

Flint Hills National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Assessment

June 2000

Prepared For:
U.S. Fish and Wildlife Service
134 Union Blvd., Suite 350
Lakewood, Colorado 80228

Prepared by:
Research Management Consultants, Inc.
1746 Cole Blvd., Suite 300
Golden, Colorado 80401

Table of Contents

Executive Summary	5	
Vision	8	
Introduction		
Regional Setting.....	9	
Refuge Purpose Statements	10	
Planning Perspectives and Considerations		
Purpose of and Need for the Plan	13	
Planning Process	14	
Planning Perspectives	15	
Expected Planning Outcomes	15	
The Ecosystem Approach to Management	16	
The Arkansas/Red Rivers Ecosystem	16	
Refuge and Ecosystem Planning Issues and Opportunities	19	
Ecosystem and Refuge Resource Description		
Area of Ecological Concern	23	
Vegetation	24	
Wildlife	27	
Threatened and Endangered Species	27	
Exotic Species	28	
Climate	28	
Geology	28	
Soils	28	
Water Management	31	
Cultural and Historic Resources Features	32	
Socio-economic Features	32	
Public Use	32	
Refuge Staffing	32	
Flint Hills NWR Management Program		41
Biological Diversity, Land Protection, Wildlife, and Habitat Protection	42	
Hydrological Restoration and Water Quality	45	
Public Use, Recreation, Wildlife Interpretation, and Education	49	
Cultural Resources	51	
Interagency Coordination and Relations	51	
Improvement of Staffing, Funding, and Facilities	52	
Legal, Policy, Administrative Guidelines, and Other Special Considerations		
Legal Mandates	53	
Agency-Wide Policy Directions	54	
National Wildlife Refuge System: Mission and Goals	55	
Refuge Purpose Statements	57	
Plan Implementation		
Resource Projects	58	
Proposed Funding and Personnel	60	
Partnership Opportunities	61	
Step-Down Management Planning	62	
Completed Plans and Other Documents	62	
Plans and Documents to be Developed in the Future	62	
Wilderness Review	63	
Refuge Program Monitoring and Evaluation	63	
Monitoring and Evaluation of the CCP	63	

References.....	64
List of Preparers	65
Glossary	66
Abbreviations and Acronyms	69
Appendices	
A. Plant List	70
B. Fish List.....	78
C. Amphibian and Reptile List	79
D. Wild Bird Species List	80
E. Mammal List	83
F. Threatened and Endangered Species List	84
G. Refuge Operating Needs System (RONS)	85
H. Arkansas/Red Rivers Ecosystem Plan	94
I. Key Legislation and Policies	109
J. Cooperative Agreements	111
K. Contaminant Assessment Process	127
L. Compatibility Determinations	131
M. Environmental Assessment	135
N. CCP Mailing List	147

Executive Summary

The Comprehensive Conservation Plan (CCP) for the Flint Hills National Wildlife Refuge (NWR) would serve as a management tool to be used by the Refuge staff and its partners in the preservation and restoration of the ecosystem's natural resources. In that regard, the Plan will guide management decisions over the next 15 years and set forth strategies for achieving Refuge goals and objectives within that time frame. The management actions presented within this document reflect the U.S. Fish and Wildlife Service (Service's) efforts to meet the goals of the Refuge Improvement Act of 1997.

The goals listed below will guide Refuge management:

- Goal 1:** To restore, enhance, and protect the natural diversity on the Flint Hills NWR including threatened and endangered species by appropriate management of habitat and wildlife resources on Refuge lands and by strengthening existing and establishing new cooperative efforts with public and private stakeholders.
- Goal 2:** To restore and maintain a hydrological system for the Neosho River drainage by managing for wetlands (Map #8), control of exotic species, and management of trust responsibilities for the maintenance of plant and animal communities.
- Goal 3:** Provide opportunities for wildlife-dependent public access and recreational opportunities to include compatible forms of hunting, fishing, wildlife observation, photography, interpretation, and educational activities.
- Goal 4:** To protect, manage, and interpret cultural resources on the Flint Hills NWR for the benefit of present and future generations.
- Goal 5:** To strengthen interagency and jurisdictional relationships in order to coordinate efforts with respect to the Refuge and surrounding area issues resulting in decisions benefitting fish and wildlife resources while at the same time avoiding duplication of effort.
- Goal 6:** Improve staffing, funding, and facilities that would result in long-term enhancement of habitat and wildlife resources in the area of ecological concern and support the achievement of the goals of this Plan and the goals of the National Wildlife Refuge System (System).

Objectives with measurable outcomes would guide the Refuge staff in a consistent direction toward the accomplishment of each goal beginning with short-term activities or strategies to occur within five years followed by implementation of long-term activities within 5 to 15 years. Completion of the following objectives depends upon funding and staffing from year to year:

1. Document existing flora and fauna of wetland, grassland, riparian, savanna, and wooded habitats through baseline surveys and monitor habitats affected by management activities.
2. Continue to protect populations of endangered and threatened species and maintain or improve their habitats on Refuge lands.
3. Manage waterfowl in accordance with the North American Waterfowl Management Plan focusing on target species including the mallard, pintail, wood duck, and gadwall.
4. Monitor population status of priority species of neotropical migratory birds, shorebirds, and other nongame migratory birds.
5. Determine population objectives of key resident wildlife species and monitor the status of these species.
6. Restore and maintain native species on Refuge lands to reestablish native habitat communities through appropriate land management techniques and monitor reestablishment of native species as a result of restoration efforts.
7. Reestablish native plants along the riparian areas of the Neosho River and its tributaries to benefit native aquatic and riparian communities of the Arkansas/Red Rivers Ecosystem and monitor reestablishment of native species as a result of restoration efforts.
8. Encourage research with universities and other institutions that would improve the biological database of the Refuge or contribute to habitat restoration and management activities that are compatible with Refuge goals and requirements of the Refuge Act. These activities would be reviewed periodically by the Service and other representatives to evaluate the effectiveness for Refuge needs.
9. Improve water management to maintain and enhance 4,500 acres of current wetlands and restore another 600 acres of wetlands. Monitor and document habitat components through annual biological surveys of two to three key components (birds, vegetation, water quality, invertebrates, and fish).
10. Develop and improve wildlife compatible recreational opportunities on Refuge lands that further the public's involvement and appreciation of the System. Through the completion and implementation of the Public Use Plan in tasks outlined in short-term and long-term phases, public use would increase 15 percent over the next five years and by 50 percent by the year 2015.

11. Develop and implement educational and interpretive programs to increase the public's understanding of the natural resources of the Refuge and issues within the Arkansas/Red Rivers Ecosystem. Develop educational or interpretive programs specific to the Flint Hills NWR and initiate Refuge participation in national educational programs. Host various special events to offer the public an opportunity to participate in Refuge activities.
12. Initiate a variety of innovative outreach strategies to strengthen the existing Refuge constituency and develop a broader base of public support in east-central Kansas. Create and develop one outreach product and/or publication to generate interest in the Refuge over the next five years. Increase community presentations, community involved habitat restoration projects, and Refuge staff representation at public events.
13. Work with the community to develop an organization or avenue for receipt of private funding to subsidize environmental education programs, habitat restoration projects, or other community based efforts benefitting wildlife habitats on Refuge lands by the year 2010.
14. Document, map, and monitor archaeological sites on current Refuge lands and future acquisitions through a baseline archaeological survey and monitor known sites for disturbance or deterioration. Incorporate information about the archaeology of the area into one Refuge educational or interpretive product or program by the year 2005.
15. Strengthen partnerships with the U.S. Army Corps of Engineers (Corps) and other private stakeholders within the community, Kansas Department of Wildlife and Parks, and other public agencies that are mutually beneficial and would ultimately benefit the fish and wildlife resources of the Refuge and surrounding lands.
16. Provide the personnel needed to accomplish the goals of this Plan through the addition of specific staff specialists and programs that encourage community volunteers.
17. Provide a safe, efficient, and productive work environment for Refuge employees and a safe infrastructure for Refuge visitors.

The goals and objectives of this Plan are the management framework providing direction and continuity in the Refuge programs over a short-term period (five years) and long-term period (5 to 15 years.) Strategies and management activities are suggested to progressively work toward achieving the specific objectives and can, over time, be modified to reflect a broader understanding or knowledge of an issue through research or experience, staff management styles, or resource specialties and regional funding priorities.

Vision

Flint Hills NWR contains biologically significant habitats in the Neosho watershed within Kansas. This unique unit of the System plays a crucial role in the conservation of biodiversity and protects a significant number of species which depend on these habitats. The Refuge straddles the Neosho River and is important for terrestrial and aquatic species. During the past decade, many research efforts have focused on the unique habitats of the Refuge. Yet much remains to be learned at Flint Hills NWR and management of the biological resources protected by the Refuge. The area is dominated by complex resource management issues revolving around the flood control function of John Redmond Reservoir. Activities associated with agriculture, flood control, and public recreation have placed increasing demands on the landscape and identified the need for more responsible utilization of land and water resources that support the remaining native ecosystem components.

Flint Hills NWR must continue to protect habitat for the diverse array of native plants and animals that rely upon the resources of the Refuge for survival. The foreseeable future is one of protection and enhancement of the existing landscape and active research and management for a diversity of native species at every trophic level within all environments on the Refuge. With continually improving data gathering and analysis, better decisions can be made regarding natural resource conservation thus leading to the secure abundance and population recovery of rare and/or state and federally listed endangered species.

The Service envisions cooperative working relationships with other Federal and State agencies along with nongovernmental organizations (NGO)'s and the interested public to accomplish its complex mission. These progressive working relationships would result in the Refuge's improving role in protecting resources from negative impacts while still providing a wide range of wildlife-dependent opportunities and activities. Flint Hills NWR continues to contribute to the economic development and enhancement of the quality of human life in the Neosho River Valley. As local communities become more and more aware of this, the Refuge would increasingly be promoted as a regional tourist destination. Such attention must be channeled to focus on the mission and benefit of the System and the promotion of an increased understanding and support for the Service's efforts to protect native plants and animals and their associated habitats.

Introduction

This CCP provides a description of the desired future conditions and long-range guidance for achieving the primary purpose for which Flint Hills NWR was established: to provide habitat for migratory birds and other wildlife. The Flint Hills NWR is one Refuge in a system that now encompasses over 92 million acres of public land and water and is the world's largest collection of land providing habitats for more than 5,000 species of birds, mammals, fish, amphibians, reptiles, and insects.

The mission of the 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 (National Wildlife Refuge Improvement Act of 1997). Established in 1903 by President Theodore Roosevelt, the System now includes 516 refuges and 38 wetland management districts in all 50 states and the U.S. territories. National wildlife refuges host a tremendous variety of plants and animals supported by a variety of habitats from arctic tundra and prairie grasslands to subtropical estuaries. Most national wildlife refuges are strategically located along major bird migration corridors. This ensures that waterfowl, raptors, and other migratory birds have publicly owned resting and feeding stops on their annual migrations.

The Service is the principal Federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats. The agency has specific trustee responsibilities for migratory birds, threatened and endangered species, anadromous fish, and certain marine mammals as well as the land and waters administered by the Service for the protection of these resources.

The following sections discuss the purpose of and need for the Flint Hills NWR CCP, the planning process used, and the general background of the Refuge. It also describes the geographic ecosystem the Refuge is located within and the legal context of the planning project.

Regional Setting

The Flint Hills NWR lies in the broad, flat Neosho River Valley, historically a native tallgrass prairie region of natural scenic beauty. The Refuge is named for the gently rolling Flint Hills 30 miles to the west. These fossil studded limestone hills were formed when seas washed across the region 250 million years ago (Oblinger-Smith Corp., 1982).

The Refuge is readily accessible by turnpike and interstate highways, lying just eight miles south of I-35 in eastern Kansas. Large cities such as Wichita, Kansas City, and Topeka are within 100 miles of the Refuge. Nearly 1.5 million people live within a 100 mile radius (Map #1). Other refuges within the immediate area include the Marais des Cygnes NWR (approximately 90 miles to the east on the Kansas-Missouri border) and Quivira NWR (approximately 150 miles to the west in south-central Kansas).

Refuge Purpose Statements

Each national wildlife refuge was established for a particular purpose. Formal establishment is usually based upon a statute or executive order specifically enumerating the purpose of the particular unit. However, refuges can also be established by the Service under the authorization offered in such laws as the Endangered Species Act of 1973 or the Fish and Wildlife Act of 1956. In these cases, lands are identified by the Service that have the right elements to contribute to the recovery of a species or the maintenance of habitat types. Oftentimes, the Service works in cooperation with private nonprofit organizations in efforts to acquire suitable lands.

Flint Hills NWR was established in 1966 and “. . . shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements . . . and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, . . .” 16 U.S.C. § 644 (Fish and Wildlife Coordination Act, 1958).

The Refuge Recreation Act (16 U.S.C. § 460-1) states that each refuge is:
“suitable for incidental fish and wildlife oriented recreational development, the protection of natural resources, and the conservation of endangered or threatened species.”

Planning Perspectives and Considerations

Purpose of and Need for the Plan

The purpose of the CCP is to “provide long range guidance for the management of national wildlife refuges.” As such, all lands of the System are to be managed in accordance with an approved CCP that will guide management decisions and set forth strategies for achieving refuge purposes. The Refuge Improvement Act of 1997 requires all refuges to have a CCP and provides the following legislative mandates to guide the development of the CCP:

- Wildlife has first priority in the management of refuges.
- Recreation or other uses are allowed if they are compatible with wildlife conservation.
- Wildlife-dependent recreation activities such as hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation will be emphasized.

This CCP provides management direction to present and future Refuge Managers for the next 15 years. It describes all management activities that occur on the Refuge and provides management goals, measurable objectives, and management actions or strategies designed to enhance and protect existing habitats and restore degraded habitats for the benefit of wildlife including endangered species. The goals and objectives shall guide management toward the Refuge vision or the ecologically desirable outcome for Flint Hills NWR.

Planning Process

This CCP establishes the goals, objectives, and management strategies for Flint Hills NWR. A CCP is guided by the established purposes of each refuge, the goals of the System, Service compatibility standards, and other Service policies, legal mandates, and laws directly related to refuge management. The Plan is in compliance with the requirements of the National Environmental Policy Act (NEPA). It addresses the National Wetlands Priority Conservation Plan, the North American Waterfowl Management Plan, conservation initiatives such as the Partners-in-Flight (PIF) Plan and private land initiatives, and the Service's ecosystem management plans.

The Plan is developed with specific activities to be implemented during a short time frame. Activities proposed for implementation over a longer term, 5 to 15 years, are sometimes stated broadly with the intent that a detailed step-down plan be developed. Step-down plans for a particular management program such as farming, public use, and prescribed fire include budgets, implementation, monitoring, and evaluation criteria.

This CCP will direct the preparation or revision of step-down management plans, affect performance standards for Refuge personnel, and justify budget approval for specific programs over the next 15 years.

The CCP and step-down plans provide the Refuge Manager a rationale and justification to guide management decisions affecting the Refuge's natural resources. The plans will be most useful if the Manager provides a detailed record of management actions and outcomes. It is the intent of the planning process that management actions developed in both the CCP and step-down plans be documented, reviewed, and evaluated within a reasonable time frame. To optimize the effectiveness of the plans, amendments need to be incorporated based on management outcomes and current Service policy.

Following the publication of a Notice of Intent in the Federal Register on October 2, 1998, a fact sheet was prepared and sent to a mailing list of citizens, interest groups, and agencies that have expressed interest in Refuge programs and issues. An open house was held at the Flint Hills NWR headquarters in Hartford, Kansas on November 5, 1998. In an ongoing effort to involve the local community and officials in the CCP process, the availability of the Draft CCP would be announced in the Federal Register by the Service. The Draft CCP would be sent to a current mailing list of citizens and interest groups and agencies previously expressing an interest in Refuge programs and issues.

As part of the process of developing a Final CCP, public meetings would be provided, if necessary, based on public response to this Draft CCP document. Any comments received from the public will be reviewed and considered throughout the CCP process. RMCI continually updates the mailing list based on responses from interested parties. The public comments will be included in the final document as an appendix.

Planning Perspectives

This comprehensive planning effort would integrate three perspectives so that the management direction over the next 15 years would produce holistic management approaches for the Flint Hills NWR. The Plan includes:

1. A broad perspective for overall environmental contextual issues including endangered species, biological diversity, water issues, inter-jurisdictional cooperation, socio-economic considerations, etc.
2. A focused perspective for the System related policy issues which affect the Flint Hills NWR programs (compatibility, endangered species management, water rights, etc.).
3. A local perspective for Refuge related activities and strategies affecting management units (grasslands, endangered species, research, etc.).

An understanding of these three perspectives and the relationship between them lead to the formulation of an integral set of Refuge goals and objectives for the next 15 years.

Expected Planning Outcomes

The planning effort should bring about the following outcomes which are all objectives of comprehensive conservation planning:

1. Ensure that management of Flint Hills NWR lands reflect the policies and goals of the System and the purposes for which the Refuge was established.
2. Ensure that Flint Hills NWR contributes to the conservation of biological diversity and to the structure and function of the ecosystem in which it is located.
3. Provide a clear statement of desired future conditions for Flint Hills NWR as it should be when the System and individual unit purposes are accomplished.
4. Provide a systematic process to aid decision making by identifying opportunities, issues, and concerns; collecting, organizing, and analyzing information; and developing and considering a range of management alternatives.
5. Provide a forum for determining the compatibility of uses on Flint Hills NWR.
6. Ensure Service programs, other agencies, and the public have opportunities to participate in management decision making for Flint Hills NWR.
7. Provide a uniform basis for budget requests for operational, maintenance, and capital development programs that accomplish Flint Hills NWR and system purposes.
8. Provide a basis for monitoring progress and evaluating Plan implementation on Flint Hills NWR.
9. Identify objectives and management strategies for Flint Hills NWR leading to their achievement.
10. Provide long-term continuity in the management of Flint Hills NWR.

The Ecosystem Approach to Management

The Service has adopted an ecosystem approach to more effectively achieve its mission of fish and wildlife conservation for future generations. The ecosystem approach is defined as protecting or restoring the natural function, structure, and species composition of an ecosystem while recognizing that all components are interrelated.

Ecosystem management includes preservation of the natural biological diversity, ecosystem health, and sustainable levels of economic and recreational activity. This approach emphasizes the identification of goals that represent resource priorities on which all parts of the Service will collectively focus their efforts. These cross program partnerships within the Service and partnerships with outside entities assist in the identification of common resource goals and contribute to the accomplishment of those goals in an effective and timely manner.

The Service has defined 52 ecosystems within the United States, based primarily on watershed designations. In order to implement the ecosystem approach, the Service has established ecosystem teams consisting of members representing the various field stations and programs within the Service in any given area. The Refuge plays an integral role in the coordination of, and is an active participant in, projects identified by the ecosystem team as priority projects in order to accomplish the overall goals of the team. Management decisions incorporate pertinent biological and socio-economic parameters within the ecosystem (Map #2).

The Arkansas/Red Rivers Ecosystem

Flint Hills NWR is part of the Arkansas/Red Rivers Ecosystem. This ecosystem contains approximately 245,000 square miles and extends from the Rocky Mountains to the bayous of Louisiana and contains all of Oklahoma and parts of seven other states. Flint Hills NWR is located in the north-central portion of this ecoregion. Threats to important fish and wildlife resources in this system include construction and operation of stream impoundments, improperly conducted livestock grazing, and further fragmentation of the prairie ecosystem. Opportunities exist to improve grazing regimes and work with Federal, State, and local agencies, as well as private organizations, to gain information and to better manage the declining resources in the Flint Hills NWR ecoregion. The Refuge plays an integral role in the participation and coordination of various projects identified by the ecosystem team as priority projects in order to accomplish the overall goal of the team.

