about 800 acres of cool-season, non-native forage species. The refuge charges permittees market rate fees for hay and gives credit for fertilizing and mowing. Permittees are required to mow the hay fields in the fall to make them attractive to wintering Canada geese. Proposed changes in future haying operations will prohibit mowing until August 1 of each year.

Haying is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Improvement Act of 1997. As an economic use of Refuge System lands, a compatibility determination for haying is mandatory.

**Availability of Resources:** Administering the haying program, which includes establishing forage, issuing permits and monitoring compliance, requires using refuge funds and personnel. The refuge wildlife biologist and a biological sciences technician administer the haying program along with their other duties. The funds necessary to administer this program are normally available through the refuge's staffing and operations and maintenance accounts. The refuge expends about \$15,000 per fiscal year in forage establishment, administrative, and maintenance activities related to haying.

**Anticipated Impacts of the Use:** Haying will result in short-term disturbances and long-term benefits to both resident and migratory wildlife using the refuge. Short-term impacts will include disturbance and displacement typical of operations involving noisy heavy equipment. Cutting and removal of standing grasses will also result in short-term loss of habitat for those species requiring tall grasses for feeding and perching such as obligatory grassland species, such as the meadowlark or dickcissel. Long-term benefits will accrue from the increased vigor of the grasses or the establishment of highly desirable, native tallgrass species, which will improve conditions for those same species affected by the short-term negative impacts. Strict time constraints placed on this use will limit anticipated negative impacts to these relatively minor areas.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Haying will be allowed only after August 1 to minimize disturbance to nesting birds. In normal years, most birds are off the nest by this date.
2. Permittees must cut hay fields in the fall to provide desirable conditions for wintering geese.
3. Haying activities will comply with all appropriate Service policies and regulations.

**Justification:** Haying, with appropriate stipulations, supports the agriculture and wildlife conservation purposes for which the refuge was established. Haying will not materially interfere with wildlife conservation if done within the above stipulations. Haying as a management tool is a valuable technique for providing long-term habitat improvements to grassland that otherwise would degrade through natural succession or dominance of non-native plants. Without this tool, the areas would suffer encroachment of undesirable woody species such as autumn-olive and multiflora rose or would remain in undesirable, non-native, cool season grasses such as fescue. Hay fields provide desirable habitat for wintering Canada geese and other wildlife.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Horseback Riding

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the Refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** This activity involves riders mounted on horses or mules traveling either on a designated trail through the refuge or on any public road within the refuge. Most of this activity would occur in the more wild and scenic southern part of the refuge, particularly the Crab Orchard Wilderness and adjacent areas. The refuge is proposing to

designate a 4.7-mile route (4.2 miles of which is in the Wilderness) that would officially become part of the River to River Trail, which is used by hikers and equestrians. This portion of the River to River Trail would be designed, constructed and maintained as defined in a memorandum of understanding between the Refuge, the River to River Trail Society, and U.S. Forest Service. Equestrians ride singly or more typically in groups of six up to several dozen. This activity occurs during any time of the year with most visits falling on the weekends. Some local residents ride onto the refuge without having to transport their horses, but the majority of riders haul their horses with trucks and trailers to the trailheads, sometimes from several hundred miles away.

Horseback riding is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

**Availability of Resources:** The refuge has an extensive network of public roads where horses may be ridden. The roads are maintained primarily for access to the various industrial areas, farm fields, and recreation areas via cars, trucks, and tractors. The River to River Trail route would require extensive work to fill gullies and harden the tread to withstand horse traffic on about 4.7 miles of trail. Since the vast majority of the work would take place in the Crab Orchard Wilderness, pack animals or other appropriate means must be utilized to haul a large amount of gravel. The refuge would need additional special project funds to pay its share of the cost, which has not yet been determined. Refuge volunteers could be assigned to monitor trail conditions and perform minor maintenance tasks.

**Anticipated Impacts of the Use:** Horseback riding causes substantial disturbance of fragile soils, especially during the winter and spring when the ground is wet and soft, which increases the potential for erosion. Hardening the tread and filling gullies by placing gravel should greatly reduce these impacts, but will not eliminate the need for regular maintenance. In addition, horse traffic often results in trampled vegetation adjacent to the tread. Hikers find the trails more difficult and unpleasant to traverse because of hoof holes and manure deposits. Invasive and exotic plants can be introduced to natural communities via seeds deposited in manure. Conflicts between hikers and equestrians may arise as use of the popular and widely promoted River to River

Trail increases. The partners involved in maintaining the River to River Trail would cooperatively attempt to minimize and resolve conflicts between users by dispersing visitors, educational efforts, and law enforcement patrols.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Horseback riding is restricted to public roads and designated trails.
2. The refuge will endorse a memorandum of understanding with the River to River Trail Society and U.S. Forest Service to define trail design, routing, construction and maintenance responsibilities. All parties to the MOU will share the costs involved as mutually agreed upon.
3. The Crab Orchard Wilderness Management Plan will be revised to allow trail construction and horseback riding.
4. The refuge reserves the right to close the River to River Trail to horseback use, if necessary, during seasons when the ground is wet and soft.

**Justification:** Horseback riding is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. However, the general recreation purpose of the refuge allows non-wildlife-dependent recreational uses. Some equestrians would likely enjoy opportunities for wildlife observation and photography. Horses are considered legal vehicles on most public roads in Illinois.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Foxhunting

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the Refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** Neighboring landowners organize and conduct traditional foxhunting meets or expeditions on their land and until 1992, had used parts of the Refuge, particularly the Crab Orchard Wilderness. This activity typically involves 10 to 20 mounted equestrians with a pack of 10 to 30 hounds chasing a fox through the fields and forest. The hunt

concludes when the fox is chased "to ground," meaning its shelter or den. The fox is not killed or otherwise intentionally harmed. Both red and gray fox are indigenous to the area. The expeditions usually take place on weekends during the fall, winter, and spring seasons.

Foxhunting was determined to be not compatible in 1992. Immediately following that determination, the refuge manager sent notices to several foxhunting clubs and this activity has not occurred on the refuge since that time.

Foxhunting is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

**Availability of Resources:** It would be difficult for the Refuge to expend its limited funds and personnel to perform the administrative, maintenance and law enforcement functions required to monitor and manage this use given the many other important needs.

**Anticipated Impacts of the Use:** Foxhunting from horseback with unleashed dogs would cause substantial disturbance to resident and migratory wildlife. The heavy volume of horse traffic would result in trampled vegetation and disturbance of fragile soils, which increases the potential for erosion. Other recreational uses occurring over an extensive area would be adversely impacted by the presence of numerous horses and hounds running about. Visitors seeking solitude in the Wilderness would instead encounter numerous horses galloping, hounds barking, and hunters blowing horns to communicate.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- X Use is Not Compatible
- Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:** Not applicable

**Justification:** There are substantial and unacceptable adverse impacts associated with this use on the refuge's natural resources and priority recreational uses. It would be imprudent to appropriate funds and personnel from other essential programs to adequately manage this use. Foxhunting was determined to be not compatible in 1992, and has not occurred on the refuge since that time. Permitting this use would materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission and the purposes of the refuge.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Recreational Hunting of Migratory Waterfowl and Game Birds, Resident Game, and Furbearers

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

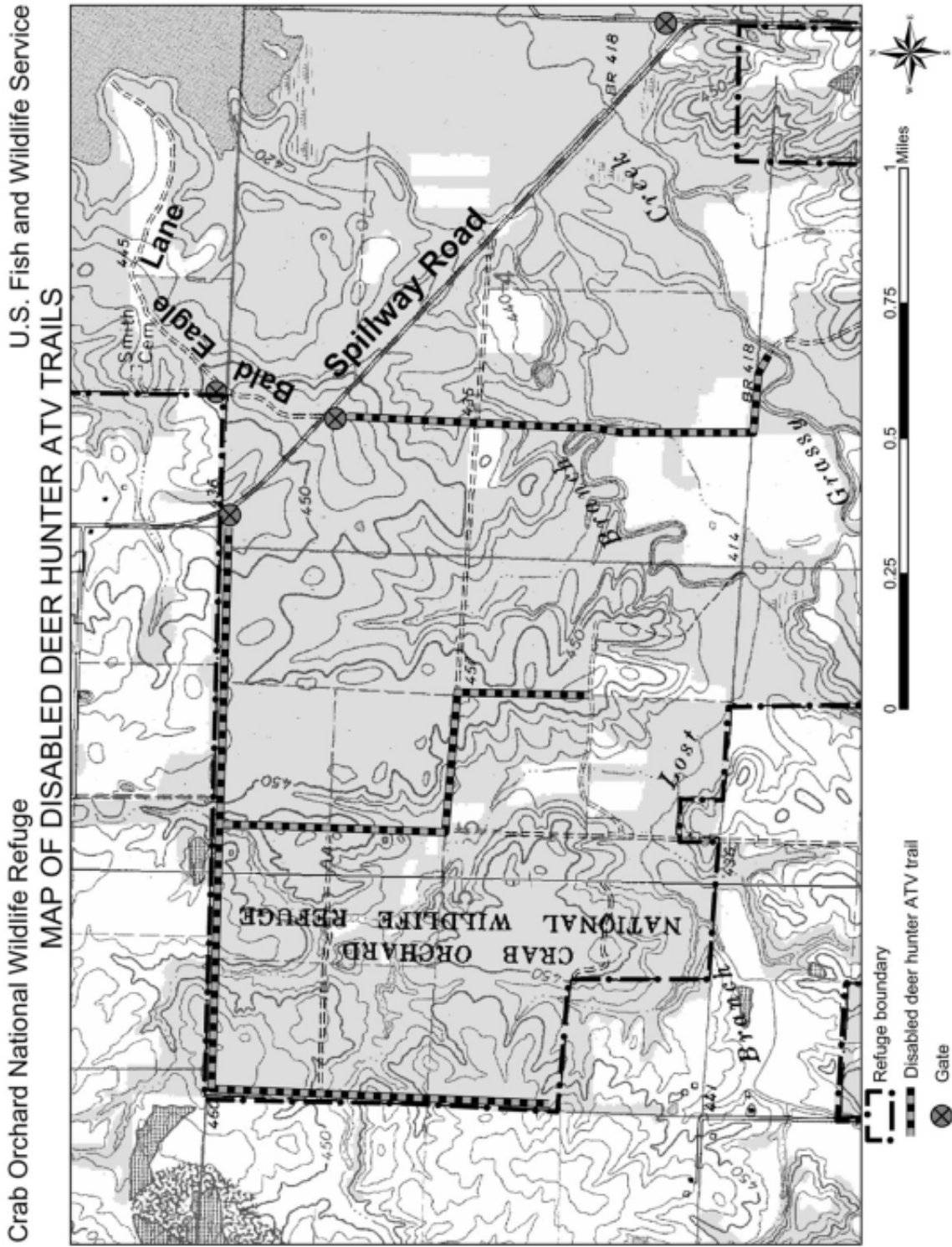
**Description of Use:** The refuge allows public hunting of migratory waterfowl and game birds, resident game, and furbearers in accordance with Federal, State, and refuge regulations and seasons on most of the 22,000-acre area of land and water