Based upon a broad set of issues identifiable throughout the entire defined Ecosystem, the Service has developed a management goal and a set of sub-goals. The Ecosystem goal is "To protect, restore, and maintain viable levels of biotic diversity within the Arkansas Red/Rivers Ecosystem." Sub-goals of the plan include:

- P Recovering federal and state listed threatened and endangered species and their habitats and ensuring that species not currently listed are managed to avoid a future need to list them under the Endangered Species Act.
- P Maintaining migratory bird populations at healthy levels.
- P Reversing declining trends in quality and quantity of riparian/wetland habitats.
- P Restoring, maintaining, and enhancing the species composition, aerial extent, and spatial distribution of riparian/wetland habitats.
- P Protecting, restoring, and maintaining native fish and aquatic communities and to promote sport fisheries management where native fish and other aquatic organisms are not adversely affected.
- P Protecting, maintaining, and restoring upland terrestrial communities at the landscape level.
- P Interpreting the link between healthy, stable ecosystems and human/community health.
- P Protecting and enhancing water quality and quantity for aquatic, wetland, and riparian habitat.

To view the Arkansas/Red Rivers Ecosystem Plan, please refer to Appendix H.

Refuge and Ecosystem Planning Issues and Opportunities

The following is a list of the major issues that confront the Flint Hills NWR programs. An issue is an area of concern or an opportunity identified through the planning process that requires more intensive management efforts or decisions to change the Service's approach to future management planning. Examples include Service initiatives, opportunities, management problems, threats to the resources, conflicts in uses, public concerns, and undesirable resource conditions. Issues are identified by input and feedback from sources within the Service, a variety of other government agencies, NGO's, and the public.

The issues identified in the planning process present various challenges for the Service and the Refuge staff. However, the process of resolving these issues provides several opportunities that further the mission of the Refuge and benefit the natural resources of the Arkansas/Red Rivers Ecosystem. The issues with associated challenges and opportunities are identified below:

Issue 1. Habitat Management

The restoration and maintenance of native habitats on the Refuge is essential for effective wildlife management. Historic records, databases, and other information can be utilized to determine the natural conditions and processes that should be restored on the Refuge. This baseline assessment is essential for determining what habitat restoration actions should be conducted and as a method for gauging the success of habitat restoration and maintenance activities. Restoration may involve strategies such as prescribed burning, exotic species control, or hydrological restoration and maintenance. The intermittent flood hydrology of the Neosho River Basin above the John Redman Reservoir poses serious problems for all management activities on the Refuge. At high pool level, 95 percent of the Refuge may be flooded for extended periods of time. These flood events can result in damage to facilities, nature trails, roads, embankments, and water control structures. Flood events can also result in the extermination of desired vegetation types and add to the introduction of exotic species.

Challenge: Restoration and management efforts must take into account and prepare for the effects of flooding on the Refuge. Many conventional management and restoration techniques are not tolerant of the flooding conditions likely to be encountered. Techniques used in habitat management for the Refuge must be flood tolerant. Management efforts would rely more on the harnessing of natural processes and may therefore take longer to accomplish. Implementation of various land management practices include assisting area landowners to modify farming practices to reduce erosion and sedimentation and improve water quality.

Opportunity: Due to the seasonal abundance of water, increased ability exists to restore wetlands and conduct moist soils management for the benefit of wildlife.

Issue 2. Public Use, Environmental Education, and Public Outreach

The Refuge has had a history of recreational public use and access for wildlife-dependent recreational activities such as fishing, hunting, and wildlife viewing. Increasing the quality of wildlife-dependent activities, as well as allowing for increased public use, is a major challenge, especially when considering the damage and disruptions caused by periodic flooding.

Challenge: Construction and maintenance of flood tolerant nature trails, viewing blinds, and other essential structures would require long-term commitment, effort, and a flexible approach.

Opportunity: Increasing environmental education, as well as public outreach, would be possible by utilizing the expanded visitor center and increased educational activities on and off the Refuge. Activities such as hiking, environmental interpretation, wildlife photography, and wildlife viewing could occur at increased levels on the Refuge. Compatibility determinations and documentation to determine appropriate locations and levels of public use activities would need to be continued.

The acquisition of an Outdoor Recreation Planner (ORP) position for the Refuge is seen as vital to the success of the environmental education and public outreach program.

Issue 3. Cultural Resources Management

Flint Hills NWR has been inventoried systematically for archaeological sites. One of the sites identified is of national significance. Continued coordination with the appropriate State agencies is needed to ensure the protection of significant sites. Educational outreach and appropriate law enforcement are two possible strategies to improve cultural resources protection.

Challenge: Develop additional strategies and methods for protecting and preserving identified sites.

Opportunity: Provide interpretive information regarding cultural resources for the public in the form of pamphlets or the incorporation of interpretive information kiosks into current and future public access trails and areas.

Issue 4. Interagency Coordination

Coordination with other agencies and institutions is essential for accomplishing Refuge goals and to ensure success of the management program. Proposed permanent increases in the John Redmond Reservoir pool elevations would cause inundation of some current public use facilities. Close coordination and negotiation with the Corps and other agencies would be needed to mitigate these impacts.

Challenge: To coordinate reservoir level manipulation in times of drought or increased rain events to benefit fish and wildlife resources. Proposed permanent increases in John Redmond Reservoir pool elevations may need to be mitigated.

Opportunity: Continued close cooperation with the Corps would allow for the continued manipulation of reservoir levels for the benefit of wildlife. Examples are the drawdown of the reservoir to allow for shorebird habitat and vegetation growth that would provide waterfowl forage when the reservoir is full.

Issue 5. Staffing and Funding

Currently, the Refuge staff consists of eight permanent full-time employees. Additional staff is needed to ensure the accomplishment of the management plan goals. Acquisition of funding for proposed actions is one limiting factor in the accomplishment of Refuge goals.

Challenge: Acquiring funds to support proposed staffing increases.

Opportunity: The hiring of an ORP biologist, biological science technician, and maintenance worker are seen as needs to accomplish the goals of this Plan.

Issue 6. Threatened and Endangered Species

Four threatened or endangered species are known to occur on the Refuge or within the Neosho River drainage. These species are the bald eagle, peregrine falcon, Neosho madtom fish, and the flat-floater mussel.

Challenge: Maintaining Refuge habitat, particularly in and along the Neosho River, free from disturbance or impact that allows the continued presence of healthy populations of these species.

Issue 7. Farming

Farming practices on national wildlife refuges is a controversial practice. When the Refuge was established, approximately 14,000 acres were farmed. Since that time, the acreage has been reduced to approximately 4,000 acres. Currently, farming on the Refuge is used as a management tool for wildlife and to further accomplish Refuge objectives. Farmed acres will continue to be reduced as needed to accomplish management objectives.

Challenge: Farmed acres would be continually reduced as croplands are retired. These acres would be managed as wildlife habitat, i.e., wetlands, buffer strips, moist soil units, etc.

Opportunity: Farming would be used as a management tool to produce forage for wildlife and reduce depredation on neighboring lands.

Issue 8. Land Acquisition

With the pending closure of the Kansas Army Ammunition Plant (KAAP) near Parsons, Kansas, the Service proposes to assume management of approximately 1,525 acres of native grassland and riparian habitat as a fee title transfer from the U.S. Army. In March of 1998, the Service sent a Letter of Interest to the General Services Administration (GSA) sighting the Service's interest in lands bordering Labette Creek and the main gate to the plant under Public Law 80-537. The Service intends on accepting land at which time it will become a unit of the System and be administered by the Flint Hills NWR in fee through a no-cost transfer from the U.S. Army.

The KAAP is located in extreme southeastern Kansas in north-central Labette County. The site is approximately three miles southeast of downtown Parsons, Kansas. The military installation is government-owned and contractor operated. The 1,525-acre proposed fee title transfer would include approximately 515 acres of native bluestem prairie grassland and 1,008 acres of mixed hardwood riparian forest. The habitat on the KAAP is situated on level to slightly rolling uplands between the Neosho River and Labette Creek. In addition to these perennial drainages, numerous unnamed, intermittent creeks drain the site primarily to the southwest and southeast. A slight north-south ridge bisects the installation and divides the two drainages. Elevations generally range from 850 to 900 feet above mean sea level (MSL).

Challenge: Detailed information has not been compiled concerning land-use changes in Labette County since the 1850's; however, the natural vegetation clearly has undergone dramatic changes. Conversion of large areas of native tallgrass prairie probably occurred before the turn of the century, and many formerly timbered areas probably have been cleared or selectively cut. In addition, suppression of wildfires that formerly kept woody vegetation in check has resulted in the establishment of tracts of forest and woodlands in upland areas that formerly were dominated by grassland vegetation.

Opportunity: With the KAAP closure and excess land, the Service is provided with a timely and unique opportunity to protect habitat of the southeastern prairie and floodplain forests within the Arkansas River watershed in southeastern Kansas. In 1974, the vegetation in the vicinity of the KAAP was mapped as predominantly bluestem prairie, with cross timber forests along portions of Labette Creek. In addition, broad floodplains along Labette Creek and the Neosho River supported a variety of wetland vegetation. Historically, and as they exist now on the KAAP, upland sites were dominated by tall and medium grasses and supported a rich variety of herbaceous plants. Woody species were scattered or absent. Broadleaf deciduous forest dominated by oaks and hickories occupied the slopes of creek and river valleys, occasionally extending onto the uplands. Floodplains comprised a mix of floodplain forests, low prairies, and freshwater marshes.

Ecosystem and Refuge Resource Description

The Flint Hills NWR lies in the broad, flat Neosho River Valley in east-central Kansas neighboring the native tallgrass prairie region of natural scenic beauty (Map #3). The Refuge is named for the gently rolling Flint Hills 30 miles to the west.

Flint Hills NWR, established in 1966, currently consists of 18,463 acres located at the upstream end of the John Redmond Reservoir. The land is owned by the Corps and is managed under a cooperative agreement. Refuge habitat consists of 4,572 acres of wetlands, 1,400 acres of open water, 599 acres of riparian wetlands on the Neosho River and associated creeks, 3,917 acres of croplands, 3,200 acres of grasslands, 2,400 acres of woodlands, 2,255 acres of brushlands, and 120 acres of administrative and recreational roadways.

The Refuge is managed primarily to benefit migrating and wintering waterfowl in the Central Flyway. Thousands of ducks and geese utilize the area during the spring and fall migrations and many winter on the Refuge. A variety of management practices are utilized on the Refuge to meet the needs of all wildlife, such as neotropical migrants, shorebirds, and native plant communities. Feeding and resting areas for migratory birds are provided through aggressive moist soil and cropland management programs. In addition, farming practices and prescribed burning are used to provide food and cover for waterfowl and resident species as well. Along with large numbers of migrating birds, the Refuge is also a haven for white-tailed deer, wild turkey, bobwhite quail, and an assortment of other mammals, birds, reptiles, and insects.

In addition to the lands managed by Flint Hills NWR, the Corps has licensed the Kansas Department of Wildlife and Parks to manage 1,472 acres adjacent to the Refuge. This land is known as the Otter Creek Game Management Area and is managed primarily for bobwhite quail, mourning dove, wild turkey, cottontail rabbit, squirrel, and white-tailed deer.

The 3.05 billion dollar Wolf Creek Nuclear Power Plant, located eight miles east of the Refuge, was commissioned for operation on September 3, 1985. The nuclear power plant has a cooling reservoir of 5,500 acres (Coffey County Lake) which has open water all year long. Wolf Creek has contracted with the Kansas Water Office for the majority of the storage capacity of John Redmond Reservoir. To transfer this water from John Redmond to Wolf Creek, two 36 inch pumps and pipelines are located below the base of the John Redmond Dam. Coffey County Lake is open to fishing but closed to hunting and is used extensively by waterfowl (USFWS, 1997).

Area of Ecological Concern

Flint Hills NWR encompasses more than 18,000 acres in the floodplain of the Neosho River near the town of Hartford, Kansas (Map #3). With an average elevation of 1,050 feet above MSL, the Refuge straddles the Neosho River at the upper end of the John Redmond Reservoir in Lyon and Coffey Counties and the majority of the Refuge is in the flood pool of the Reservoir. Most of the surrounding land is characterized by gently rolling prairies now primarily agricultural land. The hydrology of the Neosho River and the John Redmond Reservoir profoundly effects management practices and most of the Refuge land uses. In addition, the land management practices conducted by the Refuge have an effect on the hydrology and natural resources within the Neosho River watershed. The broader area of ecological concern is the Neosho River basin. The Refuge was established under a cooperative management agreement with the Corps to provide habitat for migratory waterfowl in the Central Flyway. The major management objective for Flint Hills NWR focuses on protecting the unique Refuge habitats essential for the survival of the diverse species that utilize the Refuge.

Vegetation

Refuge habitat consists of approximately 4,572 acres of wetlands, 1,400 acres of open water, 599 acres of riparian wetlands on the Neosho River and associated creeks, 3,917 acres of croplands, 3,200 acres of grasslands, 2,400 acres of woodlands, 2,255 acres of brushlands, and 120 acres of administrative and recreational roadways.

The Refuge provides habitat for a myriad of plant species. A summary of the more common species is contained in the table below:

Vegetation of Flint Hills NWR		
Acres	Habitat Type	Common Species
4,572	Wetlands	smartweed, common millet/barnyard grass, buttonbush, willow, sedge, cocklebur, and foxtail grass
599	Riparian	cottonwood, ash, sycamore, hackberry, locust, walnut, elm, and silver maple as well as bittersweet, greenbrier, dogwood, American plum, gooseberry, buckbrush, moonseed, dock, ragweed, nettle, and violets
3,200	Grasslands	big bluestem, little bluestem, Indian grass, switch grass, prairie cord grass, rice cutgrass, dropseed, and foxtail
2,255	Brushlands	buckbrush, greenbrier, dogwood, American plum, and wild grape
2,400	Woodlands	cottonwood, willow, ash, pecan, red oak, bur oak, silver maple, redbud, Osage orange, mulberry, American elm, Chinese elm, walnut, hackberry, and sycamore
3,917	Croplands	corn, milo, soybean, winter wheat, alfalfa, and sunflowers

(Oblinger-Smith Corp., 1982, USFWS, 1997)

For a complete list of plants found on the Refuge, please refer to Appendix A.

Traditionally, retired farm fields were targeted for native grass restoration. Several restoration sites were destroyed due to flood events since 1993. Only a few protected areas located on higher elevated sites would now be considered for native prairie restoration. Johnson grass and *Sericea Lespedeza*, both considered noxious weeds, have been difficult to control. Chemical application within a floodplain is a concern and, therefore, other methods of control are being explored, i.e., mechanical and biological control.

Wildlife

Flint Hills NWR offers a diverse assortment of wildlife species. The various habitats present on the Refuge support a variety of species of mammals, birds, reptiles, amphibians, and fish. Mammals common to the Refuge are white-tailed deer, coyote, beaver, opossum, raccoon, bobcat, cottontail rabbit, fox squirrel, and other small mammals. River otters have also been reported on the Refuge since their reintroduction several years ago on the Cottonwood River upstream of the Neosho River (reference used to verify mammal scientific names, Burt and Grossenheider 1976).

Bird species commonly seen on the Refuge include an abundance of waterfowl such as Canada goose, snow goose, white-fronted goose, mallard, northern pintail, and blue-winged teal. Marsh and water birds on the Refuge include American white pelican, great (common) egret, snowy egret, great blue heron, little blue heron, green-backed heron, American bittern, least bittern, double-crested cormorant, and pied-billed grebe. Shorebirds, gulls, and terns seen on the Refuge include greater yellowlegs, dowitchers, ring-billed gull, Franklin's gull, and Forester's tern. Raptors include red-tailed hawk, northern harrier, Swainson's hawk, Cooper's hawk, great horned owl and sharp-shinned hawk. Other common birds are bobwhite quail, wild turkey, and eastern bluebird (references used to verify bird scientific names included DeGraaf, and Rappole 1995; Ehrlich et al. 1988; National Geographic Society, 1987; and Peterson, 1961).

Fish found on the Refuge include carp, channel catfish, white bass, crappie, and flathead catfish. It should be noted that the collection of wildlife inventory data is still ongoing and new species are found periodically. For an inventory of wildlife species, see Appendices B through E.

Waterfowl management has been the primary focus of many management strategies over the years. While the wildlife management perspective has broadened, waterfowl continues to be a major focus and the numbers of waterfowl give an indication of the intrinsic value of the Refuge. The table below includes the waterfowl counts from 1993 to 1997 and gives an indication of the vast numbers of birds that utilize the Refuge.

Waterfowl Counts 1993-1997				
Year	Canada Geese	Snow Geese	White-fronted Geese	Ducks
1997	1,400	21,305	2,800	33,535
1996	2,561	20,000	1,215	39,570
1995	3,000	9,100	4,000	48,750
1994	3,100	20,000	1,900	44,550
1993	2,500	31,000	650	16,400

(USFWS, 1997).

Threatened and Endangered Species

Two federally listed endangered birds are known to occur on the Refuge, the bald eagle and the peregrine falcon. Peregrine falcons are observed passing through the area during spring and fall migrations. Bald eagles generally arrive in the late fall and spend the winter around the John Redmond Reservoir and surrounding areas. Eagle use on the Refuge is monitored from October through March and nesting attempts have been documented (USFWS, 1997).

In addition to the above mentioned species, the Neosho madtom is federally listed threatened and the flat-floater mussel is listed as state endangered and are known to occur within the Neosho River drainage and within the Refuge boundary. For a complete listing of threatened and endangered species, please refer to Appendix F.

Exotic Species

The most prevalent problems on the Refuge are the State and county listed noxious weeds, Johnson grass and *Sericea Lespedeza*. The Refuge is mandated by State and county law to control the two species. Control efforts usually consist of mowing and farming. Because the Refuge lies in a floodplain, the use of pesticides and herbicides is restricted. An integrated pest management approach is taken utilizing farm management practices, prescribed burning, and chemical application. Biological controls are being investigated.

Another exotic species invasion which may become a problem in the future is the zebra mussel which causes numerous filter clogging problems as well as out-competing native species for food and habitat.

Climate

The climate of Flint Hills NWR and the surrounding region is typical of the temperate continental climate. The average annual precipitation is 36.01 inches and temperatures range from below zero to above 100° F. The frost free season averages 188 days a year.

Precipitation is usually heaviest in late spring and early summer. Normally 75 percent of the precipitation occurs during the growing season. Annual snowfall averages about 14 inches with an average of 30 days with more than a trace of snowfall. Winds in the area are predominately from the south (USFWS, 1997).

Geology

The Refuge lies in a physiographic region known as the Osage Cuestas (Oblinger-Smith Corp., 1982). The land forms in this area are of Pennsylvanian age shales, limestone, sandstone, chert, and conglomerates that were deposited in this area approximately 300 million years ago when Kansas was covered by swamps and shallow seas. The Shawnee group of the Virgilian series is the specific formation that the majority of the Refuge lies on. To the west of the Refuge in the Flint Hills region, the formations are of the Permian period, deposited approximately 250 million years ago. Portions of the sediments deposited in the alluvium along the Neosho River are eroded from this Permian formation (Oblinger-Smith Corp., 1982).

Soils

Soils on the Refuge are predominately productive Class I, II, III, and IV soils of silty loam and silty clay loam (Map #4). While 27 different soil types exist on the Refuge, the majority of the soils fall into the Class II rating and are suited for cultivation, pasture, woodlands, or wildlife (Oblinger-Smith Corp., 1982).