open for public use. Public hunting is not allowed in the youth camps at Little Grassy Lake.

Animals hunted include geese, ducks, deer, turkey, rabbits, squirrels, bobwhite, woodchuck, dove, woodcock, snipe, crows, raccoon, opossum, skunk, foxes and coyote. In addition, there are two special firearm deer hunts (each with 500 permits) over seven days in the fall on about 14,700 acres of the 22,000-acre restricted use area specifically to control the population. Concurrent with the first three-day deer hunt, the refuge organizes a special deer hunt within a separate 2,000-acre portion of the restricted use area for 25 youth and 25 disabled individuals. The refuge issues 60 regular permits and 12 youth permits for a special turkey hunt which runs from late March to the beginning of May on about 14,700 acres within the restricted use area. The refuge provides controlled waterfowl hunting opportunities at 18 land blinds and 15 water blinds around western sections of Crab Orchard Lake. The Illinois Department of Natural Resources manages resident game and furbearers and helps maintain healthy populations by allowing harvest of surpluses through recreational hunting. Hunters use a variety of weapons in pursuit of the various games species, such as shotguns, handguns, muzzleloaders, small caliber rifles, crossbows, and bows and arrows. The refuge issues several special use permits annually to disabled deer hunters authorizing them to use an ATV on designated routes for access (see attached map).

**Availability of Resources:** Hunters use the existing network of roads to access the various lands and bodies of water for hunting. The refuge provides numerous trails, parking lots, blinds, boat ramps, docks, restrooms, signs and other facilities for use by hunters. The refuge provides staff and volunteers to maintain these facilities, disseminate information to visitors, and enforce regulations. All of the bodies of water open to hunting are artificial impoundments maintained and managed by the refuge.

Funding for the staff that manages the hunting program is approximately \$60,000 per year. Operation and maintenance (O&M) costs are about \$8,000. Southern Illinois Hunting and Fishing Days (a non-profit organization) constructs blinds for the controlled waterfowl hunting program managed by the Friends of Crab Orchard Refuge organization. The cost of this program to the Service is included in the O&M cost noted above. Volunteers manage the hunts for disabled hunters. The Illinois Department





of Natural Resources manages the permit system for hunts in the restricted use area at no cost to the Service.

**Anticipated Impacts of the Use:** Although hunting causes mortality and temporary disturbance to waterfowl and other wildlife, harvesting helps maintain populations at the carrying capacity of existing habitats, which helps to ensure the long-term health and survival of the species. Hunting deer helps to keep the herd size at a moderate level which protects refuge habitats from over-browsing and tends to reduce deer/vehicle collisions on the highways. Some types of hunting involving firearms, particularly waterfowl, deer and dove, tend to exclude other uses of the area. Occasionally some individual hunters commit unlawful acts, such as taking over the bag limit, taking the wrong type/sex animal, or vandalizing facilities, but these incidents usually have only minor impacts to refuge resources.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible  
 Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. All applicable Federal, State, and refuge regulations apply.
2. The refuge and the State will monitor wildlife populations to ensure their long-term sustainability.

**Justification:** Hunting is a priority wildlife-dependent recreational use, as defined by the National Wildlife Refuge System Administration Act of 1966 (as amended by the National Wildlife Refuge System Improvement Act of 1997). Hunting supports the recreation purpose for which the refuge was established. This use is compatible provided the above stipulations are implemented. This use will help meet the missions of the refuge and System by providing sustainable resources for the benefit of the American public while conserving fish, wildlife and plant resources on these lands.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2020

## COMPATIBILITY DETERMINATION

**Use:** Industrial Operations

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** There are several industrial areas covering a total of about 1,100 acres distributed within the "restricted use area." The refuge leases 1.2 million square feet of facilities which are used for manufacturing, cold storage, and explosives storage. The largest tenant, General Dynamics, manufactures munitions for national defense. In

support of the industrial operations, the refuge maintains an extensive transportation and utility infrastructure. The refuge also provides water and waste water services to the various industrial tenants, as well as to an adjacent college campus and water service to the federal prison. As buildings become unsuitable for occupancy for various reasons, they will be removed and the site restored to natural habitats.

Industrial operations is a purpose of the refuge, but it is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

**Availability of Resources:** The annual cost of administering and managing the refuge's industrial operations is about \$40,250. The refuge staff includes a contract compliance specialist who administers and manages the industrial complex. The amount of revenue received annually from leasing industrial facilities is about \$466,000. Rental receipts are returned to the refuge and are used as part of its operation and maintenance budget.

**Anticipated Impacts of the Use:** The industrial areas generally provide poor wildlife habitat because they consist of buildings, pavement, and mowed grass. Industrial operations and maintenance activities result in increased traffic, noise levels, and wildlife disturbance from the presence of humans. Industrial complexes and surrounding areas are generally off-limits to the public for hunting, wildlife observation and photography, etc.

In terms of socio-economic impacts, the industrial complex currently has 14 firms leasing space. These 14 firms employ 551 people. Annual rental receipts total about \$466,000. Eleven buildings are currently vacant, which if leased would employ about 20 people and bring in about \$55,000 in rental revenue. Total industrial output is approximately \$27.8 million.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Industrial tenants must operate under the terms of their lease contracts and within the refuge's Industrial Use Policy.

**Justification:** Industrial operations is one of the legislated purposes of the refuge.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Installation of Nesting Structures by Public or Groups

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge allows the installation of nest structures, such as bluebird nest boxes, by individuals or groups on a voluntary basis. Currently there is only one such project that involves about 300 bluebird nest boxes maintained by a group of volunteers. The Refuge Manager gives

site-by-site authorization for nest box installation via a special use permit. The structures are usually placed in late winter and monitored throughout the summer. Structures usually are affixed using posts. In all cases, the intention of the requesters is to enhance wildlife populations through providing safe nesting sites.

Placing artificial nesting structures on the refuge is not a priority wildlife-dependent recreational use as defined in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. The use is a non-essential contributor to other priority uses such as wildlife observation, wildlife photography, and environmental education.

**Availability of Resources:** Permittees use the existing network of roads to access the nesting structure sites. Minimal refuge resources (less than \$1,000 per year) are required to administer projects involving installation of artificial nest structures on the refuge by private individuals or groups. On a strictly voluntary basis, private individuals or groups install, monitor and maintain structures and bear all associated costs. Should any permittees fail to adequately maintain the structures, there will be some cost to the refuge associated with removing abandoned structures.

**Anticipated Impacts of the Use:** The installation of artificial nesting structures has minimal impact on the purposes for which the refuge was established. Structures such as bluebird houses provide nesting sites for other migratory birds as well. Artificial nesting boxes are widely credited with helping increase the population of eastern bluebirds in North America.

There is some minor, temporary wildlife disturbance caused during placement and maintenance of the structures. There have been some conflicts associated with placing bluebird nest boxes in pastures and farm fields, but these usually can be easily resolved by relocating the structure.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the

Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Approval from the Refuge Manager via a special use permit is required prior to installation.
2. Annual maintenance is required.
3. Structures must be removed upon the Refuge Manager's request. Some possible reasons include: lack of maintenance, improper placement, and variation from approved installation plan.
4. Ownership of any nest structure placed on the refuge by private individuals or groups will be forfeited to the Service upon installation.

**Justification:** Artificial nesting structures help to support the wildlife conservation purpose and do not materially interfere with or detract from the other purposes for which the refuge was established. Nesting boxes for cavity nesting birds like bluebirds can increase populations when natural cavities are scarce. At worst, nesting structures are neutral in their effect; likely there is a positive effect. The aesthetic costs of artificial nest structures are modest and can be minimized through appropriate siting.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Interpretation and Environmental Education

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge conducts wildlife interpretation and environmental education programs. Refuge staff prepare, schedule, and organize formal programs for school-aged children and other organized groups. In most cases, curriculums and program schedules are prepared in advance. These

curriculums address a number of wildlife conservation issues including wetland and grassland conservation, migratory bird management, and the conservation of endangered species. Informal programs include self-guided auto tour routes and nature trails, impromptu presentations and discussions of wildlife conservation issues with interested citizens, casual visitors, and unscheduled groups. The visitation and use of the refuge by local educators and their classes on their own for the purposes of furthering their understanding of natural resource management issues would also be classified as an informal program.

In addition, this use includes the development of indoor interpretive areas within the refuge visitor information center and headquarters. There are many purposes for these exhibits, including telling the story of wildlife conservation and the National Wildlife Refuge System.

**Availability of Resources:** The refuge visitor center, trails, and environmental education sites are available to schools, group camps, and refuge visitors for interpretation and environmental education. Staff are available to assist teachers with visits to the refuge, present classroom demonstrations off-refuge, and for refuge group camp visits and presentations. The refuge partners with the Friends of Crab Orchard NWR and Southern Illinois University's Touch of Nature center to provide environmental education to teachers and students.

Funding for staff that manage the interpretive and environmental education programs is approximately \$60,000 per year. Operations and maintenance (O&M) funding for these programs is about \$8,000. Recreational fee funds are used to supplement O&M funds and for facilities repair and replacement.

**Anticipated Impacts of the Use:** The overall impacts to the refuge and its associated wildlife populations from this use will be minimal. There is likely to be some minor disturbance to waterfowl and other wildlife. School buses and personal vehicles will utilize existing parking areas and access trails. The limited number of nature trails proposed to be developed will minimize disturbance to vegetation and wildlife.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Use of motorized vehicles is prohibited except by permit or in designated parking areas, access trails, or public roads/tour routes.
2. The refuge will monitor use patterns and densities and make adjustments as needed in timing, location and duration to minimize disturbance.

**Justification:** Wildlife interpretation and environmental education programs are priority wildlife-dependent recreational uses, as defined by the National Wildlife Refuge System Administration Act of 1966 (as amended by the National Wildlife Refuge System Improvement Act of 1997). Interpretation and environmental education support the recreation purpose for which the refuge was established. These uses are compatible provided the above stipulations are implemented. These uses will help meet the missions of the refuge and System by furthering the general public's understanding and knowledge of this Nation's wildlife conservation needs.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2020

## COMPATIBILITY DETERMINATION

**Uses:** Priority Wildlife-dependant Recreational Uses (Hunting, Fishing, Wildlife Observation and Photography, Environmental Education and Interpretation) on Lands Proposed to be Acquired

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Uses:** Under the preferred alternative of the Land Protection Plan contained in its EIS/CCP, the refuge proposes to acquire adjacent lands or interests therein totaling about 4,242 acres.

These tracts are currently under about 95 individual ownerships. Depending on the characteristics of the individual tracts, some or all of the Service's priority wildlife-dependant recreational uses may currently occur there. Generally, if the refuge were to acquire these lands, the priority uses would be accommodated to the fullest extent practicable.

Once owned or controlled by the refuge, these lands would likely be open to public hunting of migratory waterfowl and game birds, resident game, and furbearers in accordance with Federal, State, and refuge regulations and seasons.

Animals hunted locally include geese, ducks, deer, turkey, rabbits, squirrels, bobwhite, woodchuck, dove, woodcock, snipe, crows, raccoon, opossum, skunk, foxes and coyote. Any bodies of water on these tracts would likely be open to fishing as well. Except in extraordinary circumstances, the refuge would encourage the public to use these lands for wildlife observation and photography, environmental education and interpretation.

**Availability of Resources:** Any additional resources needed to manage lands acquired would be minimal. Possibly the greatest expense would be a boundary survey required on some tracts costing several thousand dollars. Most tracts would need boundary signs installed by the refuge staff at minimal cost. For the most part, the public would use the existing network of roads to access the various lands and bodies of water. The refuge provides numerous trails, parking lots, blinds, boat ramps, docks, restrooms, signs and other facilities in proximity to most tracts. The refuge would incur little additional expense to provide staff and volunteers to maintain these facilities, disseminate information to visitors, and enforce regulations.

**Anticipated Impacts of the Uses:** Impacts resulting from these uses are expected to be ordinary and minimal. Although hunting and fishing cause mortality and temporary disturbance to waterfowl and other wildlife, harvesting helps maintain populations at the carrying capacity of existing habitats, which helps to ensure the long-term health and survival of the species. Hunting deer helps to keep the herd size at a moderate level which protects refuge habitats from over-browsing and tends to reduce deer/vehicle collisions on the highways. Some types of hunting involving firearms, particularly waterfowl, deer and dove, tend to exclude other uses of the area. Occasionally some individual hunters and anglers commit unlawful acts, such as taking over the bag/creel limit, taking the wrong type/sex/size



animal, or vandalizing facilities, but these incidents usually have only minor impacts to refuge resources. Some temporary and minimal disturbance to wildlife is caused by the presence of people engaged in wildlife observation/photography and environmental education/interpretation.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible  
 Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. All applicable Federal, State, and refuge regulations apply.
2. The refuge and the State will monitor wildlife and fish populations to ensure their long-term sustainability.

**Justification:** Hunting, fishing, wildlife observation and photography, environmental education and interpretation are priority wildlife-dependent recreational uses, as defined by the National Wildlife Refuge System Administration Act of 1966 (as amended by the National Wildlife Refuge System Improvement Act of 1997). These uses also support the recreation purpose for which the refuge was established. These uses are compatible provided the above stipulations are implemented. These uses will help meet the missions of the refuge and System by providing sustainable resources for the benefit of the American public while conserving fish, wildlife and plant resources on these lands.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2020

## COMPATIBILITY DETERMINATION

**Use:** Replacement and operation of the Refuge sewage collection system by the City of Marion

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the Refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** Issuance of a Right-of-Way to the City of Marion for the replacement and operation of a sewage collection system. The City will replace sewer force mains (approximately 29,000 feet) and three lift stations, and provide sewage transport to the City's sewage treatment plant for

treatment. The Right-of-Way provides access for the City to replace, test, maintain, inspect, and operate the force main, lift stations, and associated fittings.

**Availability of Resources:** The Refuge currently operates its own sewage collection and treatment system. Once replacement of force main and lift station are completed, the old Refuge sewage treatment plant will be dismantled and area returned to wildlife habitat. The replacement and operation of these force mains, lift stations, and sewage treatment by the City of Marion will provide a cost savings to the Refuge.

**Anticipated Impacts of the Use:** The proposed use should have no impact on the purpose for which the Refuge was created. Initial impacts would be temporary and would result in little or no disturbance to wildlife or habitat.

**Public Review and Comment:** A public notice describing this project and announcing a 30-day comment period was published in the Southern Illinoisan on November 17, 2002.

**Determination:**

Use is Not Compatible

X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

No stipulations are necessary to ensure compatibility.

**Justification:** The proposed project will serve Refuge personnel and the public with sewage treatment.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:**

## COMPATIBILITY DETERMINATION

**Use:** Trapping of Furbearers

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge allows trapping of resident furbearers by the public in accordance with State regulations. This compatibility determination does not apply to trapping activities where the Service awards a contract or permit for the removal of animals to facilitate management. Trapping is not a priority wildlife-dependent recreational use as

defined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

Trapping is permitted for a wide variety of species, including raccoon, opossum, skunk, weasel, mink, muskrat, red fox, gray fox, coyote, woodchuck and beaver. Trapping seasons for the various species run from June through March. Most trapping activity is concentrated in lowland areas.

Trappers may utilize leghold traps, snares, and body-gripping ("Conibear" type) traps for the purpose of trapping various furbearers, small game, and unprotected species of wildlife. Each method is qualified under State regulation as to trap size and types of allowable sets in order to protect non-target species, and provide for the safe use of the area by others.

Access for trapping is almost exclusively by foot; some trappers may use boats.

**Availability of Resources:** There is only a slight incremental increase, estimated at less than \$500, in administering this activity above the refuge=s general operating costs.

**Anticipated Impacts of the Use:** Public trapping can potentially affect wildlife through both direct and indirect impacts. Direct impacts are those where there is an immediate cause and effect relationship between the activity and the resources required to fulfill the refuge purposes and System mission. Indirect impacts are those where the effects of the permitted activity affect other populations or habitats that in turn have direct impacts on the refuge and the System. Impacts, either direct or indirect, may be negative, neutral, or positive.

Trappers undoubtedly disturb some wintering waterfowl on occasion, and cause their temporary displacement from specific and limited areas. These impacts would be occasional, temporary, and isolated to small geographic areas. It is possible that trappers may inadvertently take non-target species, such as river otter. Any habitat change as a result of the physical impacts of trapping activity is insignificant.

When considering impacts to the System mission, impacts also include those to the furbearer populations themselves. Individual animals are harvested and removed, yet data indicates these furbearer populations, with the exception of red fox, are increasing.

Public Review and Comment: During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Trapping activity must be conducted in compliance with existing State regulations.
2. Trappers must comply with all applicable refuge regulations.
3. If needed, the refuge may establish zones in which trapping is prohibited to avoid disturbance to wintering waterfowl and other wildlife.