Water Management

Flint Hills NWR is located within the Neosho River and Eagle Creek flood pool of the John Redmond Reservoir which was constructed by the Corps as a flood control project. When the reservoir is at normal conservation pool, very little Refuge land is inundated. Water management on the Refuge is dependent on the relative abundance of water available. During abundant water periods, as much as 95 percent of the Refuge may be inundated by flooding from the rising pool level of John Redmond Reservoir. Floods of this severity are not uncommon (1973, 1985, 1986, 1993, 1995 and 1998). Most precipitation is received during the spring and some degree of flooding can be expected, while fall flooding of the Reservoir is less common. During drought periods, or other periods of low precipitation, pumping may be necessary to sustain wetlands and maintain wildlife habitat (USFWS, 1997).

Flint Hills NWR has two types of water rights. The Certificates of Appropriation allow for either pumping or natural flow diversion for recreational purposes which includes fish and wildlife. Eighteen Certificates are approved for the diversion of water from the natural flows of the Neosho River and its tributaries by low profile dikes. Ten additional Certificates cover the pumping of water from the Neosho River and its tributaries into constructed and natural wetlands (Map #5). One approved Permit remains for natural flows that has not yet been certified.

Approved Certificates of Appropriation, their type, and acre-feet authorized are listed in the following Table.

Water Rights - Flint Hills NWR - All Recreational Use (to include fish and wildlife.)

Water Unit	Certificate No.	Diversion Type	Acre-feet
Bench Marsh Unit			
Bench	38,287	Natural Flow	500
Lower Bench	39,580	Natural Flow	125
West Bench	<i>Permit</i> 42,848	Natural Flow	156
Beschka Marsh	38,280 38,282	Pump Natural Flow	73 150
Boes Marsh	21,939	Natural Flow	60
Burgess Marsh	38,278 38,279	Pump Natural Flow	206 300
Coon Hamman - Indian Hills Unit			
Coon Hamman --	17,606	Pump	19
<i>7 Pools Combined</i>	38,274	Natural Flow	80
Indian Hills --	17,601	Pump	205
	38,275	Natural Flow	330
Goose Bend Marsh	17,609 38,276	Pump Natural Flow	172 200
Hammerton Marsh	38,286 38,285	Pump Natural Flow	90 180
Hartford Unit			
Hartford/Maxwell (Pools 2&3)	39,581	Pump	476
Hartford (Pools 1&2)	38,283	Natural Flow	300
Maxwell MSU (Pool 3)	39,115	Natural Flow	270
Lairds Pond	13,712	Natural Flow	70
Monypeny Pond	5,336	Natural Flow	6
Palin Slough	38,273 38,271	Pump Natural Flow	25 25
Pintail Marsh	21,938	Natural Flow	110
Rummel Marsh	38,284 38,277	Pump Natural Flow	100 100
Strawn Flats	38,281	Natural Flow	110
Troublesome Unit			
Troublesome East	39,582	Pump	106
Troublesome	5,339	Natural Flow	30

Cultural and Historic Resources Features

Archaeological survey investigations conducted on the Flint Hills NWR have identified numerous archaeological sites. The majority of these sites represent Middle Ceramic occupation presumed to date from 1,000 to 1,500 A.D. According to Thies (1981), the archaeological sites thus far discovered represent occupations ranging from the Paleo-Indian era up to and including the Historic era, or from approximately 12,000 B.C. to the earliest days of Euro-American settlement. Thies goes on to say it is probable that more sites exist in the areas which could not be adequately investigated during the 1979 and earlier surveys. One archaeological site of note, the Williamson Site, is listed in the National Register of Historic Places. Human remains have been discovered at that site. A number of the identified sites have been recommended for preservation and further study (Thies 1981). Coordination with the appropriate authorities would be required should any construction activities take place in the vicinity of the identified sites.

Socio-economic Features

The Refuge is located in Lyon and Coffey Counties. The combined population of these counties, according to 1997 estimates, is 42,826. The population of Hartford is approximately 550. The socio-economic impacts of the Refuge on Lyon and Coffey Counties consists primarily of permitted public use, contributions of the staff, and supplies purchased within the counties for the Refuge.

In 1997, 53,565 visits were recorded at the Refuge. While many of the visits may be local or repeat visitors, the visitation rate represents considerable economic benefit to Lyon and Coffey Counties.

Lyon and Coffey Counties have significant agricultural resources. The percentage of land in farms for both counties average about 88 percent in 1992 and the combined farm acres for both counties was 839,027. In 1996 in both counties, an estimated 1,829 people were employed on farms as well as 285 agricultural service employees out of a combined total civilian labor force of 23,065. Approximately 9 percent of the labor force for the combined counties is involved in agriculture or agricultural services (IPPBR 1999). Cooperative farming agreements have resulted in the annual cultivation of almost 4,000 acres of Refuge land (Map #6).

Public Use

Public use activities currently permitted at the Refuge include wildlife observation, hiking, photography, sight-seeing, boating, picnicking, camping, fishing, wild food gathering, and hunting (Map #7a and 7b). Fish bait collecting is allowed for personal use only and firewood cutting is also allowed with a special permit from the Refuge Manager. All State and Federal regulations are in effect on the Refuge (USFWS, 1997).

Refuge Staffing

Current Refuge staff consists of the following 12 positions, 10 of which are full-time positions:

Refuge Manager	GS-14
Supervisor Refuge Operations Specialist	GS-12/13
Fish and Wildlife Biologist (Private Lands)	GS-7/9/11
Wildlife Biologist	GS-9/11
Administrative Support Assistant	GS-7
Bio-Science Tech	GS-8
Biological Aid	GS-3
Maintenance Mechanic	WG-9
Engineering Equipment Operator	WG-10
Fire Management Officer	GS-7/9
Range Technician	GS-4
Range Technician	GS-5

For a proposed full level staffing chart, please refer to Proposed Funding and Personnel section.

Flint Hills NWR

Management Program

Flint Hills NWR was established to provide habitat for migratory birds, and in so doing, serves as an inviolate sanctuary providing habitats for many other species of wildlife and plants. This purpose is fundamental in determining the Refuge mission. Both the purpose and mission are the foundation of Refuge management, the direction of which is guided by general goals with specific objectives. The protection of natural resources and the conservation of endangered or threatened species is the first priority in Refuge management; public uses are secondary as long as the activities are compatible with wildlife conservation. As appropriate, opportunities for the development of wildlife-oriented recreational development are considered. Specific projects or strategies within each objective are identified as a means of attaining the Refuge vision.

Guide for present and future management direction

The objectives and strategies presented are the Service's response to the issues and concerns expressed by the planning team and the public. These objectives and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act of 1997, the mission of the System, The Arkansas/Red Rivers Ecosystem Plan, the North American Waterfowl Management Plan, and the purpose, vision, and goals for Flint Hills NWR.

Objectives with measurable outcomes will guide the Refuge staff in a consistent direction toward the accomplishment of each goal beginning with short-term objectives and strategies to occur within five years followed by implementation of long-term strategies within 5 to 15 years. The time frame for implementing objectives may vary depending on funding, staff support, and Service directives. Due to the fact that the Flint Hills NWR CCP is a working document, modifications to the following objectives and strategies are anticipated. Where applicable, the Refuge Operating Needs System (RONS) project has been included with the associated strategy. For a complete listing of RONS projects, please refer to Appendix G.

Biological Diversity, Land Protection, Wildlife, and Habitat Protection

Goal 1: To restore, enhance, and protect the natural diversity on the Flint Hills NWR including threatened and endangered species by appropriate management of habitat and wildlife resources on Refuge lands and by strengthening existing and establishing new cooperative efforts with public and private stakeholders.

Objective 1: Restore and maintain native grassland and riparian communities within the Refuge to meet the needs of native flora and fauna.

Rationale for Objective: Native tallgrass prairies have been reduced to less than 5 percent of the historic amount in North America. Riparian communities support diversity and have high wildlife values.

Strategies

- ✓ Within two years following funding approval, develop a biological monitoring program managed by a Wildlife Biologist. The program would include conducting biological inventory studies and habitat surveys to gather baseline information to evaluate impacts of management decisions on the Refuge. Hire a GS-9/11 Wildlife Biologist in 2000 (RONS Projects).
- ✓ Strengthen existing and develop new cooperative efforts with Federal and State agencies, and private landowners regarding interrelationships between wildlife, livestock, hydrology, public use, and the ecosystem. Throughout the term of this Plan, the Refuge would provide technical assistance to landowners on land management issues.
- ✓ Maintain approximately a 200-foot wide buffer strip on each side of the Neosho River to preserve riparian habitat. Assess the need to increase the width of the buffer zone where terrain conditions and habitat needs require additional protection.
- ✓ Gradually reduce farmed acres to allow for the development of riparian zones, field buffer strips, wetlands, and prairie grassland and bottomland hardwood restoration. Approximately 75 acres of habitat would be restored annually.
- ✓ Utilize available management tools to control noxious weeds on the Refuge. These tools include but are not limited to biological, chemical, mechanical (farming, mowing), prescribed fire, and timber management.
- ✓ Within 10 years, restore 400 acres of native prairie sites that have been invaded by noxious weeds. Biological control would be the preferred method but chemical, mechanical, and burning methods as well as re-seeding may need to be utilized. (RONS Project)

Objective 2: Maintain and restore habitat for native wildlife including invertebrates, amphibians, reptiles, birds, mammals, and provide wintering grounds for waterfowl.

Rationale for Objective: While the Refuge has historically been managed primarily for the benefit of migratory waterfowl in the Central Flyway, the purposes of the Refuge state that the Refuge would be managed for the “conservation, maintenance, and management of wildlife resources.” In order to provide the life requirements for the native species that have historically inhabited the Refuge, habitat needs to be provided and maintained. Additionally, lesser known native species need to be researched to determine their possible presence and habitat needs.

Strategies

- ✓ Monitor wildlife populations including neotropical migrants (i.e., passerine, shorebirds, marsh birds, and waterfowl), reptiles, amphibians, and mammals on a periodic basis.
- ✓ Provide food, habitat, and feeding areas for migratory and resident bird populations (i.e., shorebirds, marsh birds, waterfowl, and neotropical migrants) through crop production, wetland restoration, and moist soil and riparian area management.
- ✓ Promote research and conservation of lesser known native species, typically amphibians, reptiles, small mammals, invertebrates, and native vegetation. Address potential hazards from zebra mussels and other exotic invasions.
- ✓ Identify, protect, and maintain/restore sites where habitats of concern are found. These sites include but are not limited to wet meadows, oxbows, virgin/native prairie, and bottomland hardwoods.

Objective 3: Follow existing recovery plan objectives, manage, monitor, and study threatened, endangered, and candidate species such as the bald eagle, peregrine falcon, Neosho madtom, and flat-floater mussel, their habitat requirements, predator susceptibility, exotic species encroachment, and human induced impacts to prevent further decline and eventual loss.

Rationale for Objective: Any threatened or endangered species found on the Refuge should receive the consideration of habitat management decisions that enhance the survival of the species by providing appropriate protection to enhance the existing Refuge habitat for that species.

Strategies

- ✓ Provide protected habitat free from disturbance (i.e., all terrain vehicles, hunting, aircraft, trampling, etc.) as required to protect sensitive species on a case-by-case basis through opportunistic management practices such as temporary or seasonal road closures.
- ✓ Support education about local endangered species for area schools and NGO's by conducting informative talks and promoting research of habitat requirements, population dynamics, and the problems endangered and threatened species face in the Ecosystem.

Objective 4: Utilize appropriate fire management strategies and tactics to maintain, protect, and/or restore Refuge habitats. Fire management would comprise approximately 10 percent of the total annual habitat management capabilities on the Refuge.

Rationale for Objective: Fire is a useful management tool for the restoration and maintenance of Refuge habitats.

Strategies

- ✓ Suppress wildfires, including trespass fires, in a safe, efficient, cost effective manner consistent with resources and values at risk. This will vary from aggressive initial attack to allowing fires to burn themselves out.
- ✓ Utilize minimum impact strategies and tactics to minimize environmental impacts in both wildfire suppression and prescribed fire operations.
- ✓ Prescribed fire will be used to modify vegetative communities for improved habitat for native flora and fauna, ecosystem function, and hazard fuel reduction.
- ✓ Cooperate with other agencies in wildfire suppression and prescribed fire operations.

Hydrological Restoration and Water Quality

Goal 2: To restore and maintain a hydrological system for the Neosho River drainage by managing for wetlands (Map #8), control of exotic species, and management of trust responsibilities for the maintenance of plant and animal communities.

Objective 1: Restore a more natural hydrology to the reach of the Neosho River and its associated wetlands within the Refuge boundaries in order to benefit native aquatic and riparian plant and animal communities. Restore approximately 600 acres of habitat to more natural conditions.

Rationale for Objective: With the construction of the John Redmond Reservoir, native habitats have been lost as a result of man-made impacts. Restoration of those portions of habitat that can be restored to more natural conditions would benefit the native wildlife.

Strategies

- ✓ Within five years, restore the hydrology of wetlands that were drained for farming, road construction, and other developments. Approximately 600 acres are to be restored to more natural conditions. (RONS Project)
- ✓ Continue to develop communication and cooperative efforts concerning ongoing projects within the area that affect channel morphology with the Natural Resource Conservation Service (NRCS) and the Corps.
- ✓ Update the comprehensive Water Management Plan to provide guidance for the management of existing and potential water rights for natural and man-made wetlands within the Refuge.
- ✓ Within 15 years, develop and maintain a total of approximately 3,500 acres as moist soil units.
- ✓ Conduct a long-term contaminant monitoring program on the Refuge using the September 1999 Contaminant Assessment Report (Appendix K) as a baseline.

Objective 2: Protect and conserve populations of aquatic species designated as endangered, threatened, or species of concern.

Rationale for Objective: Any threatened or endangered species found on the Refuge should receive the consideration of habitat management decisions that enhance the survival of the species by providing appropriate protection and enhance the existing Refuge habitat for that species.

Strategies

- ✓ Develop cooperative management strategies with other Federal, State, and NGO's to support maintenance and restoration of habitats supporting (or potentially supporting) native communities with special emphasis on federal and state listed species.
- ✓ Assist in developing and revising recovery plans for listed species found on the Refuge.
- ✓ Promote a public outreach campaign that stresses the importance of restoring endangered species and their relationship to sound ecosystem management.

Objective 3: Develop and support ongoing resource management practices that emphasize the control of invasive species.

Rationale for Objective: Due to the introduction of nonnative species, including state listed noxious weeds, native vegetation has been replaced by exotic species. Control of these species on the Refuge is a difficult task. Constant vigilance and control efforts are required to preserve habitats on the Refuge.

Strategies

- ✓ Control nonnative vegetation in riparian areas of the Neosho River and its tributaries through succession.
- ✓ Within five years, retire approximately 600 acres of cropland to allow for the development of buffer strips adjacent to riparian zones and wetlands.
- ✓ Continue to participate and cooperate with the U.S. Department of Agriculture (USDA) and other organizations in approved biological efforts to control exotic species. The Refuge would provide test study sites when practical.
- ✓ Utilize interactions with the public (media releases, public meetings, etc.) to disseminate information on the negative impacts that most nonnative species have on native species and the natural ecosystem as a whole.

Public Use, Recreation, Wildlife Interpretation, and Education

Goal 3: Provide opportunities for wildlife-dependent public access and recreational opportunities to include compatible forms of hunting, fishing, wildlife observation, photography, interpretation, and educational activities.

Objective 1: Maintain and improve quality wildlife-dependent recreational opportunities on the Refuge.

Rationale for Objective: Wildlife-dependent recreation is a priority as mandated by the Wildlife Improvement Act of 1997.

Strategies

- ✓ Within two years of funding approval, formulate and implement a comprehensive Public Use Plan. This Plan would address all forms of public use and access.
- ✓ Following funding approval, add a GS-5/7/9 ORP position to develop and conduct the Outdoor Recreation Program which would include off Refuge outreach programs. (RONS Project)
- ✓ Develop a visitor service center.

Objective 2: Provide compatible hunting and fishing opportunities.

Rationale for Objective: While hunting currently occurs on the Refuge, the value and quality of the activity could be improved through close cooperation with other agencies and through careful management of hunting access. Law enforcement would play a vital part in monitoring the hunting and other public use activities on the Refuge.

Strategies

- ✓ Add one full-time law enforcement officer to be shared between Flint Hills NWR and Marais des Cygnes NWR. (RONS Project)
- ✓ Use local media and other public outreach tools to keep the public informed and to enhance hunting and fishing on the Refuge.
- ✓ Maintain the quality of the fishing and hunting opportunities on the Refuge by utilizing road closures and access restrictions.

Objective 3: Improve existing and/or develop new compatible recreational opportunities for wildlife viewing and photography at Flint Hills NWR to allow for increases in public use.

Rationale for Objective: Over the years, wildlife viewing and wildlife photography have become more popular with the public. To meet this increased demand, additional facilities and programs are needed.

Strategies

- ✓ Following funding approval, develop two viewing and photography blinds with access trails. The blinds would be flood tolerant and/or removable to avoid damage during the flood season. (RONS Project)
- ✓ Following funding approval, enhance three existing nature trails for public use. (RONS Project)
- ✓ Following funding approval, develop informational and interpretive signs on the Refuge. (RONS Project)
- ✓ Use local media and public outreach to inform the public about opportunities for wildlife viewing and photography at Flint Hills NWR.

Objective 4: Promote understanding of the Service's mission and the Refuge's role in wildlife conservation.

Rationale for Objective: Educational activities and public outreach are essential to inform and educate the public about recreational opportunities and public use on the Refuge.

Strategies

- ✓ Revise and expand brochures to inform and educate the public regarding the Service mission and the recreational and educational opportunities provided by the Refuge. (RONS Project)
- ✓ Conduct school and educational programs that include field activities throughout the year. (RONS Project)
- ✓ Host on-site events and participate in community events to promote the Refuge and the Service.

Cultural Resources

Goal 4: To protect, manage, and interpret cultural resources on the Flint Hills NWR for the benefit of present and future generations.

Objective 1: Protect cultural resources on the Refuge in compliance with all applicable Federal mandates.

Rationale for Objective: The presence of cultural resources on the Refuge has been documented as required by Federal mandates.

Strategies

- ✓ Verify locations of known cultural resources using GPS technologies.
- ✓ Sample inventory one-third of the Refuge to determine if additional cultural resources exist.
- ✓ Utilize standard law enforcement practices and strategies to protect identified and unidentified cultural resources.
- ✓ Re-vegetate cultural resource sites to stabilize the surface area while at the same time reduce the site's visibility.

Objective 2: Interpret the cultural resources of the Refuge and educate the Refuge visitor to foster appreciation and understanding of current and past cultures.

Rationale for Objective: As public use increases, increased efforts to educate the public and protect cultural resources would be needed.

Strategies

- ✓ Within three years following funding approval, prepare an information pamphlet for distribution from the visitor center concerning the nature, value, and need for protection of cultural resources on the Refuge.
- ✓ Install interpretive panels to inform the public of the nature, value, and need for protection of cultural resources on the Refuge.

Interagency Coordination and Relations

Goal 5: To strengthen interagency and jurisdictional relationships in order to coordinate efforts with respect to Refuge and surrounding area issues resulting in decisions benefitting fish and wildlife resources while at the same time avoiding duplication of effort.

Objective 1: Cultivate interagency, jurisdictional and community relationships to support the Refuge mission.

Rationale for Objective: Because the Refuge is on land owned by the Corps and managed under an agreement with the Corps, close cooperation with the Corps is essential. Additionally, numerous other groups and communities have interests in the operations of the Refuge.

Strategies

- ✓ Continue to develop a close relationship with the Corps and other stakeholders that would define and implement policies and requirements that concern the Refuge.
- ✓ Develop a stronger relationship with local agencies, landowners, counties, and other stakeholders to influence land development adjacent to the Refuge in a way that would benefit wildlife.
- ✓ Develop a Refuge support group to improve community involvement.
- ✓ Work closely with the Corps to help mitigate impacts from proposed increased pool elevations.