**Justification:** Overall, trapping is a minor public use of the refuge, but is an important management tool for management of furbearer populations. Data from the State of Illinois on trapping activity and wildlife populations indicate removal of individuals under the current management scheme is not resulting in harm to the target populations. The public trapping program, as managed, does not materially interfere with or detract from the Service's ability to meet refuge purposes or the mission of the National Wildlife Refuge System.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Uses:** Water-skiing

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purposes:** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge allows water-skiing only on the main body of Crab Orchard Lake west of Highway 148. Crab Orchard Lake has a 40-mile-per-hour speed limit overall and several coves and bays are designated "no-wake" or "no ski" zones. water-skiing is a popular, seasonal activity, with most use occurring between Memorial Day and

Labor Day. There are several marinas, boat launching ramps and parking lots on Crab Orchard Lake to accommodate this use.

Water-skiing is not a priority wildlife-dependent recreational use identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997. water-skiing was instituted on Crab Orchard Lake by the USDA Soil Conservation Service before the refuge was established. This activity is considered to be consistent with the recreation purpose for which the refuge was established.

**Availability of Resources:** The refuge provides the main body of Crab Orchard Lake along with marinas, boat ramps, courtesy docks, parking lots, access trails, signs, restroom facilities, and staff to maintain these facilities and enforce regulations. These facilities will be maintained to meet the needs of the public primarily engaged in other activities. water-skiing requires minor amounts of funds and personnel for administration, maintenance, and law enforcement. Approximately \$3,000 per year is spent to manage this activity.

**Anticipated Impacts of the Use:** Short-term disturbance to wildlife may occur as a result of this activity, but usually is limited and localized. Disturbance to wintering waterfowl is minimal because most activity occurs during the summer and is restricted to the main body of Crab Orchard Lake. Water-skiing causes some shoreline erosion and water turbidity, but relatively minor amounts compared to that caused by natural wave action. Sometimes there are conflicts between the various types of boat users, such as those in sailboats or fishing boats. There is some undetermined level of water pollution caused by boat motors, particularly the ubiquitous 2-cycle engines. This activity should not result in short- or long-term impacts that adversely affect the purposes of the refuge or the mission of the National Wildlife Refuge System.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the

Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Water-skiing is allowed only in the main body of Crab Orchard Lake east of Wolf Creek Road. Water-skiing is prohibited in several coves and bays adjoining the lake that are designated “no wake” or “no ski” areas.
2. Water-skiing must comply with policy contained in Fish and Wildlife Service Manual Chapter 632 FW 3, Motorboats and water-skiing, and all other appropriate laws and regulations.

**Justification:** While water-skiing is not a priority wildlife-dependent recreational use of Refuge System lands, this activity supports the general recreation purpose for which the refuge was established. This use should have limited and localized negative impacts when conducted with the stipulations above. Administration of this use will require minor amounts of administrative time and funding.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Wildlife Observation and Photography (including the means of access such as hiking, horse-back riding on designated trails, and boating)

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge allows general public access during any time of the year to areas designated as open for observing and photographing general scenery and associated flora and fauna. The refuge's "restricted use area" may be available to

the public for observation and photography of wildlife and their habitats during special events, such as guided bird watching programs. Limited access by bicycle, horse, and motorized vehicles will be allowed on designated routes only. Entry on all or portions of specific areas may be temporarily suspended by posting upon occasions of unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

Access for wildlife observation and photography will allow the public to enjoy scenic views and an array of wildlife including waterfowl, other migratory birds, and resident wildlife. The refuge provides opportunities for the general public to enjoy wildlife observation and photography not usually available on adjacent private land.

**Availability of Resources:** Wildlife observation and photography require minimal resources. Refuge lands designated as open have been used by the public since they were acquired. Access roads and trails, parking lots, signs, platforms, blinds, and other facilities as well as staff to enforce regulations and maintain these facilities have been provided by the Service.

Some public use facilities are sub-standard. The refuge's Comprehensive Conservation Plan recognizes these problems and recommends solutions to improve public access opportunities. Some enhanced wildlife observation and photography opportunities will only be provided upon implementation of the Comprehensive Conservation Plan.

Funding for staff that manage these programs is approximately \$15,000 per year. The operations and maintenance costs are about \$2,000. Recreational fee funds that are used for the rehabilitation, replacement, or major repair of equipment and/or facilities varies from \$200 to \$2,000.

**Anticipated Impacts of the Use:** Wildlife observation and photography pose minimal impacts to wildlife. Access is typically by individuals or small groups on foot. Damage to habitat by walking is minimal and temporary. Access by motorized vehicles, bicycles, and horses is limited to designated trails, public roads and parking lots. There is some temporary disturbance to wildlife due to human activity on the land. The greatest impact to refuge wildlife would be during spring and early summer nesting and brood rearing of birds and mammals, but the expected sporadic and limited use by the public should not create unreasonable impacts. Activities during the winter pose no impact to nesting birds and little impact to vegetation. Wintering

Canada geese may be exposed to some disturbances by wildlife observation when the public exit their vehicles to observe large flocks near roads. Generally the observers remain in their vehicles and cause little disturbance to the geese and other waterfowl. Geese and other waterfowl have habitat inside the “restricted use area” that is available to them if they are disturbed in the open area. The winter disturbance to resident wildlife is temporary and minor. The interspersed habitats for wintering Canada geese and other waterfowl scattered throughout the open and restricted use areas of the refuge minimizes the impacts of wildlife observation and photography. Visitors typically use established foot trails with little impact on vegetation. Disturbance to wildlife, such as flushing a nesting bird, can occur with these activities; however, the disturbance is temporary and generally not harmful.

These activities support the wildlife conservation and recreation purposes for which the refuge was established.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

Determination:

- Use is Not Compatible
- Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. 1. Certain modes of access such as motorized vehicles, bicycles, and horses are limited to designated trails, public roads, and parking lots. ATVs are prohibited. Bicycles and other forms of mechanical transport are not allowed in Crab Orchard Wilderness.
2. Camping, overnight use, and fires are permitted only in the concession-operated campgrounds.
3. No photo or viewing blinds may be left overnight.

4. Harassment of wildlife or inordinate damage to vegetation is prohibited.

**Justification:** Wildlife observation and photography directly support the recreation purpose for which the refuge was established. Wildlife observation and photography are priority wildlife-dependent recreational uses as defined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2020



## COMPATIBILITY DETERMINATION

**Use:** Wood Cutting and Timber Harvesting

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purposes:** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. ' 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. ' 460k-2 (Refuge Recreation Act (16 U.S.C. ' 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The refuge may authorize individuals or contractors to remove live or dead, standing or fallen trees. This compatibility determination applies to all wood removal activities regardless of the reason for removal or ultimate use of the wood (e.g. firewood, pulpwood, sawtimber, etc.). Impacts to the purposes of the refuge and System mission

are similar regardless of why the wood is removed. This activity will only occur where the Service has determined that a management need exists to remove trees from the refuge consistent with the Habitat Management Plan, Safety Plan, or other document.

Wood removal may be done anywhere trees are present, except in the Crab Orchard Wilderness. However, fallen or hazard trees may need to be removed from the Wilderness along Rocky Comfort Road, a county-maintained road bisecting the area. Harvest sites will vary in size from a small fraction of an acre (in the case of individual trees) up to several hundred acres, depending on the site and management objectives.

Wood removal activities may be authorized throughout the year. Usually, wood removal activities will occur during the summer and fall months when dry ground conditions facilitate access and prevent damage to roads, soil, plant roots and cultural resources.

The scope of the activity will be determined by the management objective for the area and by the quantity and quality of available wood. Equipment used for removal may range from chainsaws to traditional logging equipment such as feller-bunchers and log skidders. Access may be by pick-up truck, farm tractor, or larger traditional logging equipment.

Harvest of wood products may be authorized by a firewood cutting permit, special use permit, concession contract, timber sale contract or cooperative farming agreement.

**Availability of Resources:** The refuge has various personnel on staff who administer permits and contracts for wood cutting and timber harvesting, and monitor the operations. These functions are performed as part of their normal duties.

**Anticipated Impacts of the Use:** The potential exists for tree and wood removal activities to directly impact wildlife by displacement of animals from localized areas due to disturbance or elimination of suitable habitat. Removal of certain trees in some instances will eliminate habitat used by cavity-nesting species. Some impacts on wildlife can be minimized by timing the removal operations to avoid periods when critical activities such as nesting and wintering take place. Impacts should be minimal overall because the extent of activity will be limited to a small portion of the available habitat.

Vehicular access to and from wood cutting and timber harvest sites will be carefully controlled to avoid impacts such as rutting, erosion, and compaction of the soil. Vehicular traffic may impact habitat by destroying ground cover, creating weed seed beds, and increasing runoff and sedimentation. These impacts can be minimized by scheduling operations and limiting the types of equipment and vehicles used.

Removal of hazard trees in recreation areas and along roads will benefit visitors by ensuring their safety. For some people, there will be a temporary reduction in aesthetic quality on timber harvesting sites.

Individuals participating in any wood removal or timber harvest program will be under permit or contract, thus site-specific stipulations will ensure resource protection and achievement of management goals.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the refuge. Written comments were solicited from the public about refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Wood cutting and timber harvesting will only be done according to the Habitat Management Plan, Safety Plan, or other approved document.
2. Wood cutting and timber harvesting will comply with all applicable policies and regulations.

**Justification:** Wood cutting is often necessary to remove hazard trees in recreational areas and along roads to maintain safe conditions for visitors, thus it indirectly supports the recreation purpose for which the refuge was established. Timber harvesting is the

principal means of manipulating forest habitat conditions, which in turn supports the wildlife conservation purpose of the refuge. The short- and long-term benefits derived from wood cutting and timber harvesting outweigh the short-term negative impacts.