Improvement of Staffing, Funding, and Facilities

Goal 6: Improve staffing, funding, and facilities that would result in long-term enhancement of habitat and wildlife resources in the area of ecological concern and support the achievement of the goals of this Plan and the goals of the System.

Objective 1: Increase staffing to the proposed “Proposed Staffing Level” or its equivalent in order to provide the level of support needed to accomplish the goals of this Plan.

Rationale for Objective: In order to accomplish Refuge goals and objectives, additional staff would be required. Additionally, foreseeable increases in public use would be difficult to accommodate without additional staff.

Strategies

- ✓ Add additional staff required to support the goals of this Plan.
- ✓ Utilize internal mechanisms such as RONS to justify and acquire the additional funding and personnel to accomplish Refuge goals within 15 years.
- ✓ Pursue agreements with other interested agencies and public partners to provide the needed personnel and funds to accomplish Refuge goals.

Objective 2: Improve facilities in order to provide the infrastructure needed to accomplish the goals of this Plan.

Rationale for Objective: Facilities provide the infrastructure that allows the accomplishment of all Refuge goals and activities. Periodic improvements, replacements, and additions are an integral part of the development of the Refuge.

Strategies

- ✓ Construct an all steel storage building to store heavy equipment to better protect and preserve equipment and comply with current contaminant control regulations. (RONS Project)
- ✓ Construct a fire equipment storage facility. (RONS Project)
- ✓ Construct housing for seasonal fire fighting personnel. (RONS Project)
- ✓ Expand office space to accommodate additional staff.

Legal, Policy, Administrative Guidelines, and Other Special Considerations

This Section outlines current legal, administrative, and policy guidelines for the management of national wildlife refuges. It begins with the more general considerations such as laws and executive orders for the Service, and moves toward those guidelines that apply specifically to the Flint Hills NWR.

This unit also includes sections dealing with specially designated sites such as historical landmarks and archaeological sites, all of which carry with them specific direction by law and/or policy. In addition, consideration is given to guidance prompted by other formal and informal natural resource planning and research efforts.

All the legal, administrative, policy, and planning guidelines provide the framework within which management activities are proposed and developed. This guidance also provides the framework for the enhancement of cooperation between the Flint Hills NWR and other surrounding jurisdictions in the ecosystem.

Legal Mandates

Administration of the refuges takes into account a myriad of bills passed by the United States Congress and signed into law by the President of the United States. These statutes are considered to be the law of the land as are executive orders promulgated by the President. The following is a list of most of the pertinent statutes establishing legal parameters and policy direction to the National Wildlife Refuge System. Included are those statutes and mandates pertaining to the management of the Flint Hills NWR.

For those laws that provide special guidance and have strong implications relevant to the Service or Flint Hills NWR, legal summaries are offered in Appendix I. Many of the summaries have been taken from *The Evolution of National Wildlife Law* (Bean 1985). For the bulk of applicable laws and other mandates, legal summaries are available upon request.

Agency-Wide Policy Directions

Fish and Wildlife Service Agency Mission — Since the early 1900's, the Service mission and purpose has evolved, while holding on to a fundamental national commitment to threatened wildlife ranging from the endangered bison to migratory birds of all types. The earliest national wildlife refuges and preserves are examples of this. Pelican Island, the first refuge, was established in 1903 for the protection of colonial nesting birds such as the snowy egret and the endangered brown pelican. The National Bison Range was instituted for the endangered bison in 1906. Malheur National Wildlife Refuge was established in Oregon in 1908 to benefit all migratory birds with emphasis on colonial nesting species on Malheur Lake. It was not until the 1930's that the focus of refuge programs began to shift toward protection of migratory waterfowl (i.e., ducks and geese). As a result of drought conditions in the 1930's, waterfowl populations became severely depleted. The special emphasis of the Service (then called the Bureau of Sport Fisheries and Wildlife) during the next several decades was on the restoration of critically depleted migratory waterfowl populations.

The passage of the Endangered Species Act of 1973 refocused the activities of the Service as well as other governmental agencies. This Act mandated the conservation of threatened and endangered species of fish, wildlife, and plants both through Federal action and by encouraging the establishment of State programs. In the late 1970's, the Bureau of Sport Fisheries and Wildlife was renamed the U.S. Fish and Wildlife Service to broaden its scope of wildlife conservation responsibilities to include endangered species, as well as game and nongame species. A myriad of other conservation oriented laws followed, including the Fish and Wildlife Conservation Act of 1980, which emphasized the conservation of nongame species.

National Wildlife Refuge System: Mission and Goals

The National Wildlife Refuge System is the only existing system of federally owned lands managed chiefly for the conservation of wildlife. The System mission is a derivative of the Service mission. This mission was most recently revised in October 1997 by passage of the National Wildlife Refuge System Improvement Act (P.L. 105-57). This Act followed up on Executive Order 12996 (April 1996) Management of Public Uses on National Wildlife Refuges to reflect the importance of conserving natural resources for the benefit of present and future generations of people.

This Act amends the National Wildlife Refuge System Administration Act of 1966 in a manner that provides for the Refuge System. It would ensure that the Refuge System is effectively managed as a national system of lands, waters, and interests for the protection and conservation of our nation's wildlife resources.

The Act gives guidance to the Secretary of the Interior in the overall management of the Refuge System. The Act's main components include a strong and singular conservation mission for the Refuge System, a requirement that the Secretary of the Interior maintain the biological integrity, diversity, and environmental health of the Refuge System, a new 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 Refuge Improvement Act is an overarching Act with both general and specific elements that provide long-term management direction for the Refuge System. It became law the day it was signed; however, pending development and approval of final rules and regulations, the Service has issued the following as interim policy guidance with respect to the Act's Sections:

Sec. 1 Purpose

This Order provides guidance for implementing specific provisions of the National Wildlife Refuge System Improvement Act of 1997, pending development of new policies and regulations responsive to the Act.

Sec. 2 Scope

This policy applies to management of the National Wildlife Refuge System.

Sec. 3 Existing policy

Existing policy and directives for management of the National Wildlife Refuge System remain in force except for those which are in conflict with provisions in the Act, in which case the Act prevails.

Sec. 4 Mission of the National Wildlife Refuge System

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."

Sec. 5 Administration of the National Wildlife Refuge System

- a. The term "refuge" means a designated area of land, water, or an interest in land or water within the Refuge System, but does not include Coordination Areas.
- b. Each refuge shall be managed to fulfill the mission of the Refuge System, as well as the specific purposes for which that refuge was established.
- c. Each refuge shall be managed in a manner that maintains the biological integrity, diversity and environmental health of the Refuge System.
- d. The status and trends of wildlife resources on each refuge shall be monitored.
- e. The purposes of each refuge are the purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge sub-unit.
- f. Each refuge shall ensure effective coordination, interaction, and cooperation with neighboring landowners and appropriate State fish and wildlife agencies.
- g. Each refuge shall cooperate and collaborate with other Federal agencies and appropriate state fish and wildlife agencies in refuge acquisition and management.

Sec. 6 Public Uses

- a. When determined to be compatible, the following six wildlife-dependent recreational uses are the priority general public uses of the Refuge System: hunting, fishing, wildlife observation and photography, and environmental education and interpretation.
- b. Compatible priority public uses shall receive enhanced consideration over other public uses in refuge planning and management.
- c. Priority public uses are appropriate and legitimate uses of the Refuge System. Refuges are strongly encouraged to seek opportunities to permit these activities when ways can be found to ensure their compatibility. Reasonable efforts should be made to ensure that lack of funding is not an obstacle to permitting these uses through development of partnerships with the States, local communities, and private and nonprofit groups.
- d. The following general hierarchy between refuge activities and public uses would apply: Priority 1 - activities necessary to fulfill the refuge purposes and the Refuge System mission; Priority 2 - provide opportunities for wildlife-dependent recreational uses, when determined to be compatible. All other public uses would be a lower priority.
- e. In providing priority public uses, refuges shall emphasize opportunities for families to experience compatible wildlife-dependent recreation, particularly opportunities for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting.

Sec. 7 Compatibility

- a. Compatibility determinations prepared during the period between enactment of the National Wildlife Refuge System Improvement Act of 1997 (October 9, 1997) and issuance of a new compatibility policy would be made under the existing compatibility standards and process.

Sec. 8 Comprehensive Conservation Planning

- a. The Act provides that Comprehensive Conservation Plans shall be completed for all refuge units within 15 years from the date of enactment.

Refuge Purpose Statements

Formal establishment of a unit of the National Wildlife Refuge System is usually based upon a specific statute or executive order specifically enumerating the purpose of the particular unit. However, refuges can also be established by the Service under the authorization offered in such laws as the Endangered Species Act of 1973 or the Fish and Wildlife Act of 1956. In these cases, lands are identified by the Service that have the right elements to contribute to the recovery of a species or the maintenance of habitat types. Often, the Service works in cooperation with private nonprofit organizations in efforts to acquire suitable lands.

Flint Hills NWR was established in 1966 and “. . .shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements . . . and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, . . .” 16 U.S.C. § 644 (Fish and Wildlife Coordination Act, 1958).

Plan Implementation

Refuge objectives are intended to be accomplished over the next 15 years. Many of the management activities for Flint Hills NWR would require the development of step-down management plans. Implementation of new management activities would be phased in over time as described within the step-down plans and would be contingent upon funding, staffing, regional and national Service directives. This section identifies major resource projects or planning to be accomplished within 5 to 10 years, estimated initial costs, staffing and funding needs, partnership opportunities, and step-down management plans.

Resource Projects

Listed below are a summary of major resource project needs addressing the goals and objectives of this Plan. Each project summary includes planning links to this CCP. This list only reflects the basic needs identified by the planning team based on available information and are subject to modification depending on future conditions, needs, and cost adjustments.

Project 1. Riparian Habitat Restoration and Protection

Provide and maintain riparian habitats and increase the diversity of wildlife communities. Restoration management includes establishment of riparian buffer strips, control of exotic vegetation, and prescribed fire in some areas.

Planning Links: Goal 1, Objectives 1, 2, 3 and 4
Goal 2, Objectives 1 and 3
Goal 5, Objective 1
Goal 7, Objective 1

Project 2. Water Management

Develop and implement a Water Management Plan. The Plan would determine water needs to maintain wetlands acres and restore riparian habitats of the Neosho River, and estimate water rights needed for the beneficial use of fish and wildlife. The Plan would include water management strategies for the production of quality wetland habitat components, and inventory and monitoring strategies for evaluating the diversity of wetland communities.

Planning Links: Goal 2, Objectives 1 and 2
Goal 3, Objective 3
Goal 5, Objective 1
Goal 7, Objective 1

Project 3. Wetland Restoration and Management

Restore and maintain wetland habitats to more natural conditions. Restoration management includes retiring cropland and constructing and restoring wetlands to benefit wildlife resources.

Planning Links: Goal 1, Objectives 1, 2, and 3
Goal 2, Objectives 1, 2, and 3
Goal 5, Objective 1

Project 4. Grassland Management

Restore 400 acres of native prairie sites that have been invaded by noxious weeds. Restoration management would include biological control, chemical control, mechanical control, burning and re-seeding. Identify, protect and / or restore remaining tracts of true native prairie grasslands.

Planning Links: Goal 1, Objectives 1, 2, 3, and 4
Goal 2, Objective 3
Goal 5, Objective 1
Goal 7, Objective 1

Project 5. Outdoor Recreation Improvement

Improve the outdoor recreation component of the Refuge by adding an Outdoor Recreation Planner to the Refuge staff. Outdoor recreation improvements would include adding or improving trails, wildlife viewing and photography blinds, development of informational pamphlets, and increased public education and outreach.

Planning Links: Goal 1, Objective 3
Goal 3, Objectives 1, 2, 3, and 4
Goal 4, Objective 2
Goal 5, Objective 1
Goal 6, Objective 1
Goal 7, Objective 1

Project 6. Public Use Plan and Visitor Services

Develop a Public Use Plan which emphasizes visitor services at the headquarters and increased opportunities for wildlife related recreation activities.

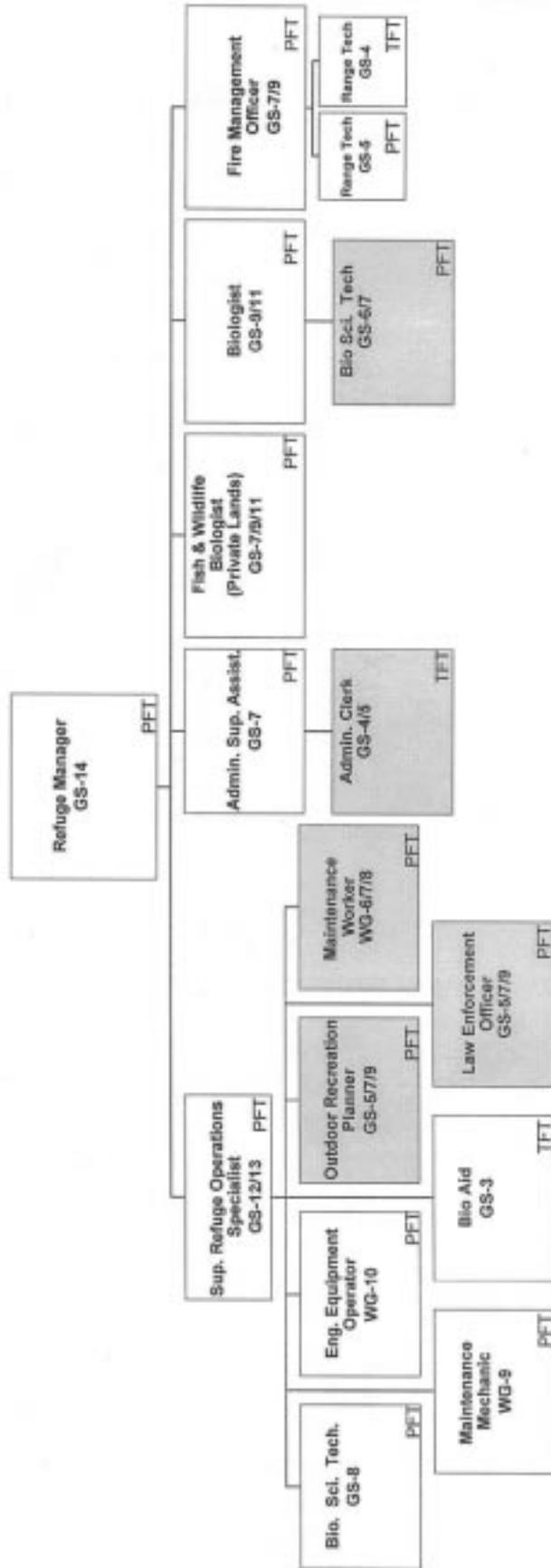
Planning Links: Goal 1, Objective 3
Goal 3, Objectives 1, 2, 3, and 4
Goal 4, Objective 2
Goal 5, Objective 1
Goal 6, Objective 1
Goal 7, Objective 1

Flint Hills NWR

Proposed Full Staffing

Shaded Box Denotes Proposed Staff additions

PFT = Permanent Full-time
 TFT = Temporary Full-time



Current base funding and other funds

Total annual budget for the Refuge varies depending on the Service priorities for the resource projects each year and the national and regional allocation of RONS and Maintenance Management System (MMS) funds.

The following is a general breakdown of the annual operation budget of the Refuge (amount \$K):

Annual Operations Budget (amount \$K)						
Year	1261*	1262*	8260*	9100* 9251*	1121*	Total
1999	320.69	86.0	86.69	97.70	230.0	\$821.08
1998	301.23	70.0	118.00	49.80	216.3	\$755.33
1997	302.25	25.0	286.49	62.58	207.0	\$883.32
1996	286.85	65.0	74.08	26.60	180.0	\$632.53

*Description of funding categories:

1261 funds include annual fixed costs: salaries, utilities, gasoline, diesel, equipment repair, mandatory training/travel.

1262 funds includes routine maintenance and vehicle replacement, maintenance on refuge facilities, and infrastructure.

8260 funds are from receipt of sales from the farming program and can be used to fund Refuge operations.

9100 and 9251 are funds used for fire preparedness.

1121 monies fund the Private Lands Program.

Partnership Opportunities

Many opportunities exist to partner with county, State and Federal agencies, NGO's, private landowners, and conservation groups such as PIF, Ducks Unlimited, The Nature Conservancy, Wild Turkey Federation, and Quail Unlimited to combine efforts on resource issues or projects that would mutually benefit all with the greatest benefits to the area's natural resources. The benefits of the following partnerships or relationships are emphasized:

- P Establishing relationships through partners for fish and wildlife programs, private landowners, and conservation organizations could result in the development of conservation agreements or other options for land protection, habitat enhancement and restoration, and opportunities for continuity of management.
- P Strengthening partnerships with Kansas Wildlife and Parks and local law enforcement agencies could lead to sharing of volunteers to conduct activities associated with public use on the Refuge wetlands, enhancing biological programs and management strategies of habitats and wildlife populations on adjoining lands, sharing research opportunities and information that would mutually benefit management of adjoining resource areas, coordinating water management to enhance wetland habitats, improving wildlife-oriented recreation opportunities through joint efforts, and coordinating efforts for more efficient law enforcement coverage.
- P Partnerships or joint efforts with the Corps, Kansas Department of Wildlife and Parks, Kansas Water Office, and Neosho Basin Advisory Committee, the timing and amount of water flows could be maximized for beneficial use on riparian, wetland, and aquatic communities of the Neosho adjacent to the Refuge. Improved relationships with area water users and the Corps would provide better communication on water issues. A coordinated effort for the protection of water rights and efficient use of this limited resource would benefit all users.

Step-Down Management Planning

The following is a list of step-down management plans that include mandatory plans, programmatic plans, and special use plans. Often these plans would require compatibility determinations, environmental assessments, or other supporting justification before they can be implemented. The preparation and execution of these plans is dependent on funding and the availability of staff or technical support.

Completed Plans and Other Documents

Station Safety Plan: describes actions and improvements necessary to make station facilities and operations comply with Federal occupational health and safety standards and other applicable regulations.

Fire Management Plan: determines the best use of prescribed fire in managing and enhancing the Refuge habitats and addresses wildfire preparedness and suppression. Plan was last updated in 1997.

Sign Plan: provides a record of all signs installed throughout the Refuge and guidelines for sign replacement.

Hunting Plan: addresses specific aspects of the Refuge hunting program defining the species to be hunted, season structure, hunting methods, and applicable Refuge specific hunting regulations. Completed between 1980-1984.

Migratory Bird Disease Contingency Plan: describes strategies to be implemented during migratory bird disease outbreaks. Completed between 1980-1984. Needs to be reviewed and updated.

Integrated Pest Management Plan: describes biological, mechanical, or chemical methods for the most effective eradication and control of exotic weeds and woody vegetation and specific pests including those damaging crops without impacting the natural resources of the area.

Plans and Documents to be Developed in the Future

Public Use Management Plan: addresses specific wildlife related public recreation issues and needs.

Refuge Inventory and Monitoring Plan: describes specific wildlife inventory activities and techniques to be conducted to monitor wildlife populations including specific species population objectives, census/survey methods, data analysis, and reporting requirements.

Habitat Management Plan: describes the most appropriate management strategies for habitat protection, enhancement and restoration, emphasizes specific habitats and areas for management activities, provides monitoring methods and evaluation criteria.

Cultural Resources Management Plan: identifies areas with significant sites and develops methods for the management of these resources. The Cultural Resources Management (CRM) Plan also identifies areas with high potential of significant resources and provides the manager with information to make better decisions regarding development or management activities. A comprehensive cultural resource inventory is a prerequisite to the development of the CRM plan as land management activities including public access could impact unidentified or unevaluated resources.