**Signature:**Refuge Manager: \_\_\_\_\_

**Concurrence:**Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

## COMPATIBILITY DETERMINATION

**Use:** Youth Camp Operations

**Refuge Name:** Crab Orchard National Wildlife Refuge

**Establishing and Acquisition Authorities:** Public Law 80-361 and the Refuge Recreation Act

**Refuge Purpose(s):** Crab Orchard National Wildlife Refuge was established by Public Law 80-361 "... for the conservation of wildlife, and for the development of the agricultural, recreational, industrial, and related purposes ..." (61 Stat. 770, dated Aug. 5, 1947)

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

On October 19, 1976, Congress enacted Public Law 94-557 designating a portion of the Refuge one of many wilderness areas of the National Wilderness Preservation System "... administered for the use and enjoyment of the American people in such a 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..." (Wilderness Act, Public Law 88-577, 78 Stat. 892)

**National Wildlife Refuge System Mission:** 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.

**Description of Use:** The Refuge leases four campground areas (all located on Little Grassy Lake) to non-profit organizations which provide recreational and educational services to their members and guests. The organizations are: Girl Scouts which operates Camp Cedar Point; Boy Scouts of America which operates Pine Ridge Camp; United Methodist

Church which operates the United Methodist Church Camp; and Presbyterian Church which operates Camp Carew. The total land area reserved for youth camp use is about 600 acres. In addition, all the camps use Little Grassy Lake for swimming and boating.

Youth camp operations amount to an exclusive use of government property by these organizations. Youth camp operations support the general recreation purpose of the Refuge, and provide some environmental education which is a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

**Availability of Resources:** The Refuge provides the facilities and surrounding lands and waters; the youth camp operators are responsible for general camp operations and maintenance. The annual cost of administering and managing the Refuge's youth camp operations is about \$42,000. The Refuge staff includes a contract compliance specialist who administers and manages the youth camp operations, with support from a secretary—all under the direction of the refuge manager. The Refuge currently receives no revenue from these organizations, but is proposing to assess a nominal fee to cover its administrative expenses.

**Anticipated Impacts of the Use:** Most of the services provided by youth camp operations are non-wildlife-dependent, although some environmental education is offered because it is either required by the Refuge or inherent in the organization's mission. Some of the lands occupied by these camps are developed for human uses, and thus provide poor habitat for wildlife. The concentration of people in these recreational areas results in some disturbance of wildlife. Since the youth camps are closed to public hunting, the opportunities for public hunting are somewhat reduced.

**Public Review and Comment:** During preparation of the Comprehensive Conservation Plan three open house public meetings and four focus group meetings were held to identify and prioritize issues facing the Refuge. Written comments were solicited from the public about Refuge operations.

This compatibility determination is being made as part of an Environmental Impact Statement and Comprehensive Conservation Plan. The public will have an opportunity to review and comment on the Draft Environmental Impact Statement and Draft Comprehensive Conservation Plan.

**Determination:**

- Use is Not Compatible
- X Use is Compatible With Following Stipulations

**Stipulations Necessary to Ensure Compatibility:**

1. Youth camps must operate under the terms of their lease agreements.
2. Youth camps must provide at least the minimum amount of environmental education to campers as specified in their lease agreements.
3. The Refuge will assess and collect a nominal fee from each youth camp to help cover its administrative expenses.

**Justification:** Youth camp operations support the general recreation purpose of the Refuge and provide environmental education, which is a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.

**Signature:** Refuge Manager: \_\_\_\_\_

**Concurrence:** Regional Chief: \_\_\_\_\_

**Mandatory 10- or 15-year Re-evaluation Date:** 2015

# **Appendix K: Refuge Operating Needs System (RONS) and Maintenance Management 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<br>(1,000 of \$) |
|-------------|---|--------------------------------|
| 97001       | <i>Increase Pest Plant Control:</i> 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       | <i>Conduct Nongame Bird Census:</i> 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       | <i>Reduce Forest Fragmentation:</i> 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       | <i>Enhance Timber Management:</i> 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       | <i>Conduct Indiana Bat survey:</i> 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       | <i>Provide Shoreline Stabilization for Crab Orchard Lake:</i> 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 \$) |
|--------------------|---|-----------------------------|
| <b>RONS Tier 2</b> |   |                             |
| 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 grasslands 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   | Cost Estimate (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**

| <b>Project No.</b> | <b>Project Title</b>  | <b>Cost Estimate<br/>(1000's of \$)</b> |
|--------------------|---|---|
| 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**

| <b>Project No.</b> | <b>Project Title</b>   | <b>Cost Estimate<br/>(1000's of \$)</b> |
|--------------------|--|---|
| 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   | Cost Estimate<br>(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.

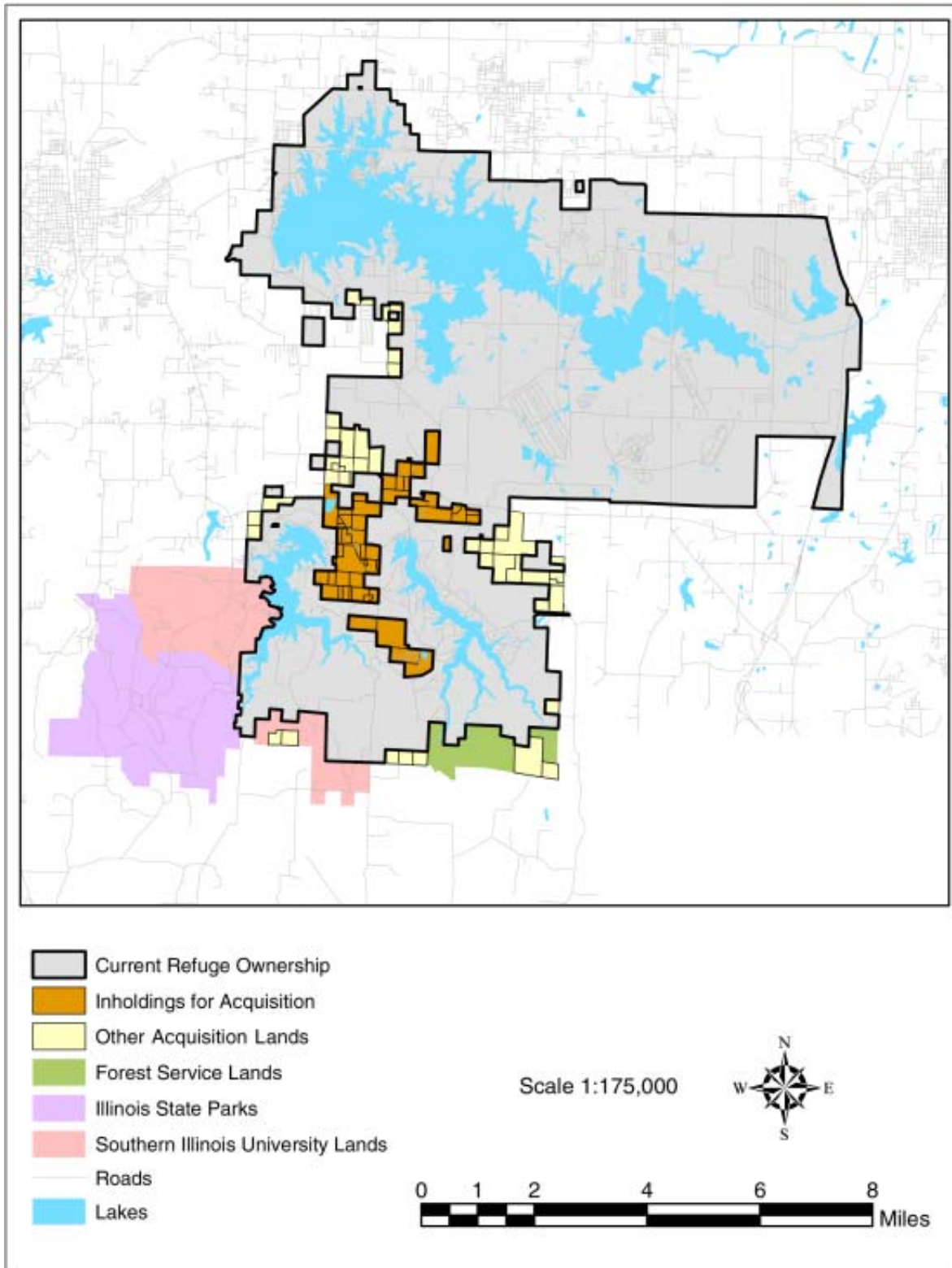
The preferred alternative within the environmental impact statement that accompanies the CCP contains a modification of the existing refuge boundary. This modification could result in the addition of approximately 4,242 acres to the Refuge. The boundary adjustment does not include and is independent 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