Water Use Plan: describes annual water management strategies including quantities of water delivered, place of use and timing, and habitat objectives.

Prescribed Fire Environmental Assessments: an Environmental Assessment is planned to assess the environmental impacts of prescribed fire as a management tool in restoring and enhancing grassland habitats on the Flint Hills NWR. The primary objective of the environmental assessment is to determine the effects of prescribed fire on human and wildlife populations. A Finding of No Significant Impact would determine fire to have no significant environmental effects. If prescribed fire is not deemed a major Federal action significantly affecting the quality of human environment within the meaning of section 102 (2) © of the National Environmental Policy Act of 1969, no formal environmental statement would be recommended.

Wilderness Review

This Refuge does not conform to the definition of a wilderness, as described in the Wilderness Act of 1964. The Refuge is an overlay of Corps property and is managed under a cooperative agreement with the Corps. Additionally, the Refuge is fragmented by numerous county roads and heavily impacted by man-made flooding events from the Reservoir that inundate as much as 95 percent of the Refuge. Acquisition of additional lands in the vicinity of the KAAP near Parsons, Kansas, may eventually provide sufficient opportunities for exploring wilderness designation.

Refuge Program Monitoring and Evaluation

Where possible, the CCP identifies and incorporates monitoring and evaluation activities as strategies under the objectives developed for Flint Hills NWR. Each Refuge program has specific guidelines described in the appropriate step-down plan. Step-down plans include approaches and methods to monitoring management activities and specific criteria to evaluate the outcomes of the activities. As new information becomes available through baseline data, research, or outcomes of management projects the existing Refuge programs would be adjusted. Step-down plans including the monitoring and evaluation sections would require periodic review, program evaluation, and adjustments as necessary.

Monitoring and Evaluation of the CCP

For this Plan to be a useful working document for present and future Refuge managers, documentation and accountability must be a priority. The most effective implementation of the CCP would require periodic review, evaluation, and the addition of information as necessary to keep the document as current as the Refuge programs that evolve.

References

- Bean, Michael J. 1985. *The Evolution of National Wildlife Law*, Praeger Publishers, New York.
- Burt, W. H. and R. P. Grossenheider, 1976. *A Field Guide to the Mammals*. Houghton Mifflin Co. Boston.
- DeGraaf, R.M. and Rappole, J. H. 1995. *Neotropical Migratory Birds, (Natural History, Distribution, and Population Change)* Comstock Publishing Associates, a Division of Cornell University Press, Ithaca and London.
- Ehrlich, Paul R., D.S. Dobkin and D. Wheye. 1988. *The Birders Handbook: a Field Guide to the Natural History of North American Birds*. Simon and Schuster.
- The Institute for Public Policy and Business Research (IPPBR). 1999. (<http://www.ukans.edu/cwis/units/IPPBR>). University of Kansas, Lawrence, KS 66506 70874-4490 USA.
- National Geographic Society. 1987. *Field Guide to the Birds of North America*.
- Oblinger-Smith Corporation. 1982. *Flint Hills NWR Master Plan*. Oblinger-Smith Corporation, Wichita, KS.
- Peterson, R. T. 1961. *A Field Guide to Western Birds*. Houghton Mifflin Co. Boston.
- Thies, R. M. 1981. *Archaeological Investigations in the John Redmond Reservoir, East Central Kansas 1979*. Kansas State Historical Society. Submitted to US Army Corp of Engineers, Tulsa. pg. 306.
- U.S. Department of Agriculture, NRCS 1999. *The PLANTS database* (<http://plants.usda.gov/plants>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
- U.S. Fish and Wildlife Service. 1997. *Flint Hills National Wildlife Refuge Annual Narrative Report Calendar Year 1997*. Flint Hills National Wildlife Refuge.

List of Preparers

Research Management Consultants, Inc. (RMCI)

Louis J. Bridges - Project Scientist/Biologist

B.S. Biology/Natural History; M. A. Science Education
Seven years of experience at RMCI as an Environmental Scientist/
Biologist. Sixteen years of related experience ranging from research
with the Colorado Division of Wildlife to Environmental Science
Instructor at the University of Northern Colorado.

J. Paul Wharry - Environmental Scientist IV

B.A. Biology
Seven years of experience at RMCI as an Environmental Scientist.
Sixteen years of related experience ranging from High School Science
Instructor to Director of the Frontiers of Science Institute at the
University of Northern Colorado.

C. Anne Janik - Environmental Scientist III

M.S. Wildlife Management
Eleven years of experience with the U.S. Fish and Wildlife Service as a
Wildlife biologist for refuges in Alaska, California, and Nevada.

Michael S. Piro - Environmental Scientist III

B.S. Biology/Minor Chemistry
One year of experience at RMCI as an Environmental Scientist.
Twelve years of related experience ranging from Project Management
of RCRA sites to conducting Phase I Real Estate Transaction
Assessments.

USFWS contributors: Jerre Gamble, Refuge Manager; Alice Hanley,
Refuge Operations Specialist; Adam Misztal, Planning Branch; Jaymee
Fojtik, GIS/Mapping; Beverly Boecher, Cover Photo; Barbara Shupe,
Document Layout.

Glossary

Alternative: A set of objectives and strategies needed to achieve refuge goals and the desired future condition.

Biological Diversity: The variety of life forms and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Biotic Community: An assemblage of interrelated plants and animals that together inhabit a defined location.

Compatible Use: A wildlife-dependent recreational use, or any other use on a refuge than would not materially interfere with or detract from the fulfillment of the mission of the Service or the purpose(s) of the refuge.

Comprehensive Conservation Plan (CCP): A document that describes the desired future conditions of the refuge, and specifies management actions to achieve refuge goals and the mission of the National Wildlife Refuge System.

Ecosystem: A dynamic and interrelated complex of plant and animal communities and their associated non-living environment.

Ecosystem Approach: A strategy or plan to protect and restore the natural function, structure, and species composition of an ecosystem, recognizing that all components are interrelated.

Ecosystem Management: Management of an ecosystem that includes all ecological, social, and economic components which make up the whole of the system.

Ecoregion: Ecological region as determined by the Service, but defined by geographic similarities.

Endangered Species: Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.

Environmental Assessment (EA): A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.

Exotic: A plant or animal species not native to the area and introduced intentionally or unintentionally.

Goals: Descriptive statements of desired future conditions.

Habitat: The environment in which a plant or animal naturally occurs, its "living space."

Issue: Any unsettled matter that requires a management decision. For example, a resource management problem, concern, a threat to natural resources, a conflict in uses, or the presence of an undesirable resource condition.

National Wildlife Refuge (NWR): A designated area of land or water or an interest in land or water within the System, including national wildlife refuges, wildlife management areas, waterfowl production areas, and other areas under Service jurisdiction for the protection and conservation of fish and wildlife, and plant resources. A complete listing of all units of the refuge system may be found in the current "Annual Report of Lands Under Control of the U.S. Fish and Wildlife Service."

National Wildlife Refuge System (System): All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife, and plant resources.

No Action Alternative: An alternative under which existing management would be continued.

Non-priority Public Use: Any use other than a compatible wildlife-dependent recreational use.

Objectives: A concise statement of what would be achieved, how much would be achieved, when and where it would be achieved and who is responsible for the work. Objectives are derived from goals and provide the basis for determining management strategies, monitoring refuge accomplishments, and evaluating the success of the strategies. Objectives should be attainable and time specific and should be stated qualitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively; actions to be accomplished to achieve a desired outcome.

Preferred Alternative: The Service's selected alternative identified in the Draft CCP.

Priority Public Use: Compatible wildlife dependent recreational uses (hunting, fishing wildlife observation and photography, environmental education and interpretation) are the priority general public uses of the system and shall receive priority consideration in refuge planning and management.

Proposed Action: The Service proposed action for CCP's is to prepare and implement the CCP.

Public Involvement: The process by which interested and affected individuals, organizations, agencies, and governmental entities participate in the planning and decision making process.

Purpose of the Refuge: The purposes specified in or derived from the law, proclamation executive order, agreement, public land order, donating document, or administrative memorandum establishing, authorizing or expanding a refuge, refuge unit or refuge sub-unit.

Riparian: Of or relating to land lying immediately adjacent to a water body and having specific characteristics of that transitional area, such as riparian vegetation. A stream bank is an example of a riparian area.

Scoping: A process for determining the scope of issues to be addressed by a CCP and for identifying the significant issues. Involved in the scoping process are Federal, state, and local agencies, private organizations, and individuals.

Species: A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Strategies: A general approach or specific actions to achieve objectives.

Threatened Species: Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Vegetation: Plants in general, or the sum total of the plant life in an area.

Vegetation Type: A category of land based on potential or existing dominant plant species of a particular area.

Watershed: The entire land area that collects and drains water into a stream or stream system.

Wetland: Areas such as lakes, marshes, and streams that are inundated by surface or ground water for a long enough period of time each year to support, and do support under natural conditions, plants and animals that require saturated or seasonally saturated soils.

Wildlife-dependent Recreational Use: A use of a refuge that involves hunting, fishing, wildlife observation, and photography, or environmental education and interpretation, as identified in the National Wildlife Refuge System Improvement Act of 1997.

Wildlife Diversity: A measure of the number of wildlife species in an area and their relative abundance.

Abbreviations and Acronyms

CCP	Comprehensive Conservation Plan
Corps	U.S. Army Corps of Engineers
CRM	Cultural Resources Management
EA	Environmental Assessment
GSA	General Services Administration
KAAP	Kansas Army Ammunition Plant
MMS	Maintenance Management System
MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NRCS	Natural Resource Conservation Service
NWR	National Wildlife Refuge
NGO	Non-governmental Organization
ORP	Outdoor Recreation Planner
PIF	Partners-in-Flight
RONs	Refuge Operating Needs System
Service	U.S. Fish and Wildlife Service
System	National Wildlife Refuge System
USDA	U.S. Department of Agriculture

Appendix A.

Flint Hills NWR

Plant List

Plants of Coffey and Lyon Counties, Kansas, USA
 Provided by the KANU Information Management
 Systems

Acanthaceae

Water Willow *Justicia americana*
 Fringed Leaf Ruellia *Ruellia humilis*
 Limestone Ruellia *Ruellia strepens*

Aceraceae

Common Boxelder *Acer negundo* var. *negundo*
 Violet Boxelder *Acer negundo* var. *violaceum*
 Silver Maple *Acer saccharium*

Adiantaceae

Northern Maidenhair Fern *Adiantum pendatum*
 Powdery Cloak Fern *Argyochosma dealbata*
 Purple Cliff-brake *Pellaea atropurpurea*
 Smooth Cliff-brake *Pellaea glabella* ssp. *glabella*

Agavaceae

Limp Soap Weed *Yucca filamentosa*

Alismataceae

Smallflower Water Plantain *Alisma subcordatum*
 Erect Burhead *Echinodorus berterol*
 Creeping Burhead *Echinodorus cordofolius*
 Shortbeak Arrowhead *Sagittaria brevirostra*
 Common Arrowhead *Sagittaria latifolia*

Amaranthaceae

Prostrate Pigweed *Amaranthus blitoides*
 Slender Pigweed *Amaranthus hybridus*
 Palmer's Pigweed *Amaranthus palmeri*
 Rough Pigweed *Amaranthus retroflexus*
 Water Hemp *Amaranthus rudis*
 Spiny Pigweed *Amaranthus spinosus*

Anacardiaceae

Late Aromatic Sumac *Rhus aromatica*
 Dwarf Sumac *Rhus copellinum*
 Smooth Sumac *Rhus glabra*
 Common Poison Ivy *Toxicodendron radicans* ssp. *negundo*
 Rydberg's Poison Ivy *Toxicodendron rydbergii*

Annonaceae

Pawpaw *Asimina triloba*

Apiaceae

Spreading SpERMolepis *Spermolepis innermis*
 Yellow Pimpernel *Taenidia integerrima*
 Hedge Parsley *Torilis arvensis*
 Golden Zizia *Zizia aurea*

Apocynaceae

Hemp Dogbane *Apocynum cannebinum*

Araceae

Green Dragon *Arisaema dracontium*
 Jack-in-the-Pulpit *Arisaema triphyllum* ssp. *triphyllum*
 Virginia Arum *Peltandra virginica*

Asclepiadaceae

Bluntleaf Milkweed *Asclepias amplexicaulus*
 Prairie Milkweed *Asclepias hirtella*
 Swamp Milkweed *Asclepias incarnata*
 Mead's Milkweed *Asclepias meadii*
 Purple Milkweed *Asclepias purpurascens*
 Narrowleaf Milkweed *Asclepias stenophylla*
 Sullivant's Milkweed *Asclepias sullivantii*
 Common Milkweed *Asclepias syriaca*
 Butterfly Milkweed *Asclepias tuberosa* ssp. *interior*
 Whorled Milkweed *Asclepias verticillata*
 Green-flowered Milkweed *Asclepias viridiflora*
 Green Milkweed *Asclepias viridis*
 Climbing Milkweed *Cynanchum laeve*

Aspleniaceae

Ebony Spleenwort *Asplenium platyneuron*
 Walking Fern *Asplenium rhizophyllum*

Asteraceae

Western Yarrow *Achilles millefolium* ssp. *occidentalis*
 Hardheads *Acroptilon repens*
 Common Ragweed *Ambrosia artemisiifolia*
 Lanceleaf Ragweed *Ambrosia bidentata*
 Western Ragweed *Ambrosia psilostachya*
 Giant Ragweed *Ambrosia trifida*
 Annual Broomweed *Amphiachyris dracunculoides*
 Field Pussetoes *Antennaria neglecta*
 Plantainleaf Pussetoes *Antennaria parlinii* ssp. *fallax*
 Camomile *Anthemis cotula*
 Common Burdock *Arctium minus*
Arnoglossum atriplicifolium
Arnoglossum plantagineum
 Mexican Sagewort *Artemisia ludoviciana* ssp. *mexicana*
 Drummond's Aster *Aster drummondii* ssp. *drummondii*
 Heath Aster *Aster ericoides* ssp. *ericoides* var. *ericoides*
 Smooth Blue Aster *Aster laevis*
 Common Panicked Aster *Aster lanceolatus* ssp. *lanceolatus*
 Simple Panicked Aster *Aster lanceolatus* ssp. *simplex*
 New England Aster *Aster novae-angliae*
 Aromatic Aster *Aster oblongifolius* var. *oblongifolius*
 Azure Aster *Aster oolentangiensis*
 Small-headed Aster *Aster parviceps*
 Slender Spreading Aster *Aster patens* var. *gracilis*
 Hairy Aster *Aster pilosus* ssp. *demotus*
 Hairy Aster *Aster pilosus* ssp. *pilosus*
 Common Yellow-leaved Aster *Aster praealtus* var. *praealtus*

Aster sericeus
Aster subulatus var. *ligulatus*
 Tickseed Beggartick *Bidens aristosa* var. *retrorsa*
 Spanish Needles *Bidens bipinnata*
 Nodding Beggartick *Bidens cernua*
 Leafybract Beggartick *Bidens comosa*
 Devil's Beggartick *Bidens frondosa*
 Tall Beggartick *Bidens vulgata* greene
 Violet Boltonia *Boltonia asteroides* var. *latisquama*
 False Boneset *Brickellia eupatorioides* var. *corymbulosa*
 Musk Thistle *Carduus nutans* ssp. *leiophyllus*
 Ox-eye Daisy *Chrysanthemum leucanthemum*
 Common Chicory *Cichorium intybus*
 Tall Thistle *Cirsium altissimum*
 Canada Thistle *Cirsium arvense*
 Wavyleaf Thistle *Cirsium undulatum*
 Bull Thistle *Cirsium vulgare*
 Canada Horseweed *Conyza canadensis*
 Lawn Horseweed *Conyza ramosissima*
 Bigflower Coreopsis *Coreopsis grandiflora*
 Finger Coreopsis *Coreopsis palmata*
 Foetid Dogweed *Dyssodia papposa*
 Coneflower spp. *Echinacea atrorubens*
 Pale Purple Coneflower *Echinacea pallida*

Yerba de Tajo	<i>Eclipta prostrata</i>		
Annual Fleabane	<i>Erigeron annuus</i>		
Philadelphia Fleabane	<i>Erigeron philadelphicus</i>		
Daisy Fleabane	<i>Erigeron strigosus</i>		
Tall Joe-pye-weed	<i>Eupatorium altissimum</i>		
Boneset	<i>Eupatorium perfoliatum</i>		
Holzinger's Joe-pye-weed	<i>Eupatorium purpureum var. holzingeri</i>		
White Snakeroot	<i>Eupatorium rugosum</i>		
Late Eupatorium	<i>Eupatorium serotinum</i>		
Viscid Euthamia	<i>Euthamia gymnospermoides</i>		
Fringed Quickweed	<i>Galinsoga quadriradiata</i>		
Fragrant Cudweed	<i>Gnaphalium obtusifolium</i>		
Common Sneezeweed	<i>Helenium autumnale</i>		
Sunflower spp.	<i>Helianthus X laetiflorus</i>		
Common Sunflower	<i>Helianthus annuus</i>		
Sawtooth Sunflower	<i>Helianthus grosseserratus</i>		
Maximilian's Sunflower	<i>Helianthus maximiliani</i>		
Ashy Sunflower	<i>Helianthus mollis</i>		
Stiff Sunflower	<i>Helianthus pauciflorus var. pauciflorus</i>		
Willowleaf Sunflower	<i>Helianthus salicifolius</i>		
Jerusalem Artichoke	<i>Helianthus tuberosus</i>		
Longbeard Hawkweed	<i>Hieracium longipilum</i>		
Flattop Hymenopappus	<i>Hymenopappus scabiosaeus var. corymbosus</i>		
Annual Sumpweed	<i>Iva annua</i>		
Common Dwarf Dandelion	<i>Krigia cespitosa</i>		
Canada Lettuce	<i>Lactuca canadensis</i>		
Florida Lettuce	<i>Lactuca floridana</i>		
Louisiana lettuce	<i>Lactuca ludoviciana</i>		
Willowleaf Lettuce	<i>Lactuca saligna</i>		
Prickly Lettuce	<i>Lactuca scariola</i>		
Rough Gayfeather	<i>Liatris aspera</i>		
Dotted Gayfeather	<i>Liatris punctata</i>		
Thickspike Gayfeather	<i>Liatris pycnostachya</i>		
Hairy Gayfeather	<i>Liatris squarrosa var. hirsuta</i>		
Plains Groundsel	<i>Packera plattensis</i>		
Carolina False Dandelion	<i>Pyrrhopappus carolinianus</i>		
Yellow Prairie Coneflower	<i>Ratibida columnifera</i>		
Grayhead Prairie Coneflower	<i>Ratibida pinnata</i>		
Black-eyed Susan	<i>Rudbeckia hirta var. pulcherrima</i>		
Cutleaf Coneflower	<i>Rudbeckia laciniata</i>		
Sweet Coneflower	<i>Rudbeckia subtomentosa</i>		
Brown-eyed Susan	<i>Rudbeckia triloba</i>		
Compass Plant	<i>Silphium laciniatum</i>		
Cup Plant	<i>Silphium perfoliatum</i>		
Giant Goldenrod	<i>Solidago gigantea var. serotina</i>		
Missouri Goldenrod	<i>Solidago missouriensis var. fasciculata</i>		
Gray Goldenrod	<i>Solidago nemoralis var. longipetiolata</i>		
Stiff Goldenrod	<i>Solidago rigida var. rigida</i>		
Elm-leaved Goldenrod	<i>Solidago ulmifolia var. microphylla</i>		
Prickly Sowthistle	<i>Sonchus asper</i>		
Common Dandelion	<i>Taraxacum officinale</i>		
Western Salsify	<i>Tragopogon dubius</i>		
Wingstem Crownbeard	<i>Verbesina alternifolia</i>		
Arkansas Ironweed	<i>Vernonia arkansana</i>		
Inland Ironweed	<i>Vernonia baldwinii ssp. interior</i>		
Common Cocklebur	<i>Xanthium strumarium</i>		
Azollaceae			
Mexican Mosquito Fern	<i>Azolla mexicana</i>		
Balsaminaceae			
Spotted Touch-me-not	<i>Impatiens capensis</i>		
Pale Touch-me-not	<i>Impatiens pallida</i>		
Berberidaceae			
May-apple	<i>Podophyllum peltatum</i>		
Bignoniaceae			
Trumpet Creeper		<i>Campsis radicans</i>	
Catalpa		<i>Catalpa speciosa</i>	
Boraginaceae			
Pasture Heliotrope		<i>Heliotropium tenellum.</i>	
Corn Gromwell		<i>Lithospermum arvense</i>	
Hoary Gromwell		<i>Lithospermum canescens</i>	
Narrowleaf Gromwell		<i>Lithospermum incisum</i>	
Virginia Forget-me-not		<i>Myosotis verna</i>	
Western Marbleseed		<i>Onosmodium bejariense var. occidentale</i>	
Brassicaceae			
Canada Rockcress		<i>Arabis canadensis</i>	
Winter Cress		<i>Barbarea vulgaris</i>	
Small-seeded False Flax		<i>Camelina microcarpa</i>	
Shepherd's Purse		<i>Capsella bursa-pastoris</i>	
Toothwort		<i>Cardamine concatenata</i>	
Small-flowered Bittercress		<i>Cardamine parviflora var. arenicola</i>	
Blue Mustard		<i>Chorispura tenella</i>	
Tansy Mustard	<i>Descurainia pinnata var. brachycarpa</i>		
Shortpod Draba		<i>Draba brachycarpa</i>	
Wedgeleaf Draba		<i>Draba cuneifolia</i>	
Bushy Wallflower		<i>Erysimum repandum</i>	
Peppergrass		<i>Lepidium densiflorum</i>	
Veiny Pepperweed		<i>Lepidium oblongum</i>	
Spreading Bladderpod	<i>Lesquerella gracilis ssp. nuttallii</i>		
Stalkless Yellowcress		<i>Rorippa sessiliflora</i>	
Spreading Yellowcress		<i>Rorippa sinuata</i>	
Virginia Rockcress		<i>Sibara virginica</i>	
Wild Mustard		<i>Sinapis arvensis</i>	
Pennycress		<i>Thlaspi arvense</i>	
Thorwort Pennycress		<i>Thlaspi perfoliatum</i>	
Cactaceae			
Prickly-pear		<i>Opuntia humifusa</i>	
Bigroot Prickly-pear		<i>Opuntia macrorhiza</i>	
Callitrichaceae			
		<i>Callitriche heterophylla</i>	
Campanulaceae			
American Bellflower		<i>Campanula americana</i>	
Cardinal Flower		<i>Lobelia cardinalis</i>	
Indian Tobacco		<i>Lobelia inflata</i>	
Blue Lobelia		<i>Lobelia siphilitica</i>	
Palespike Lobelia		<i>Lobelia spicata</i>	
		<i>Triodanis holzingeri</i>	
Slimpod Venus' Looking Glass		<i>Triodanis leptocarpa</i>	
Venus' Looking Glass		<i>Triodanis perfoliata</i>	
Cannabaceae			
Japanese Hops		<i>Humulus japonicus</i>	
Capparaceae			
Clammyweed	<i>Polanisia dodecandra ssp. trachysperma</i>		
Caprifoliaceae			
Common Elderberry		<i>Sambucus canadensis</i>	
Buckbrush		<i>Symphoricarpos orbiculatus</i>	
Common Horsegentian		<i>Triosteum perfoliatum var. perfoliatum</i>	
Rusty Blackhaw		<i>Viburnum rufidulum</i>	

Caryophyllaceae

Thyme-leaved Sandwort	<i>Arenaria serpyllifolia</i>
Shortstalk Cerastium	<i>Cerastium brachypodum</i>
Big Chickweed	<i>Cerastium fontanum ssp. vulgare</i>
Deptford Pink	<i>Dianthus armeria</i>
Jagged Chickweed	<i>Holosteum umbellatum</i>
Canada nailwort	<i>Paronychia canadensis</i>
Sleepy Catchfly	<i>Silene antirrhina</i>
Starry Campion	<i>Silene stellata</i>
Chickweed	<i>Stellaria media</i>

Celastraceae

American Bittersweet	<i>Celastrus scandens</i>
Wahoo	<i>Evonymus atropurpurea</i>

Ceratophyllaceae

Common Hornwort	<i>Ceratophyllum demersum</i>
Prickly Hornwort	<i>Ceratophyllum echinatum</i>

Chenopodiaceae

Mexican Tea	<i>Chenopodium ambrosioides</i>
Pitseed Goosefoot	<i>Chenopodium berlandieri var. zschackii</i>
Missouri Goosefoot	<i>Chenopodium missouriense</i>
Maple-leaved Goosefoot	<i>Chenopodium simplex</i>
Standley's Goosefoot	<i>Chenopodium standleyanum</i>
Winged Pigweed	<i>Cycloloma atriplicifolium</i>
Summer Cypress	<i>Kochia scoparia</i>
Nuttall's Povertyweed	<i>Monolepis nuttalliana</i>
Russian Thistle	<i>Salsola iberica</i>

Clusiaceae

Nits-and-lice	<i>Hypericum drummondii</i>
Common St. John's-wort	<i>Hypericum perforatum</i>
Round-fruit St. John's-wort	<i>Hypericum sphaerocarpum</i>

Commelinaceae

Creeping Dayflower	<i>Commelina diffusa</i>
Narrowleaf Dayflower	<i>Commelina erecta var. angustifolia</i>
Erect Dayflower	<i>Commelina erecta var. erecta</i>
Bracted Spiderwort	<i>Tradescantia bracteata</i>
Ohio Spiderwort	<i>Tradescantia ohiensis</i>

Convolvulaceae

Macoun's Bindweed	<i>Calystegia macounii</i>
Hedge Bindweed	<i>Calystegia sepium var. angulata</i>
Hedge Bindweed	<i>Calystegia silvatica ssp. fraterniflora</i>
Field Bindweed	<i>Convolvulus arvensis</i>
Red Morning-glory	<i>Ipomoea coccinea</i>
Ivy-leaf Morning-glory	<i>Ipomoea hederacea</i>
White Morning-glory	<i>Ipomoea lacunosa</i>
Bigroot Morning-glory	<i>Ipomoea pandurata</i>
Common Morning-glory	<i>Ipomoea purpurea</i>
Shumard's Morning-glory	<i>Ipomoea shumardiana</i>

Cornaceae

Pale Dogwood	<i>Cornus amomum ssp. obliqua</i>
Roughleaf Dogwood	<i>Cornus drummondii</i>

Crassulaceae

Ditch Stonecrop	<i>Penthorum sedoides</i>
Showy Stonecrop	<i>Sedum pulchellum</i>

Cucurbitaceae

Buffalo Gourd	<i>Cucurbita foetidissima</i>
Wild Cucumber	<i>Echinocystis lobata</i>
Bur Cucumber	<i>Sicyos angulatus</i>

Cupressaceae

Eastern Red-cedar	<i>Juniperus virginiana var. virginiana</i>
-------------------	---

Cuscutaceae

Hazel Dodder	<i>Cuscuta coryli</i>
Cluster Dodder	<i>Cuscuta glomerata</i>
Field Dodder	<i>Cuscuta pentagona var. pentagona</i>

Cyperaceae

Yellowfruit Sedge	<i>Carex annectens var. annectens</i>
Yellowfruit Sedge	<i>Carex annectens var. xanthocarpa</i>
Southern Sedge	<i>Carex australis</i>
Bicknell's Sedge	<i>Carex bicknellii var. bicknellii</i>
Woodland Sedge	<i>Carex blanda</i>
Straw Sedge	<i>Carex brevior</i>
Bush's Sedge	<i>Carex bushii</i>
Crowfoot Sedge	<i>Carex crus-corvi</i>
Frank's Sedge	<i>Carex frankii</i>
Heavy Sedge	<i>Carex gravida</i>
Heavy Sedge	<i>Carex gravida var. gravida</i>
Eastern Narrowleaf Sedge	<i>Carex grisea</i>
Bottlebrush Sedge	<i>Carex hystericina</i>
Sun Sedge	<i>Carex inops ssp. heliophila</i>
Mead's Sedge	<i>Carex meadii</i>
Littletooth Sedge	<i>Carex microdonta</i>
Woolly Sedge	<i>Carex pellita</i>
Fox Sedge	<i>Carex vulpinoidea</i>
Tapleaf Sedge	<i>Cyperus acuminatus</i>
Globe Flatsedge	<i>Cyperus echinatus</i>
Redroot Flatsedge	<i>Cyperus erythrorhizos</i>
Yellow Nutsedge	<i>Cyperus esculentus</i>
Great Plains Flatsedge	<i>Cyperus lupulinus</i>
Slender Flatsedge	<i>Cyperus odoratus</i>
Lean Flatsedge	<i>Cyperus setigerus</i>
Awned Flatsedge	<i>Cyperus squarrosus</i>
False Nutsedge	<i>Cyperus strigosus</i>
Flatstem Spikesedge	<i>Eleocharis compressa</i>
Longstem Spikesedge	<i>Eleocharis macrostachya</i>
Blunt Spikesedge	<i>Eleocharis obtusa var. detonsa</i>
Blunt Spikesedge	<i>Eleocharis obtusa var. obtusa</i>
Squarestem Spikesedge	<i>Eleocharis quadrangulata</i>
Small's Spikesedge	<i>Eleocharis smallii</i>

Eleocharis xyridiformis

Slender Fimbristylis	<i>Fimbristylis autumnalis</i>
Hairy Fimbristylis	<i>Fimbristylis puberula var. puberula</i>
Harvey's Beakrush	<i>Rhynchospora harveyi</i>
Bigstem Beakrush	<i>Rhynchospora macrostachya</i>
Hardstem Bulrush	<i>Schoenoplectus acutus var. acutus</i>
Slender Bulrush	<i>Schoenoplectus heterochaetus</i>
Softstem Bulrush	<i>Schoenoplectus tabernaemontani ssp. validus</i>

Green Bulrush	<i>Scirpus atrovirens</i>
Pale Bulrush	<i>Scirpus pallidus</i>
Rusty Bulrush	<i>Scirpus pendulus</i>
Fringed Razorsedge	<i>Scleria ciliata var. ciliata</i>
Fewflower Nutrush	<i>Scleria pauciflora var. pauciflora</i>
Whip Razorsedge	<i>Scleria triglomerata</i>

Dipsacaceae

Fuller's Teasel	<i>Dipsacus fullonum</i>
-----------------	--------------------------

Dryopteridaceae

Mackay's Brittle Fern	<i>Cystopteris tenuis</i>
Marginal Wood Fern	<i>Dryopteris marginalis</i>

Equisetaceae

Smooth Scouring Rush	<i>Equisetum laevigatum</i>
----------------------	-----------------------------

Euphorbiaceae

Slender Threeseed Mercury	<i>Acalypha monococca</i>
Rough-pod Copperleaf	<i>Acalypha ostryifolia</i>
Rhombic Copperleaf	<i>Acalypha rhomboidea</i>
Virginia Copperleaf	<i>Acalypha virginica</i>
Spotted Spurge	<i>Chamaesyce maculata</i>
Prairie Sandmat	<i>Chamaesyce missurica</i> var. <i>intermedia</i>
Eyebane	<i>Chamaesyce nutans</i>
Prostrate Spurge	<i>Chamaesyce prostrata</i>
Round-leaved Spurge	<i>Chamaesyce serpens</i>
Mat Spurge	<i>Chamaesyce stictospora</i>
Woolly Croton	<i>Croton capitatus</i> var. <i>capitatus</i>
Tropic Croton	<i>Croton glandulosus</i> var. <i>septentrionalis</i>
One-seeded Croton	<i>Croton monanthogynus</i>
Flowering Spurge	<i>Euphorbia corollata</i>
Painted Spurge	<i>Euphorbia cyathophora</i>
	<i>Euphorbia davidii</i>
Toothed Spurge	<i>Euphorbia dentata</i>
Six-angled Spurge	<i>Euphorbia hexagona</i>
Snow-on-the-mountain	<i>Euphorbia marginata</i>
Warty Spurge	<i>Euphorbia spathulata</i>
Nettleleaf Noseburn	<i>Tragia betonicifolia</i>
Stalked Noseburn	<i>Tragia ramosa</i>

Fabaceae

Lead Plant	<i>Amorpha canescens</i>
False Indigo	<i>Amorpha fruticosa</i>
Hog Peanut	<i>Amphicarpaea bracteata</i>
American Potato Bean	<i>Apios americana</i> Medik
Common Ground-plum	<i>Astragalus crassicaarpus</i> var. <i>crassicaarpus</i>
Ozark Milk-vetch	<i>Astragalus distortus</i> var. <i>distortus</i>
Platte River Milk-vetch	<i>Astragalus plattensis</i>
White Wild Indigo	<i>Baptisia alba</i> var. <i>macrophylla</i>
Blue False Indigo	<i>Baptisia australis</i> var. <i>minor</i>
Plains Wild Indigo	<i>Baptisia bracteata</i> var. <i>leucophaea</i>
Redbud	<i>Cercis canadensis</i>
Showy Partridge Pea	<i>Chamaecrista fasciculata</i>
Sensitive Partridge Pea	<i>Chamaecrista nictitans</i> ssp. <i>nictitans</i> var. <i>nictitans</i>
Crown Vetch	<i>Coronilla varia</i>
Rattlebox	<i>Crotalaria sagittalis</i>
White Prairie-clover	<i>Dalea candida</i> var. <i>candida</i>
Roundhead Prairie-clover	<i>Dalea multiflora</i>
Purple Prairie-clover	<i>Dalea purpurea</i> var. <i>purpurea</i>
Illinois Bundleflower	<i>Desmanthus illinoensis</i>
Canada Tickclover	<i>Desmodium canadense</i>
Hoary Tickclover	<i>Desmodium canescens</i>
Large-flowered Tickclover	<i>Desmodium glutinosum</i>
Illinois Tickclover	<i>Desmodium illinoense</i>
	<i>Desmodium perplexum</i>
Sessile-leaf Tickclover	<i>Desmodium sessilifolium</i>
Honey Locust	<i>Gleditsia triacanthos</i>
Wild Licorice	<i>Glycyrrhiza lepidota</i>
Kentucky Coffee-tree	<i>Gymnocladus dioica</i>
Korean Clover	<i>Kummerowia stipulacea</i>
Everlasting Pea	<i>Lathyrus latifolius</i>
Round-head Lespedeza	<i>Lespedeza capitata</i>
Sericea Lespedeza	<i>Lespedeza cuneata</i>
Prairie Lespedeza	<i>Lespedeza violacea</i>
Black Medick	<i>Medicago lupulina</i>
Alfalfa	<i>Medicago sativa</i> ssp. <i>sativa</i>
White Sweet Clover	<i>Melilotus albus</i>
Yellow Sweet Clover	<i>Melilotus officinalis</i>
Catclaw Sensitive Brier	<i>Mimosa quadrivalvis</i> var. <i>nuttallii</i> Barneby
Silverleaf Scurfpea	<i>Pediomelum argophyllum</i>
Prairie Turnip	<i>Pediomelum esculentum</i>
Many-flowered Scurfpea	<i>Psoralidium tenuiflorum</i>
Bristly Locust	<i>Robinia hispida</i>
Black Locust	<i>Robinia pseudoacacia</i>
Maryland Senna	<i>Senna marilandica</i>

Wild Bean	<i>Strophostyles helvula</i>
Slick-seed Bean	<i>Strophostyles leiosperma</i>
Goat's Rue	<i>Tephrosia virginiana</i>
Low Hop Clover	<i>Trifolium campestre</i>
Alsike Clover	<i>Trifolium hybridum</i>
Alsike Clover	<i>Trifolium hybridum</i> ssp. <i>elegans</i>
Red Clover	<i>Trifolium pratense</i>
White Clover	<i>Trifolium repens</i>
Hairy Vetch	<i>Vicia villosa</i> var. <i>villosa</i>

Fagaceae

Bur Oak	<i>Quercus macrocarpa</i>
Chinquapin Oak	<i>Quercus muehlenbergii</i> Engelm
Red Oak	<i>Quercus rubra</i>
Shumard's Oak	<i>Quercus shumardii</i>
Black Oak	<i>Quercus velutina</i>

Fumariaceae

Slender Fumewort	<i>Corydalis micrantha</i> ssp. <i>micrantha</i>
Dutchman's Breeches	<i>Dicentra cucullaria</i>

Gentianaceae

Downy Gentian	<i>Gentiana puberulenta</i>
---------------	-----------------------------

Geraniaceae

Filaree	<i>Erodium cicutarium</i>
Carolina Cranesbill	<i>Geranium carolinianum</i>
Small Cranesbill	<i>Geranium pusillum</i>

Grossulariaceae

Missouri Gooseberry	<i>Ribes missouriense</i>
---------------------	---------------------------

Haloragaceae

Green Parrot's Feather	<i>Myriophyllum pinnatum</i>
------------------------	------------------------------

Hippocastanaceae

Western Buckeye	<i>Aesculus glabra</i> var. <i>arguta</i>
-----------------	---

Hydrophyllaceae

Waterpod	<i>Ellisia nyctelea</i>
Virginia Waterleaf	<i>Hydrophyllum virginianum</i>

Iridaceae

Prairie Blue-eyed Grass	<i>Sisyrinchium campestre</i>
-------------------------	-------------------------------

Juglandaceae

Bitternut Hickory	<i>Carya cordiformis</i>
Pecan	<i>Carya illinoensis</i>
Kingnut Hickory	<i>Carya laciniosa</i>
Shagbark Hickory	<i>Carya ovata</i>
Mockernut Hickory	<i>Carya tomentosa</i>
Black Walnut	<i>Juglans nigra</i>

Juncaceae

Dudley's Rush	<i>Juncus dudleyi</i>
Inland Rush	<i>Juncus interior</i>
Shore Rush	<i>Juncus marginatus</i>
Torrey's Rush	<i>Juncus torreyi</i>

Lamiaceae

Catnip	<i>Agastache nepetoides</i>
Giant Hyssop	<i>Hedeoma hispida</i>
Rough False Pennyroyal	<i>Hedeoma pulegioides</i>
American False Pennyroyal	<i>Lamium amplexicaule</i>
Henbit	<i>Lamium purpureum</i>
Deadnettle	<i>Lycopus americanus</i>
American Bugleweed	<i>Marrubium vulgare</i>
Common Horehound	<i>Mentha arvensis</i>
Field Mint	<i>Monarda citriodora</i>
Lemon Beebalm	<i>Monarda fistulosa</i> var. <i>fistulosa</i>
Wild Bergamot	<i>Nepeta cataria</i>
Catnip	<i>Physostegia angustifolia</i>
False Dragonhead	<i>Prunella vulgaris</i>
Self-heal	<i>Pycnanthemum tenuifolium</i>
Slender Mountain Mint	<i>Salvia azurea</i>
Blue Sage	<i>Salvia reflexa</i>
Lanceleaf Sage	<i>Scutellaria lateriflora</i>
Sideflower Skullcap	<i>Scutellaria parvula</i> var. <i>leonardii</i>
Leonard's Small Skullcap	<i>Stachys tenuifolia</i>
Slenderleaf Betony	<i>Teucrium canadense</i> var. <i>canadense</i>
American Germander	<i>Teucrium canadense</i> var. <i>occidentale</i>
Northern Germander	<i>Trichostema brachiatum</i>
False Pennyroyal	