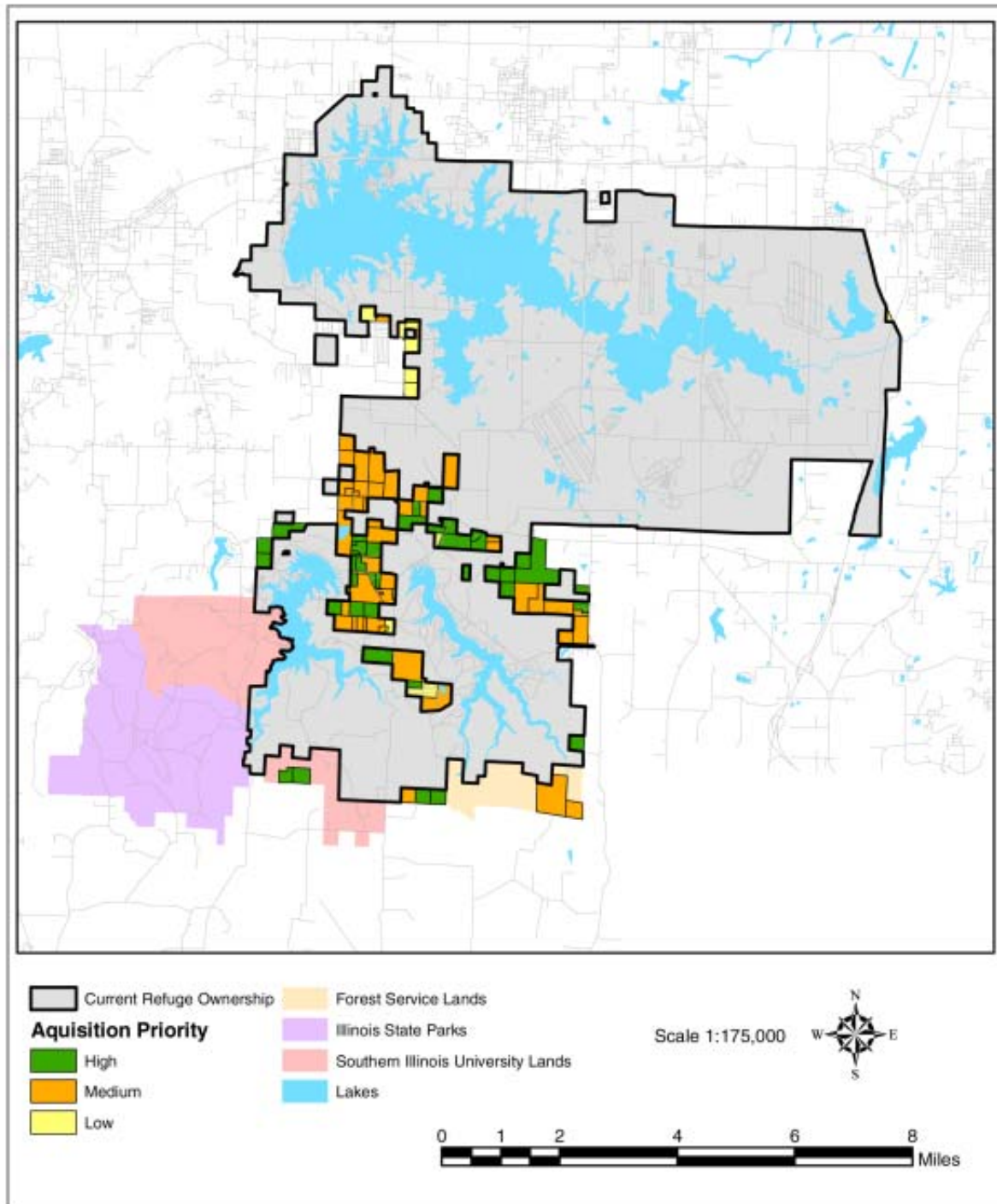
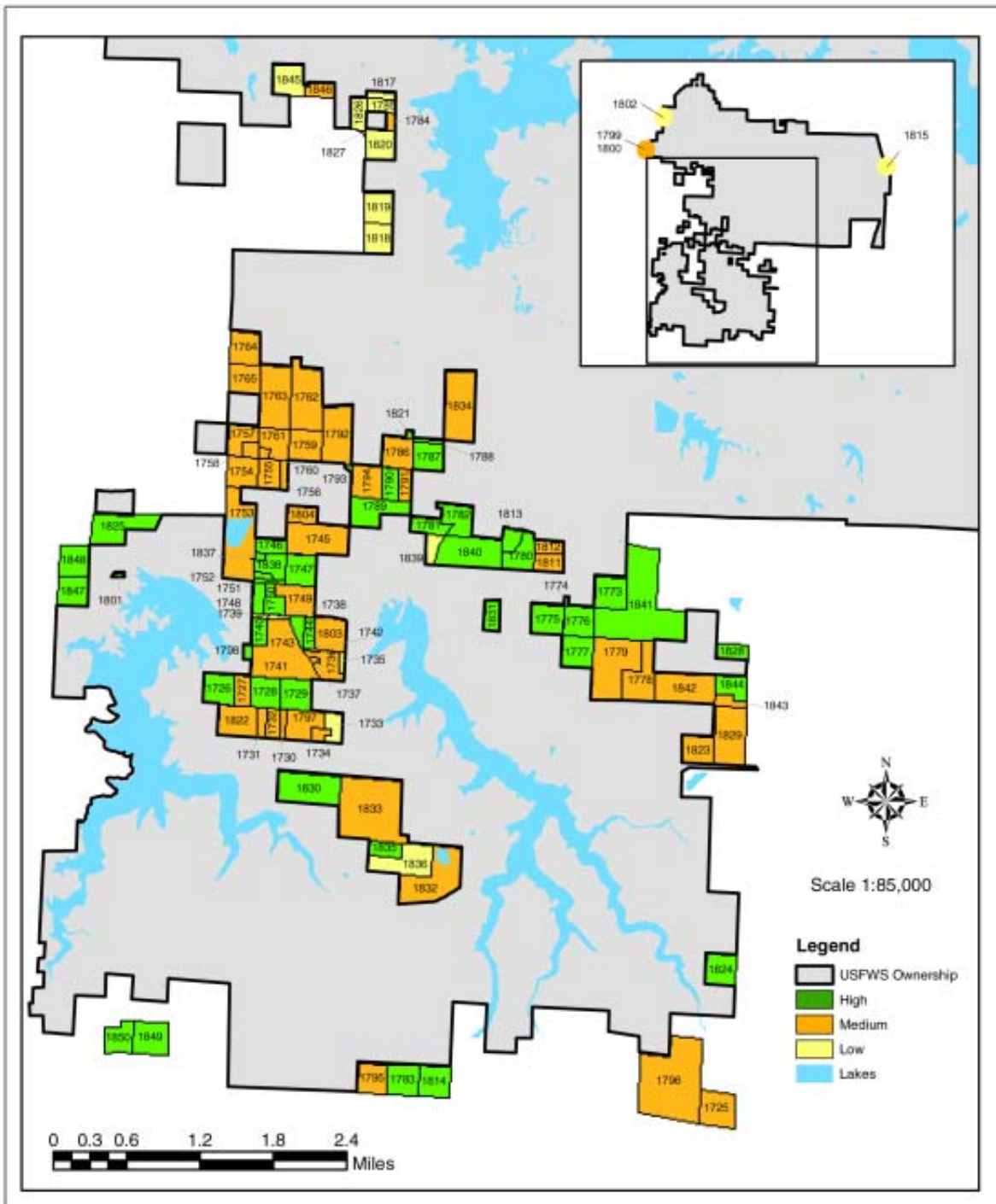


Figure 3: Crab Orchard NWR Boundary Modification Numbered Tracts



**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 |
| <p><b>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.</b></p>  |              |   |   |   |   |
| <p><b>Objectives</b></p>  |              |   |   |   |   |
| <p>Assure that federally listed species and state-listed species and federally proposed species and their habitats are protected.</p>   |              |   |   |   |   |
| <p><i>Strategies</i></p>  |              |   |   |   |   |
| <p>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.</p>  |              |   |   |   |   |
| <p>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.</p> |              |   |   |   |   |
| <p><b>Goal: Maintain or enhance resident fish and wildlife populations consistent with management activities for federal trust resources in cooperation with the Illinois DNR.</b></p>  |              |   |   |   |   |
| <p><b>Objectives</b></p>  |              |   |   |   |   |
| <p>Manage Refuge fisheries with emphasis on mixed-species, warmwater sport fishing.</p>   |              |   |   |   |   |
| <p>Manage Refuge resident wildlife populations at levels that allow opportunities for sport hunting of game species.</p>  |              |   |   |   |   |

|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| <i>Strategies</i>   |              |   |   |   |   |
| 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 |
| <b>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.</b>   |              |   |   |   |   |
| <b>Objectives</b>   |              |   |   |   |   |
| 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 |
| <i>Strategies</i>   |              |   |   |   |   |
| 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 verbal public input submitted to the Refuge. Review this log quarterly and address voiced community concerns.   | X            | X | X | X | X |

|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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        |
| 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        |
| <b>Goal: Protect the integrity of Refuge biological and cultural resources and the health and safety of visitors and the Refuge staff.</b>  |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| 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        |
| <b>Strategies</b>   |                     |          |          |          |          |
| 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        |

|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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        |
| <b>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.</b> |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| 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, multi-flora 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        |
| 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        |
| <b>Strategies</b>   |                     |          |          |          |          |
| 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        |



|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| 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 |
| 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 |
| Map the existing network of trails in the Wilderness; assess the condition of trails; determine whether trails meet design standards; evaluate the proposed River to River Trail route; cooperate with partners to plan, construct and maintain a sustainable trail system.   | X            | X | X | X | X |