Lemnaceae

Lesser Duckweed	<i>Lemna aequinoctialis</i>
Minute Duckweed	<i>Lemna minor</i>
Greater Duckweed	<i>Lemna perpusilla</i>
	<i>Spirodela polyrrhiza</i>

Lentibulariaceae

Common Bladderwort	<i>Utricularia macrorhiza</i>
--------------------	-------------------------------

Liliaceae

Canada Wild Onion	<i>Allium canadense</i> var. <i>canadense</i>
Lavender Wild Onion	<i>Allium canadense</i> var. <i>lavandulare</i>
Wild Onion	<i>Allium sativum</i>
Pink Wild Onion	<i>Allium stellatum</i>
Field Garlic	<i>Allium vineale</i>
Asparagus	<i>Asparagus officinalis</i>
Wild Hyacinth	<i>Camassia angusta</i>
Wild Hyacinth	<i>Camassia scilloides</i>
White Dogtooth Violet	<i>Erythronium albidum</i>
Prairie Dogtooth Violet	<i>Erythronium mesochoreum</i>
Day Lily	<i>Hemerocallis fulva</i>
Yellow Star Grass	<i>Hypoxis hirsuta</i>
Michigan Lily	<i>Lilium canadense</i> ssp. <i>michiganense</i>
Feathery False Solomon's Seal	<i>Maianthemum racemosum</i>
False Garlic	<i>Nothoscordum bivalve</i>
Solomon's Seal	<i>Polygonatum biflorum</i>
Nuttall's Death Camas	<i>Zigadenus nuttallii</i>

Linaceae

Grooved Flax	<i>Linum sulcatum</i>
--------------	-----------------------

Loasaceae

Stickleaf Mentzelia	<i>Mentzelia oligosperma</i>
---------------------	------------------------------

Lythraceae

E arleaf Ammannia	<i>Ammannia auriculata</i>
Red Ammannia	<i>Ammannia coccinea</i>
Winged Loosestrife	<i>Lythrum alatum</i>
California Loosestrife	<i>Lythrum californicum</i>
Rotala	<i>Rotala ramosior</i>

Malvaceae

Velvet-leaf	<i>Abutilon theophrasti</i>
Pale Poppy Mallow	<i>Callirhoe alcaeoides</i>
Purple Poppy Mallow	<i>Callirhoe involucrata</i>
Flower-of-an-hour	<i>Hibiscus trionum</i>
Hairy False Mallow	<i>Malvastrum hispidum</i>
Prickly Sida	<i>Sida spinosa</i>

Menispermaceae

Moonseed	<i>Menispermum canadense</i>
Carolina Snailseed	<i>Cocculus carolinus</i>

Molluginaceae

Carpetweed	<i>Mollugo verticillata</i>
------------	-----------------------------

Monotropaceae

Indian Pipe	<i>Monotropa uniflora</i>
-------------	---------------------------

Moraceae

Osage Orange	<i>Maclura pomifera</i>
White Mulberry	<i>Morus alba</i>
Red Mulberry	<i>Morus rubra</i>

Najadaceae

Southern Naiad	<i>Najas guadalupensis</i>
----------------	----------------------------

Nelumbonaceae

American Lotus	<i>Nelumbo lutea</i>
----------------	----------------------

Nyctaginaceae

White Four-o'clock	<i>Mirabilis albidia</i>
Narrowleaf Four-o'clock	<i>Mirabilis linearis</i>
Wild Four-o'clock	<i>Mirabilis nyctaginea</i>

Oleaceae

Green Ash	<i>Fraxinus pennsylvanica</i> var. <i>subintegerrima</i>
-----------	--

Onagraceae

Plains Yellow Evening Primrose	<i>Calylophus serrulatus</i>
Enchanter's Nightshade	<i>Circaea lutetiana</i> ssp. <i>canadensis</i>
Biennial Gaura	<i>Gaura longiflora</i>
Velvety Gaura	<i>Gaura parviflora</i>
Bush Seedbox	<i>Ludwigia alternifolia</i> var. <i>pubescens</i>
Water Purslane	<i>Ludwigia palustris</i>
Marsh Seedbox	<i>Ludwigia peploides</i> ssp. <i>glabrescens</i>
Many-seeded Seedbox	<i>Ludwigia polycarpa</i>
Cutleaf Evening Primrose	<i>Oenothera laciniata</i>
Narrow-leaved Evening Primrose	<i>Oenothera linifolia</i>
Missouri Evening Primrose	<i>Oenothera macrocarpa</i> ssp. <i>macrocarpa</i>
White Evening Primrose	<i>Oenothera speciosa</i>
Common Evening Primrose	<i>Oenothera villosa</i> ssp. <i>villosa</i>
Stenosiphon	<i>Stenosiphon linifolius</i>

Ophloglossaceae

Dissected Grape Fern	<i>Botrychium dissectum</i>
Rattlesnake Fern	<i>Botrychium virginianum</i>
Limestone Adder's-tongue	<i>Ophioglossum engelmannii</i>

Orchidaceae

Putty Root	<i>Aplectrum hyemale</i>
Late Coralroot	<i>Corallorrhiza odontorhiza</i>
Western Prairie Fringed Orchid	<i>Platanthera praeclara</i>
Nodding Ladies'-tresses	<i>Spiranthes cernua</i>
Slender Ladies'-tresses	<i>Spiranthes lacera</i>
Great Plains Ladies'-tresses	<i>Spiranthes magnicamporum</i>
Little Ladies'-tresses	<i>Spiranthes tuberosa</i>
Upland Ladies'-tresses	<i>Spiranthes vernalis</i>

Oxalidaceae

Green Wood Sorrel *Oxalis dillenii*
 Common Wood Sorrel *Oxalis stricta*
 Violet Wood Sorrel *Oxalis violacea*

Phytolaccaceae

Pokeweed *Phytolacca americana* var. *americana*

Plantaginaceae

Bottlebrush Plantain *Plantago aristata*
 English Plantain *Plantago lanceolata*
 Tiny Plantain *Plantago pusilla*
 Red-seeded Plantain *Plantago rhodosperma*
 Rugel's Plantain *Plantago rugelii*
 Pale-seeded Plantain *Plantago virginica*

Platanaceae

Sycamore *Platanus occidentalis*

Poaceae

Jointed Goatgrass *Aegilops cylindrica*
 Jointed Goatgrass *Aegilops cylindrica* x *Triticum aestivum*

Awned Bentgrass *Agrostis elliottiana*
 Winter Bentgrass *Agrostis hyemalis* var. *hyemalis*
 Autumn Bentgrass *Agrostis perennans*
 Redtop *Agrostis stolonifera*
 Carolina Foxtail *Alopecurus carolinianus*
 Big Bluestem *Andropogon gerardii*
 Broomsedge Bluestem *Andropogon virginicus*
 Slimspike Threeawn *Aristida longespica* var. *geniculata*
 Slimspike Threeawn *Aristida longespica* var. *longespica*
 Prairie Threeawn *Aristida oligantha*
 Caucasian Bluestem *Bothriochloa bladhii*
 Silver Bluestem *Bothriochloa laguroides* ssp. *torreyana*
 Side-oats Grama *Bouteloua curtipendula*
 Hairy Grama *Bouteloua hirsuta*
 Hairy Chess *Bromus commutatus*
 Smooth Brome *Bromus inermis* ssp. *inermis*
 Japanese Brome *Bromus japonicus*
 Canada Brome *Bromus pubescens*
 Rye Brome *Bromus secalinus*
 Downy Brome *Bromus tectorum*
 Buffalograss *Buchloe dactyloides*
 Longspine Sandbur *Cenchrus longispinus*
 Sea Oats *Chasmanthium latifolium*
 Windmillgrass *Chloris verticillata*
 Stout Woodreed *Cinna arundinacea*
 Bermudagrass *Cynodon dactylon*
 Orchardgrass *Dactylis glomerata*
 American Beakgrass *Diarrhena americana*
 American Beakgrass *Diarrhena obovata*
 Pointed Dichanthelium *Dichanthelium acuminatum* var. *implicatum*
 Hairy Dichanthelium *Dichanthelium acuminatum* var. *villosum*
 Slimleaf Dichanthelium *Dichanthelium linearifolium*
 Scribner's Dichanthelium *Dichanthelium oligosanthes* var. *scribnerianum*
 Roundseed Dichanthelium *Dichanthelium sphaerocarpon*
 Southern Crabgrass *Digitaria ciliaris*
 Fall Witchgrass *Digitaria cognata* var. *cognata*
 Smooth Crabgrass *Digitaria ischaemum*
 Hairy Crabgrass *Digitaria sanguinalis*
 Jungle-rice *Echinochloa colona*
 Common Barnyardgrass *Echinochloa crus-galli* var. *crus-galli*

Prickly Barnyardgrass *Echinochloa muricata* var. *muricata*
 Goosegrass *Eleusine indica*
 Canada Wildrye *Elymus canadensis*
 Bottlebrushgrass *Elymus hystrix*

Hairy Wildrye *Elymus villosus*
 Virginia Wildrye *Elymus virginicus* var. *jejunus*
 Virginia Wildrye *Elymus virginicus* var. *virginicus*
 Stinkgrass *Eragrostis cilianensis*
 Carolina Lovegrass *Eragrostis pectinacea* var. *miserrima*
 Carolina Lovegrass *Eragrostis pectinacea* var. *pectinacea*
 Purple Lovegrass *Eragrostis spectabilis*
 Prairie Cupgrass *Eriochloa contracta*
 Tall Fescue *Festuca arundinacea*
 Fowl Mannagrass *Glyceria striata*
 Foxtail Barley *Hordeum jubatum*
 Little Barley *Hordeum pusillum*
 Junegrass *Koeleria macrantha*
 Rice Cutgrass *Leersia oryzoides*
 Whitegrass *Leersia virginica*
 Bearded Sprangletop *Leptochloa fascicularis*
 Red Sprangletop *Leptochloa mucronata*
 Perennial Ryegrass *Lolium perenne* var. *perenne*
 Bush's Muhly *Muhlenbergia bushii*
 Wirestem Muhly *Muhlenbergia frondosa*
 Nimblewill *Muhlenbergia schreberi*
 Rock Muhly *Muhlenbergia sobolifera*
 Forest Muhly *Muhlenbergia sylvatica*
 Creeping Lovegrass *Neeragrostis reptans*
 Common Witchgrass *Panicum capillare* var. *brevifolium*
 Common Witchgrass *Panicum capillare* var. *capillare*
 Fall Panicum *Panicum dichotomiflorum*
 Switchgrass *Panicum virgatum*
 Western Wheatgrass *Pascopyrum smithii*
 Florida Paspalum *Paspalum floridanum* var. *glabratum*
 Smoothseed Paspalum *Paspalum pubiflorum* var. *glabrum*
 Thin Paspalum *Paspalum setaceum* var. *muhlenbergii*
 Thin Paspalum *Paspalum setaceum* var. *stramineum*
 Reed Canarygrass *Phalaris arundinacea*
 Carolina Canarygrass *Phalaris caroliniana*
 Timothy *Phleum pratense*
 Annual Bluegrass *Poa annua*
 Canada Bluegrass *Poa compressa*
 Kentucky Bluegrass *Poa pratensis*
 Tumblegrass *Schedonnardus paniculatus*
 Little Bluestem *Schizachyrium scoparium*
 Hardgrass *Sclerochloa dura*
 Chinese Foxtail *Setaria faberi*
 Knotroot Bristlegrass *Setaria parviflora*
 Yellow Foxtail *Setaria pumila*
 Green Foxtail *Setaria viridis*
 Indiangrass *Sorghastrum nutans*
 Johnsongrass *Sorghum halepense*
 Prairie Cordgrass *Spartina pectinata*
 Prairie Wedgegrass *Sphenopholis obtusata* var. *obtusata*
 Rough Dropseed *Sporobolus asper* var. *asper*
 Drummond's Dropseed *Sporobolus asper* var. *drummondii*
 Sand Dropseed *Sporobolus cryptandrus*
 Puffsheath Dropseed *Sporobolus neglectus*
 Whorled Dropseed *Sporobolus pyramidatus*
 Povertygrass *Sporobolus vaginiflorus*
 Porcupinegrass *Stipa spartea*
 Purpletop *Tridens flavus*
 Eastern Gramagrass *Tripsacum dactyloides* var. *dactyloides*
 Sixweeks Fescue *Vulpia octoflora*

Polemoniaceae

Sweet William Phlox *Phlox divaricata* ssp. *laphamii*
 Downy Phlox *Phlox pilosa* ssp. *fulgida*

Polygalaceae

Slender Milkwort *Polygala incarnata*
 Blood Milkwort *Polygala sanguinea*
 Whorled Milkwort *Polygala verticillata*

Polygonaceae

Swamp Smartweed	<i>Polygonum amphibium</i> var. <i>emersum</i>
Prostrate Knotweed	<i>Polygonum arenastrum</i>
Longstyle Smartweed	<i>Polygonum bicorne</i>
Wild Buckwheat	<i>Polygonum convolvulus</i>
Mild Water-pepper Smartweed	<i>Polygonum hydropiperoides</i>
Pale Smartweed	<i>Polygonum lapathifolium</i>
Pennsylvania Smartweed	<i>Polygonum pennsylvanicum</i>
Lady's-thumb Smartweed	<i>Polygonum persicaria</i>
Dotted Smartweed	<i>Polygonum punctatum</i>
Bush Knotweed	<i>Polygonum ramosissimum</i>
Climbing False Buckwheat	<i>Polygonum scandens</i>
Slender Knotweed	<i>Polygonum tenue</i>
Virginia Knotweed	<i>Polygonum virginianum</i>
Sheep Sorrel	<i>Rumex acetosella</i>
Pale Dock	<i>Rumex altissimus</i>
Curly Dock	<i>Rumex crispus</i>

Pontederiaceae

Bouquet Mudplantain	<i>Heteranthera multiflora</i>
Common Pickerelweed	<i>Pontederia cordata</i>

Portulacaceae

Virginia Spring Beauty	<i>Claytonia virginica</i>
Common Purslane	<i>Portulaca oleracea</i>
Hairy Purslane	<i>Portulaca pilosa</i>
Rockpink Fameflower	<i>Talinum calycinum</i>
Prairie Fameflower	<i>Talinum parviflorum</i>

Potamogetonaceae

Waterthread Pondweed	<i>Coleogeton pectinatus</i>
Leafy Pondweed	<i>Potamogeton diversifolius</i>
Longleaf Pondweed	<i>Potamogeton foliosus</i>
Baby Pondweed	<i>Potamogeton nodosus</i>
	<i>Potamogeton pusillus</i> ssp. <i>pusillus</i>

Primulaceae

Scarlet Pimpernel	<i>Anagallis arvensis</i>
Western Rock Jasmine	<i>Androsace occidentalis</i>

Ranunculaceae

Carolina Anemone	<i>Anemone caroliniana</i>
Rue Anemone	<i>Anemonella thalictroides</i>
Canada Columbine	<i>Aquilegia canadensis</i>
Pitcher's Clematis	<i>Clematis pitcheri</i>
Rocket Larkspur	<i>Consolida ajacis</i>
Plains Larkspur	<i>Delphinium carolinianum</i> ssp. <i>virescens</i>
Mousetail	<i>Myosurus minimus</i>
Littleleaf Buttercup	<i>Ranunculus abortivus</i>

Rhamnaceae

New Jersey Tea	<i>Ceanothus americanus</i>
Inland New Jersey Tea	<i>Ceanothus herbaceus</i>
Smooth Lanceleaf Buckthorn	<i>Rhamnus lanceolata</i> var. <i>glabrata</i>

Rosaceae

Woodland Agrimony	<i>Agrimonia rostellata</i>
Summer Hawthorn	<i>Crataegus mollis</i>
Wild Strawberry	<i>Fragaria virginiana</i>
White Avens	<i>Geum canadense</i>
Sulphur Cinquefoil	<i>Potentilla recta</i>
Old-field Cinquefoil	<i>Potentilla simplex</i>
Wild Plum	<i>Prunus americana</i>
Mahaleb Plum	<i>Prunus mahaleb</i>
Mexican Plum	<i>Prunus mexicana</i>
Black Cherry	<i>Prunus serotina</i>
Prairie Wild Rose	<i>Rosa X rudiuscula</i>
Multiflora Rose	<i>Rosa arkansana</i>
Northern Dewberry	<i>Rosa multiflora</i>
	<i>Rubus flagellaris</i>

Black Raspberry	<i>Rubus occidentalis</i>
Highbush Blackberry	<i>Rubus ostryifolius</i>

Rubiaceae

Buttonbush	<i>Cephalanthus occidentalis</i>
Rough Buttonweed	<i>Diodia teres</i>
Catchweed Bedstraw	<i>Galium aparine</i>
Woods Bedstraw	<i>Galium circaezans</i>
Bluntleaf Bedstraw	<i>Galium obtusum</i>
Piedmont Bedstraw	<i>Galium pedemontanum</i>
Fragrant Bedstraw	<i>Galium triflorum</i>
Narrowleaf Bluets	<i>Hedyotis nigricans</i> var. <i>nigricans</i>
Small Bluets	<i>Houstonia pusilla</i>

Rutaceae

Common Prickly Ash	<i>Zanthoxylum americanum</i>
--------------------	-------------------------------

Salicaceae

Silver Poplar	<i>Populus alba</i>
Plains Cottonwood	<i>Populus deltoides</i> ssp. <i>monilifera</i>
Peach-leaved Willow	<i>Salix amygdaloides</i>
Carolina Willow	<i>Salix caroliniana</i>
Interior Sandbar Willow	<i>Salix exigua</i> ssp. <i>interior</i>
Dwarf Prairie Willow	<i>Salix humilis</i> var. <i>humilis</i>
Black Willow	<i>Salix nigra</i>

Santalaceae

Bastard Toadflax	<i>Comandra umbellata</i> ssp. <i>umbellata</i>
------------------	---

Sapindaceae

Soapberry	<i>Sapindus saponaria</i> var. <i>drummondii</i>
-----------	--

Sapotaceae

Woolly Buckthorn	<i>Bumelia lanuginosa</i> var. <i>oblongifolia</i>
------------------	--

Scrophulariaceae

Rough Agalinis	<i>Agalinis aspera</i>
Gattinger's Purple False Foxglove	<i>Agalinis gattingeri</i>
Roundleaf Water Hyssop	<i>Bacopa rotundifolia</i>
Blue Hearts	<i>Buchnera americana</i>
Dwarf Snapdragon	<i>Chaenorrhinum minus</i>
Golden Hedge Hyssop	<i>Gratiola neglecta</i>
Paleseed	<i>Leucospora multifida</i>
Yellow False Pimpernel	<i>Lindernia dubia</i>
Sharpwing Monkeyflower	<i>Mimulus alatus</i>
Texas Toadflax	<i>Nuttallanthus texanus</i>
Wood Betony	<i>Pedicularis canadensis</i>
Cobaea Beardtongue	<i>Penstemon cobaea</i> var. <i>cobaea</i>
Smooth Beardtongue	<i>Penstemon digitalis</i>
Tube Beardtongue	<i>Penstemon tubiflorus</i>
Earleaf Foxglove	<i>Tomanthera auriculata</i>
Fineleaf Foxglove	<i>Tomanthera densiflora</i>
Moth Mullein	<i>Verbascum blattaria</i>
Woolly Mullein	<i>Verbascum thapsus</i>
Water Speedwell	<i>Veronica anagallis-aquatica</i>
Corn Speedwell	<i>Veronica arvensis</i>
Purslane Speedwell	<i>Veronica peregrina</i> var. <i>peregrina</i>
Wayside Speedwell	<i>Veronica polita</i>

Selaginellaceae

Rock Spike-moss	<i>Selaginella rupestris</i>
-----------------	------------------------------