|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| <b>Goal: Volunteers and Refuge support groups will be stewardship partners and strong advocates for the Refuge.</b>   |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| Improve Refuge support for volunteer and Friends of Crab Orchard activities to a point where 95 percent of volunteers and Friends members feel like valued contributors to the success of Refuge programs and endeavors.                  | X                   | X        | X        | X        | X        |
| <i>Strategies</i>   |                     |          |          |          |          |
| 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        |
| <b>Goal: Provide habitat for wintering Canada geese in support of the Mississippi Valley Population Canada Goose Management Plan.</b>   |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| Provide enough food for wintering Canada geese to support 6.4 million goose-use-days.   | X                   | X        | X        | X        | X        |
| <i>Cropland Strategies</i>  |                     |          |          |          |          |
| Maintain 4,500 acres of cropland in agricultural production. Manage 1,100 acres of pasture and 800 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        |          |

|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| 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 |
| <i>Moist-soil Units Strategies</i>  |              |   |   |   |   |
| Manage 450 acres of moist-soil units.   | X            |   |   | X |   |
| Manage 500 acres of moist-soil units.   |              | X | X |   | X |
| <i>Other Management Strategies</i>  |              |   |   |   |   |
| 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 |
| <b>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.</b>  |              |   |   |   |   |
| <b>Forests</b>  |              |   |   |   |   |
| <b>Objectives</b>   |              |   |   |   |   |
| Complete about 240 acres of reforestation as outlined under the existing Refuge reforestation plan to benefit forest wildlife species.  | X            |   |   |   |   |
| 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 |   |   |

|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| <i>Strategies</i>   |                     |          |          |          |          |
| 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        |
| 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        |          |          |
| <b>Pine Plantations</b>   |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| Accelerate succession of all (about 3,300 acres) pine plantations to hardwood forest.   | X                   | X        |          | X        | X        |
| Accelerate succession of pine plantations south of Grassy Road and outside the wilderness area (about 650 acres) to native hardwood forest.   |                     |          | X        |          |          |
| <i>Strategies</i>   |                     |          |          |          |          |
| 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        |
| <b>Early Successional Habitat</b>   |                     |          |          |          |          |
| <b>Objective</b>  |                     |          |          |          |          |
| Maintain about 300 acres in early successional habitat.   |                     | X        | X        | X        | X        |

|  | <b>Alternatives</b> |          |          |          |          |
|--|---------------------|----------|----------|----------|----------|
|  | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| <p><i>Strategies</i></p> <p>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.</p> |                     | X        | X        | X        | X        |
| <b>Grasslands</b>  |                     |          |          |          |          |
| <p><b>Objectives</b></p> <p>Maintain 240 acres of native warm-season grassland to benefit grassland birds, such as northern bobwhite, eastern meadowlark, and Henslow's sparrow.</p>   | X                   |          |          |          |          |
| <p>Maintain 260 acres of native warm-season grassland.</p>   |                     | X        | X        | X        | X        |
| <p><i>Strategies</i></p> <p>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.</p>                          | X                   | X        | X        | X        | X        |
| <b>Pasture, Hay and Clover Fields</b>  |                     |          |          |          |          |
| <p><b>Objectives</b></p> <p>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.</p>   | X                   | X        | X        |          | X        |
| <p>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.</p>   |                     |          |          | X        |          |
| <p><i>Strategies</i></p> <p>All mowing of pastures, hay fields, and clover fields will take place after August 1.</p>  | X                   |          |          |          |          |

|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| <p>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.</p> |              | X | X |   | X |
| <p>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.</p>  |              |   |   | X |   |
| <p><b>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.</b></p>   |              |   |   |   |   |
| <p><b>Objectives</b></p>  |              |   |   |   |   |
| <p>Provide 350 to 450 acres of moist soil habitat during fall, winter and spring for migrating shorebirds, waterfowl, and other waterbirds.</p>   | X            |   |   | X |   |
| <p>Provide 450 to 500 acres of moist-soil habitat during fall, winter and spring for migrating shorebirds, waterfowl, and other waterbirds.</p>   |              | X | X |   | X |
| <p><i>Strategies</i></p>  |              |   |   |   |   |
| <p>Maintain dikes and water control structures. Manipulate water levels and vegetation to encourage production of food.</p>   | X            |   |   | X |   |
| <p>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.</p>  |              | X | X |   | X |

|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| <b>Goal: Provide and manage for quality of water in streams and lakes at Crab Orchard National Wildlife Refuge.</b>   |              |   |   |   |   |
| <b>Objectives</b>   |              |   |   |   |   |
| 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 |
| <i>Strategies</i>   |              |   |   |   |   |
| 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 |
| 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 |
| <b>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.</b>  |              |   |   |   |   |
| <b>Hunting</b>  |              |   |   |   |   |
| <b>Objectives</b>   |              |   |   |   |   |
| Provide hunting opportunities at the levels offered in 2001.  | X            |   |   |   |   |
| Increase the quality of hunting opportunities to a level where 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 |   |   |   |

|  | Alternatives |   |   |   |   |
|--|--------------|---|---|---|---|
|  | A            | B | C | D | E |
| <p>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.</p>   |              |   | X | X | X |
| <p><i>Strategies</i></p> <p>In the open area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.</p>   | X            |   |   |   |   |
| <p>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.</p>   | X            |   |   |   |   |
| <p>Continue providing waterfowl hunting opportunities in the controlled area through an agreement with a partner organization.</p>   | X            |   |   |   |   |
| <p>In the open area of the Refuge, continue the policy of providing hunting opportunities based on state hunting seasons and state and federal regulations.</p>  |              | X | X | X | X |
| <p>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.</p> |              | X | X | X | X |
| <p>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.</p>  |              | X |   |   |   |
| <p>Within 10 years and in cooperation with a partner organization, improve all hunting blinds used in the controlled goose hunting program. Administer goose hunts in the controlled area through an agreement with a partner organization.</p>  |              | X | X | X | X |



|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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.  |                     | 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        |
| <b>Fishing</b>  |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| Provide fishing opportunities at the levels offered in 2001.  | X                   |          |          |          |          |
| Increase the quality of fishing opportunities to a level where 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        |          |          |          |
| 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        |
| <i>Strategies</i>   |                     |          |          |          |          |
| 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        |          |          |          |

|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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        |
| <b>Wildlife Observation and Photography</b>   |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| 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        |
| <b>Strategies</b>   |                     |          |          |          |          |
| 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                   |          |          |          |          |

|  | <b>Alternatives</b> |          |          |          |          |
|--|---------------------|----------|----------|----------|----------|
|  | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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        |
| 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        |

|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| <p>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.</p>  |              | X | X | X | X |
| <b>Interpretation</b>   |              |   |   |   |   |
| <b>Objectives</b>   |              |   |   |   |   |
| <p>Provide interpretive opportunities and materials at the levels offered in 2001.</p>  | X            |   |   |   |   |
| <p>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.</p> |              | X |   |   |   |
| <p>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.</p>   |              |   | X | X | X |
| <b>Strategies</b>   |              |   |   |   |   |
| <p>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.</p>  | X            |   |   |   |   |
| <p>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.</p>   | X            |   |   |   |   |

|  | Alternatives |   |   |   |   |
|--|--------------|---|---|---|---|
|  | A            | B | C | D | E |
| 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 |
| 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 |

|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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                   |          |          |          |          |
| 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        |
| <b>Environmental Education</b>  |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| 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        |          |          |          |

|  | Alternatives |   |   |   |   |
|--|--------------|---|---|---|---|
|  | A            | B | C | D | E |
| <p>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.</p> |              |   | X | X | X |
| <p><i>Strategies</i></p> <p>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.</p>  | X            |   |   | X |   |
| <p>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.</p>   | X            |   |   |   |   |
| <p>Conduct an annual review of the Refuge environmental education program. Invite feedback from area educators. Revise as necessary.</p>   | X            |   | X | X | X |
| <p>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.</p>  |              | X | X | X | X |
| <p>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.</p>   | X            |   |   |   |   |

|  | <b>Alternatives</b> |          |          |          |          |
|--|---------------------|----------|----------|----------|----------|
|  | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| <p>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 includes three or more themes. Themes may include: exploring the diversity of wildlife, understanding the past, protecting the balance, and communicating visitor opportunities.</p> |                     | X        | X        | X        | X        |
| <p>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.</p>   |                     | X        | X        | X        | X        |
| <p>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.</p>   |                     | X        | X        | X        | X        |
| <p>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.</p>   |                     | X        | X        | X        | X        |



|  | <b>Alternatives</b> |          |          |          |          |
|--|---------------------|----------|----------|----------|----------|
|  | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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        |
| 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 environmental education program as described in Service policy.   |                     | X        |          |          |          |

|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| 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 |
| <b>Goal: Visitors will enjoy high quality, land- and water-based activities that fulfill the recreation purpose of the Refuge.</b>  |              |   |   |   |   |
| <b>Objectives</b>   |              |   |   |   |   |
| 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 |
| <b>Strategies</b>   |              |   |   |   |   |
| 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, Chamness 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 |
| 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 |   |   |   |

|   | Alternatives |   |   |   |   |
|---|--------------|---|---|---|---|
|   | A            | B | C | D | E |
| 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 | X | X | X |
| Maintain picnicking at the Refuge recreational areas of Greenbriar, Wolf Creek, Harmony Trail, Cambria Neck, Playport Marina and the Visitor Center. 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 east of Highway 148.  |              |   | 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 |
| <b>Gas Motors on Devils Kitchen Lake</b>  |              |   |   |   |   |
| 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 |   |   | X |
| Gas motors would be prohibited at Devils Kitchen Lake.  |              |   | X |   |   |
| Gas motors would be permitted on Devils Kitchen Lake.   |              |   |   | X |   |
| <b>Horseback Use</b>  |              |   |   |   |   |
| 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 |

|  | <b>Alternatives</b> |          |          |          |          |
|--|---------------------|----------|----------|----------|----------|
|  | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| Horseback use would be prohibited on the Refuge.   |                     |          |          | X        |          |
| <b>Goal: Visitors of all abilities will feel welcome and enjoy a safe visit to an area that they recognize as a national wildlife refuge.</b>  |                     |          |          |          |          |
| <b>Objectives</b>  |                     |          |          |          |          |
| 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        |
| <i>Strategies</i>  |                     |          |          |          |          |
| 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                   |          |          |          |          |
| 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        |

|   | <b>Alternatives</b> |          |          |          |          |
|---|---------------------|----------|----------|----------|----------|
|   | <b>A</b>            | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> |
| 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        |
| <b>Goal: Provide opportunities for agricultural uses on Refuge lands that help attain wildlife conservation goals.</b>  |                     |          |          |          |          |
| <b>Objectives</b>   |                     |          |          |          |          |
| 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        |          |          |

|  | Alternatives |   |   |   |   |
|--|--------------|---|---|---|---|
|  | A            | B | C | D | E |
| 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 |
| <i>Strategies</i>  |              |   |   |   |   |
| 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            |   |   |   |   |
| 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 |

|  | Alternatives |   |   |   |   |
|--|--------------|---|---|---|---|
|  | A            | B | C | D | E |
| <p>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.</p>   |              | X | X |   | X |
| <p>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 cooperators 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.</p> |              |   |   | X |   |
| <p>Prohibit mowing of hay until after August 1. Maintain an updated rate charge for hay.</p>   |              |   |   | X |   |
| <p>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.</p>   |              |   |   | X |   |
| <p><b>Goal: Provide an industrial complex and attendant utility and transportation infrastructure, which conform to prescribed safety, health, environmental and maintenance standards.</b></p>  |              |   |   |   |   |
| <p><b>Objectives</b></p>   |              |   |   |   |   |
| <p>Meet the guidelines of the Industrial Policy established December 1981.</p>   | X            |   |   |   |   |
| <p>Consolidate the areas occupied by industry.</p>   |              | X | X | X | X |

|  | Alternatives |   |   |   |   |
|--|--------------|---|---|---|---|
|  | A            | B | C | D | E |
| <i>Strategies</i>  |              |   |   |   |   |
| 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<br>Plantation Swamp<br>Forest | Early<br>Successional Oak<br>Forest (reforested) | Upland Mixed<br>Shrubland (old<br>field) | Willow/Wet<br>Shrubland | Buttonbush<br>Swamp<br>Shrubland | Restored<br>Native<br>Grassland | Fallow<br>Herbaceous<br>Field | Forest<br>Regeneration<br>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   |
| Dickeissel                  | 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              |

# Crab Orchard

## National Wildlife Refuge

### Draft EIS/CCP

#### Index

#### A

##### Agriculture

I, i, ix, x, xiv, xxii, xxiii, xxiv, 1, 10, 16, 18, 19, 20, 21, 22, 24, 28, 38, 39, 70, 76, 80, 84, 87, 89, 105, 112, 123, 158, 161, 162, 163, 164, 177, 183, 184, 285, 286, 370, 375

##### Amphibians

IV, xi, xiii, 84, 88, 89, 91, 94, 222

##### Area designations

i, 27, 97

##### Auto tour

xiii, 10, 37, 47, 48, 62, 96, 100, 179, 382, 383, 385, 386

#### B

##### Bicycling

13, 23, 287, 390

##### Birds

i, iii, iv, viii, xi, xiii, xv, xvi, xvii, xxiv, 5, 6, 7, 8, 11, 17, 18, 19, 20, 33, 41, 44, 54, 57, 65, 69, 72, 73, 83, 88, 89, 91, 94, 129, 131, 136, 139, 143, 144, 146, 148, 151, 152, 154, 159, 162, 163, 164, 175, 176, 183, 347, 348, 358, 375, 377, 378, 394

##### Raptors

iv, xi, xiii, xiv, xx, xxiv, 16, 17, 18, 19, 22, 37, 47, 72, 84, 89, 91, 94, 95, 101, 108, 129, 130, 133, 134, 139, 144, 148, 151, 164, 176, 179, 213, 214, 369, 382, 383

##### Songbirds

xiii, 17, 19, 84, 89, 94, 137, 176, 213, 286, 287, 288

##### Waterfowl

iii, xi, xiii, 7, 8, 11, 36, 45, 57, 65, 69, 73, 84, 86, 89, 94, 96, 98, 101, 121, 122, 123, 124, 126, 129, 131, 136, 139, 144, 148, 151, 155, 176, 184, 213, 378, 380

##### Boating

iii, vi, viii, xiii, xvi, xvii, xxii, xxv, 13, 16, 17, 18, 19, 20, 28, 32, 37, 39, 49, 50, 57, 65, 69, 76, 89, 96, 98, 103, 121, 122, 123, 124, 138, 142, 147, 150, 153, 157, 158, 165, 175, 182, 285, 286, 288, 375, 391

##### Boy Scouts of America

10, 29, 107, 169, 287

#### C

##### Camping length of stay

i, vi, xvii, xix, xxv, 16, 17, 18, 19, 20, 28, 75, 141, 147, 153, 165

##### Cemeteries

109, 111

##### Concessionaires

viii, xiii, xix, 14, 28, 63, 64, 96, 100, 105, 123, 124, 141, 142, 146, 147, 153, 154, 157, 182, 184, 390, 391

##### Crab Orchard Boat & Yacht Club

vi, viii, xiii, 21, 37, 39, 50, 55, 63, 64, 96, 100, 103, 126, 142, 147, 154, 169, 182, 184, 285, 286

##### Crab Orchard NWR

###### Visitor Center

xiii, xiv, 12, 23, 48, 49, 50, 62, 63, 96, 101, 103, 108, 121, 180, 181, 182, 348, 351, 371, 385, 386, 388, 390, 391

#### D

##### Devils Kitchen Campground

xiii, 75, 100, 141, 157, 350

##### Devils Kitchen Lake

###### Boating

viii, xiv, 17, 18, 19, 20, 50, 52, 63, 68, 69, 76, 103, 137, 141, 142, 146, 147, 150, 153, 165, 168, 182, 287, 391

#### F

##### Farming

viii, 38, 53, 54, 57, 64, 68, 76, 86, 115, 118, 119, 120, 123, 126, 129, 147, 151, 158, 159, 183, 393, 394

---

## Fees

I, i, vi, 29, 30, 38, 105, 114, 124, 159, 202, 204, 286, 287, 288, 390

## Fishing tournaments

xiii, 30, 95, 100

## Forest management

22, 131, 175, 176, 177, 369

## G

### Group camps

I, i, vi, xiv, xxv, 17, 19, 20, 21, 28, 29, 37, 49, 62, 75, 103, 107, 138, 141, 142, 147, 150, 154, 166, 181, 287, 387, 389

## H

### Horseback riding

viii, xiii, xxvi, 17, 18, 19, 20, 24, 25, 27, 50, 53, 63, 68, 75, 96, 105, 109, 138, 141, 142, 143, 146, 147, 150, 151, 153, 154, 163, 166, 182, 287, 372, 391

## I

### Illinois Department of Natural Resources

ii, iii, xiii, 4, 10, 12, 30, 83, 91, 93, 94, 95, 162, 169, 286, 347, 359

## J

### Jackson County

xv, 79, 80, 95, 117, 118, 119, 120, 125

## L

### Land acquisition

IV, i, iv, 54, 55, 143, 154, 185, 189, 195, 196, 355, 357, 358, 359, 360, 363

### Law enforcement

10, 23, 24, 46, 53, 60, 64, 70, 100, 116, 178, 181, 183, 185, 202, 286, 348, 371, 381, 393

## M

### Marinas

xiii, xvii, xxv, 10, 13, 18, 19, 20, 38, 39, 50, 55, 63, 64, 70, 71, 75, 96, 100, 103, 123, 124, 138, 142, 147, 150, 153, 154, 157, 165, 182, 184, 286, 287, 390, 391

## N

### National Wildlife Refuge System

i, vi, viii, xviii, 1, 3, 5, 11, 13, 14, 28, 29, 45, 46, 47, 48, 60, 61, 62, 83, 111, 178, 179, 180, 286, 287, 288, 379, 380, 381, 382, 383, 384

## O

### Operational policies

III, 27

## P

### Partnerships

xv, 5, 8, 27, 49, 63, 126, 181, 184, 185, 287, 389

### Personal watercraft

xxii, 285, 286, 287, 288

### Potential species occurrence

128, 129, 131, 134, 136, 137, 139, 144, 146, 148, 151, 152

### Private clubs

xxvi, 138, 142, 147, 150, 154, 166

### Public involvement

4, 168

## R

### Roads

iv, ix, xiv, 13, 14, 17, 18, 20, 32, 37, 38, 48, 54, 55, 62, 68, 83, 86, 98, 105, 107, 108, 109, 111, 129, 132, 134, 183, 190, 196, 285, 349, 355, 385, 386, 394, 395, 396

## T

### The Haven

vi, 37, 39, 50, 55, 63, 75, 142, 170

### Tourism

xiv, xxiii, 14, 108, 126, 169, 170, 185, 286

## W

### Williamson County

ix, xiv, xv, 80, 108, 109, 115, 117, 118, 119, 120, 125, 126, 162, 168, 169, 170, 185

## Z

### Zoning on lakes

I, vii, xv, xxii, xxv, 50, 51, 52, 63, 76, 138, 165, 182, 286, 391