Simaroubaceae

Tree-of-heaven	<i>Ailanthus altissima</i>
----------------	----------------------------

Smilacaceae

Carrion Flower	<i>Smilax ecirrata</i>
Carrion Flower	<i>Smilax herbacea</i> var. <i>lasioneur</i>
Bristly Greenbrier	<i>Smilax hispida</i>

Solanaceae

Jimsonweed	<i>Datura stramonium</i>
Clammy Groundcherry	<i>Physalis heterophylla</i>
Common Groundcherry	<i>Physalis longifolia</i> var. <i>longifolia</i>
Longleaf Groundcherry	<i>Physalis longifolia</i> var. <i>subglabrata</i>
Hairy Groundcherry	<i>Physalis pumila</i> ssp. <i>pumila</i>
Carolina Horse Nettle	<i>Solanum carolinense</i>
Black Nightshade	<i>Solanum ptychanthum</i>
Buffalo Bur	<i>Solanum rostratum</i>

Sparganiaceae

Giant Bur-reed	<i>Sparganium eurycarpum</i>
----------------	------------------------------

Staphyleaceae

American Bladdernut	<i>Staphylea trifolia</i>
---------------------	---------------------------

Tiliaceae

American Basswood	<i>Tilia americana</i>
-------------------	------------------------

Typhaceae

Narrow-Leaved cattail	<i>Typha angustifolia</i>
Southern Cattail	<i>Typha domingensis</i>
Common Cattail	<i>Typha latifolia</i>

Ulmaceae

Common Hackberry	<i>Celtis occidentalis</i>
Dwarf Hackberry	<i>Celtis tenuifolia</i>
American Elm	<i>Ulmus americana</i>
Elm	<i>Ulmus pumila</i>
Slippery Elm	<i>Ulmus rubra</i>

Urticaceae

Bog Hemp	<i>Boehmeria cylindrica</i>
Wood Nettle	<i>Laportea canadensis</i>
Pennsylvania Pellitory	<i>Parietaria pennsylvanica</i>
Clearweed	<i>Pilea pumila</i>
Stinging Nettle	<i>Urtica dioica</i> ssp. <i>gracilis</i>

Valerianaceae

Corn Salad	<i>Valerianella radiata</i>
------------	-----------------------------

Verbenaceae

Lopseed	<i>Phryma leptostachya</i>
Lanceleaf Frogfruit	<i>Phyla lanceolata</i>
	<i>Verbena X moechina</i>
Prostrate Verbena	<i>Verbena bracteata</i>
Canada Verbena	<i>Verbena canadensis</i>
Blue Verbena	<i>Verbena hastata</i>
Narrowleaf Verbena	<i>Verbena simplex</i>
Woolly Verbena	<i>Verbena stricta</i>
White Verbena	<i>Verbena urticifolia</i>

Violaceae

Bird's-foot Violet	<i>Viola pedata</i>
Prairie Violet	<i>Viola pedatifida</i>
Downy Yellow Violet	<i>Viola pubescens</i>
Johnny-jump-up	<i>Viola rafinesquii</i>
Downy Blue Violet	<i>Viola sororia</i>

Vitaceae

Raccoon Grape	<i>Ampelopsis cordata</i>
Virginia Creeper	<i>Parthenocissus quinquefolia</i>
Graybark Grape	<i>Vitis cinerea</i>
Riverbank Grape	<i>Vitis riparia</i>

Zygophyllaceae

Puncture Vine	<i>Tribulus terrestris</i>
---------------	----------------------------

Appendix B.

Flint Hills NWR

Fish List

Fish of Lyon and Coffey Counties, Kansas
 Provided by the Kansas Biological Survey, University
 of Kansas, Natural Heritage Inventory

Lepisosteidae

Longnose Gar *Lepisosteus osseus*
 Shortnose Gar *Lepisosteus platostomus*

Clupeidae

Gizzard Shad *Dorosoma cepedianum*

Cyprinidae

Central Stoneroller *Campostoma anomalum*
 Goldfish *Carassius auratus*
 Grass Carp *Ctenopharyngodon idella*
 Common Carp *Cyprinus carpio*
 Redspot Chub *Nocomis asper*
 Hornyhead Chub *Nocomis biguttatus*
 Golden Shiner *Notemigonus crysoleucas*
 Ghost Shiner *Notropis buchanani*
 Rosyface Shiner *Notropis rubellus*
 Sand Shiner *Notropis stramineus*
 Mimic Shiner *Notropis volucellus*
 Suckermouth Minnow *Phenacobius mirabilis*
 Bluntnose Minnow *Pimephales notatus*
 Fathead Minnow *Pimephales promelas*
 Slim Minnow *Pimephales tenellus*
 Bullhead Minnow *Pimephales vigilax*
 Creek Chub *Semotilus atromaculatus*
 Bluntnose Shiner *Cyprinella camura*
 Red Shiner *Cyprinella lutrensis*
 Gravel Chub *Erimystax X-punctatus*
 Cardinal Shiner *Luxilus cardinalis*
 Redfin Shiner *Lythrurus umbratilis*

Catostomidae

River Carpsucker *Carpodes carpio*
 White Sucker *Catostomus commersoni*
 Blue Sucker *Cycleptus elongatus*
 Smallmouth Buffalo *Ictiobus bubalus*
 Bigmouth Buffalo *Ictiobus cyprinellus*
 Black Buffalo *Ictiobus niger*
 Spotted Sucker *Minytrema melanops*
 Golden Redhorse *Moxostoma erythrurum*
 Shorthead Redhorse *Moxostoma macrolepidotum*

Ictaluridae

Blue Catfish *Ictalurus furcatus*
 Channel Catfish *Ictalurus punctatus*
 Stonecat *Noturus flavus*
 Tadpole Madtom *Noturus gyrinus*
 Brindled Madtom *Noturus miurus*
 Freckled Madtom *Noturus nocturnus*
 Slender Madtom *Noturus exilis*
 Neosho Madtom *Noturus placides*
 Flathead Catfish *Pylodictis olivaris*
 Black Bullhead *Ameiurus melas*
 Yellow Bullhead *Ameiurus natalis*

Cyprinodontidae

Blackstripe Topminnow *Fundulus notatus*

Poeciliidae

Western Mosquitofish *Gambusia affinis*

Atherinidae

Brook Silverside *Labidesthes sicculus*

Percichthyidae

White Bass *Morone chrysops*
 Striped Bass *Morone saxatilis*

Centrarchidae

Green Sunfish *Lepomis cyanellus*
 Orangespotted Sunfish *Lepomis humilis*
 Bluegill *Lepomis macrochirus*
 Longear Sunfish *Lepomis megalotis*
 Smallmouth Bass *Micropterus dolomieu*
 Spotted Bass *Micropterus punctulatus*
 Largemouth Bass *Micropterus salmoides*
 White Crappie *Pomoxis annularis*
 Black Crappie *Pomoxis nigromaculatus*

Percidae

Fantail Darter *Etheostoma flabellare*
 Johnny Darter *Etheostoma nigrum*
 Orangethroat Darter *Etheostoma spectabile*
 Yellow Perch *Perca flavescens*
 Logperch *Percina caprodes*
 Channel Darter *Percina copelandi*
 Slenderhead Darter *Percina phoxocephala*
 Walleye *Stizostedion vitreum*

Sciaenidae

Freshwater Drum *Aplodinotus grunniens*

Appendix C. Flint Hills NWR Amphibian and Reptile List

Amphibians and Reptiles of Lyon and Coffey
Counties, Kansas
Provided by the Kansas Biological Survey, University
of Kansas, Natural Heritage Inventory

Amphibians

Salamanders

Smallmouth Salamander	<i>Ambystoma texanum</i>
Tiger Salamander	<i>Ambystoma tigrinum</i>
Mudpuppy	<i>Necturus maculosus</i>

Frogs

Cope's Gray Tree Frog	<i>Hyla crysoscelis</i>
Gray Tree Frog	<i>Hyla versicolor</i>
Crawfish Frog	<i>Rana areolata</i>
Plains Leopard Frog	<i>Rana blairi</i>
Bullfrog	<i>Rana catesbeiana</i>
Southern Leopard Frog	<i>Rana spenocephala</i>
Blanchard's Cricket Frog	<i>Acris crepitans blanchardi</i>
Western Chorus Frog	<i>Pseudacris triseriata</i>

Toads

Woodhouse's Toad	<i>Bufo woodhousei</i>
American Toad	<i>Bufo americanus</i>
Great Plains Narrow Mouthed Toad	<i>Gastrophryne olivacea</i>

Reptiles

Turtles

Snapping Turtle	<i>Chelydra serpentina</i>
Alligator Snapping Turtle	<i>Macrickenys temminckii</i>
Common Map Turtle	<i>Graptemys geographica</i>
False Map Turtle	<i>Graptemys pseudogeographica</i>
Ouachita Map Turtle	<i>Graptemys ouachitensis</i>
River Cooter	<i>Pseudemys concinna</i>
Slider	<i>Trachemys scripta</i>
Eastern Box Turtle	<i>Terrapene carolina</i>
Western Box Turtle	<i>Terrapene ornata</i>
Smooth Softshell	<i>Apalone mutica</i>
Spiny Softshell	<i>Apalone spinifera</i>

Lizards

Slender Glass Lizard	<i>Ophisaurus attenuatus</i>
Collared Lizard	<i>Crotaphytus collaris</i>
Lesser Earless Lizard	<i>Holbrookia maculata</i>
Texas Horned Lizard	<i>Phrynosoma cornutum</i>
Coal Skink	<i>Eumeces anthracinus</i>
Five-lined Skink	<i>Eumeces fasciatus</i>
Prairie Skink	<i>Eumeces septentrionalis</i>
Great Plains Skink	<i>Eumeces obsoletus</i>
Ground Skink	<i>Scincella lateralis</i>
Six-lined Racerunner	<i>Cnemidophorus sexlineatus</i>

Snakes

Worm Snake	<i>Carphophis amoenus</i>
Racer	<i>Coluber constrictor</i>
Ringneck Snake	<i>Diadophis punctatus</i>
Corn Snake	<i>Elaphe guttata</i>
Rat Snake	<i>Elaphe obsoleta</i>
Eastern Hognose Snake	<i>Heterodon platirhinos</i>
Prairie Kingsnake	<i>Lampropeltis calligaster</i>
Common Kingsnake	<i>Lampropeltis getula</i>
Milk Snake	<i>Lampropeltis triangulum</i>
Plainbelly Water Snake	<i>Nerodia erythrogaster</i>
Diamondback Water Snake	<i>Nerodia rhombifer</i>
Northern Water Snake	<i>Nerodia sipedon</i>
Pine or Gopher Snake	<i>Pituophis catenifer</i>
Graham's Crayfish Snake	<i>Regina grahamii</i>
Brown Snake	<i>Storeria dekayi</i>
Flathead Snake	<i>Tantilla gracilis</i>
Western Ribbon Snake	<i>Thamnophis proximus</i>
Plains Garter Snake	<i>Thamnophis radix</i>
Common Garter Snake	<i>Thamnophis sirtalis</i>
Lined Snake	<i>Tropidoclonion lineatum</i>
Copperhead	<i>Agkistrodon contortrix</i>
Timber Rattlesnake	<i>Crotalus horridus</i>
Massasauga	<i>Sistrurus catenatus</i>

Appendix D.

Flint Hills NWR

Wild Bird Species List

(Order follows the A.O.U. Check-list of North American Birds, 7th ed. 1998)

Grebes

Pied-billed Grebe	<i>Podilymbus podiceps</i>
Horned Grebe	<i>Podiceps auritus</i>
Eared Grebe	<i>Podiceps nigricollis</i>
Western Grebe	<i>Aechmophorus occidentalis</i>

Pelicans

American White Pelican	<i>Pelecanus erythrorhynchos</i>
------------------------	----------------------------------

Cormorants

Double-crested Cormorant	<i>Phalacrocorax auritus</i>
--------------------------	------------------------------

Bitterns, Herons, and Egrets

American Bittern	<i>Botaurus lentiginosus</i>
Least Bittern	<i>Ixobrychus exilis</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Ardea alba</i>
Snowy Egret	<i>Egretta thula</i>
Little Blue Heron	<i>Egretta caerulea</i>
Cattle Egret	<i>Bubulcus ibis</i>
Green Heron	<i>Butorides virescens</i>
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
Yellow-crowned Night-Heron	<i>Nyctanassa violaceus</i>

Ibises and Spoonbills

White-faced Ibis	<i>Plegadis chihi</i>
------------------	-----------------------

New World Vultures

Turkey Vulture	<i>Cathartes aura</i>
----------------	-----------------------

Swans, Geese, and Ducks

Greater White-fronted Goose	<i>Anser albifrons</i>
Snow Goose	<i>Chen caerulescens</i>
Ross' Goose	<i>Chen rossii</i>
Canada Goose	<i>Branta canadensis</i>
Wood Duck	<i>Aix sponsa</i>
Gadwall	<i>Anas strepera</i>
Eurasian Wigeon	<i>Anas penelope</i>
American Wigeon	<i>Anas americana</i>
Mallard	<i>Anas platyrhynchos</i>
Blue-winged Teal	<i>Anas discors</i>
Cinnamon Teal	<i>Anas cyanoptera</i>
Northern Shoveler	<i>Anas clypeata</i>
Northern Pintail	<i>Anas acuta</i>
Green-winged Teal	<i>Anas crecca</i>
Canvasback	<i>Aythya valisineria</i>
Redhead	<i>Aythya americana</i>
Ring-necked Duck	<i>Aythya collaris</i>
Lesser Scaup	<i>Aythya affinis</i>
Oldsquaw	<i>Clangula hyemalis</i>
Bufflehead	<i>Bucephala albeola</i>
Common Goldeneye	<i>Bucephala clangula</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>
Common Merganser	<i>Mergus merganser</i>
Red-breasted Merganser	<i>Mergus serrator</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>

Osprey, Kites, Hawks, and Eagles

Osprey	<i>Pandion haliaetus</i>
Swallow-tailed Kite	<i>Elanoides forficatus</i>

Mississippi Kite	<i>Ictinia mississippiensis</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Northern Harrier	<i>Circus cyaneus</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Northern Goshawk	<i>Accipiter gentilis</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Broad-winged Hawk	<i>Buteo platypterus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Ferruginous Hawk	<i>Buteo regalis</i>
Rough-legged Hawk	<i>Buteo lagopus</i>
Golden Eagle	<i>Aquila chrysaetos</i>

Falcons and Caracaras

American Kestrel	<i>Falco sparverius</i>
Merlin	<i>Falco columbarius</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Prairie Falcon	<i>Falco mexicanus</i>

Gallinaceous Birds

Ring-necked Pheasant	Introduced	<i>Phasianus colchicus</i>
Greater Prairie-Chicken		<i>Tympanuchus cupido</i>
Wild Turkey		<i>Meleagris gallopavo</i>
Northern Bobwhite		<i>Colinus virginianus</i>

Rails

King Rail	<i>Rallus elegans</i>
Virginia Rail	<i>Rallus limicola</i>
Sora	<i>Porzana carolina</i>
Purple Gallinule	<i>Porphyryula martinica</i>
Common Moorhen	<i>Gallinula chloropus</i>
American Coot	<i>Fulica americana</i>

Cranes

Sandhill Crane	<i>Grus canadensis</i>
----------------	------------------------

Plovers

Black-bellied Plover	<i>Pluvialis squatarola</i>
American Golden-Plover	<i>Pluvialis dominica</i>
Snowy Plover	<i>Charadrius alexandrinus</i>
Semipalmated Plover	<i>Charadrius semipalmatus</i>
Piping Plover	<i>Charadrius melodus</i>
Killdeer	<i>Charadrius vociferus</i>

Stilts and Avocets

American Avocet	<i>Recurvirostra americana</i>
-----------------	--------------------------------

Sandpipers and Phalaropes

Greater Yellowlegs	<i>Tringa melanoleuca</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>
Solitary Sandpiper	<i>Tringa solitaria</i>
Willet	<i>Catoptrophorus semipalmatus</i>
Spotted Sandpiper	<i>Actitis macularia</i>
Long-billed Curlew	<i>Numenius americanus</i>
Hudsonian Godwit	<i>Limosa haemastica</i>
Marbled Godwit	<i>Limosa fedoa</i>
Ruddy Turnstone	<i>Arenaria interpres</i>
Sanderling	<i>Calidris alba</i>
Western Sandpiper	<i>Calidris mauri</i>
Least Sandpiper	<i>Calidris minutilla</i>
White-rumped Sandpiper	<i>Calidris fuscicollis</i>
Baird's Sandpiper	<i>Calidris bairdii</i>
Pectoral Sandpiper	<i>Calidris melanotos</i>
Dunlin	<i>Calidris alpina</i>
Stilt Sandpiper	<i>Calidris himantopus</i>
Short-billed Dowitcher	<i>Limnodromus griseus</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
Common Snipe	<i>Gallinago gallinago</i>
American Woodcock	<i>Scolopax minor</i>
Wilson's Phalarope	<i>Phalaropus tricolor</i>

Skuas, Jaegers, Gulls, and Terns

Parasitic Jaeger	<i>Stercorarius pomarinus</i>
Franklin's Gull	<i>Larus pipixcan</i>
Black-headed Gull	<i>Larus ridibundus</i>
Bonaparte's Gull	<i>Larus philadelphia</i>
Ring-billed Gull	<i>Larus delawarensis</i>
Herring Gull	<i>Larus argentatus</i>
Glaucus Gull	<i>Larus hyperboreus</i>
Great Black-backed Gull	<i>Larus marinus</i>
Black-legged Kittiwake	<i>Rissa tridactyla</i>
Caspian Tern	<i>Sterna caspia</i>
Common Tern	<i>Sterna hirundo</i>
Forster's Tern	<i>Sterna forsteri</i>
Least Tern	<i>Sterna antillarum</i>
Black Tern	<i>Chlidonias niger</i>

Pigeons and Doves

Rock Dove	Introduced	<i>Columba livia</i>
Mourning Dove		<i>Zenaidura macroura</i>

Cuckoos and Anis

Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>

Barn Owls

Barn Owl	<i>Tyto alba</i>
----------	------------------

Typical Owls

Eastern Screech-Owl	<i>Otus asio</i>
Great Horned Owl	<i>Bubo virginianus</i>
Burrowing Owl	<i>Athene cunicularia</i>
Barred Owl	<i>Strix varia</i>
Long-eared Owl	<i>Asio otus</i>
Short-eared Owl	<i>Asio flammeus</i>
Northern Saw-whet Owl	<i>Aegolius acadicus</i>

Nightjars

Common Nighthawk	<i>Chordeiles minor</i>
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
Whip-poor-will	<i>Caprimulgus vociferus</i>

Swifts

Chimney Swift	<i>Chaetura pelagica</i>
---------------	--------------------------

Hummingbirds

Ruby-throated Hummingbird	<i>Archilochus colubris</i>
---------------------------	-----------------------------

Kingfishers

Belted Kingfisher	<i>Ceryle alcyon</i>
-------------------	----------------------

Woodpeckers

Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Hairy Woodpecker	<i>Picoides villosus</i>
Northern Flicker	<i>Colaptes auratus</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>

Tyrant Flycatchers

Olive-sided Flycatcher	<i>Contopus cooperi</i>
Eastern Wood-Pewee	<i>Contopus virens</i>
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>
Acadian Flycatcher	<i>Empidonax virescens</i>
Alder Flycatcher	<i>Empidonax alnorum</i>
Willow Flycatcher	<i>Empidonax traillii</i>
Least Flycatcher	<i>Empidonax minimus</i>
Gray Flycatcher	<i>Empidonax wrightii</i>
Eastern Phoebe	<i>Sayornis phoebe</i>
Say's Phoebe	<i>Sayornis saya</i>
Dusty-capped Flycatcher	<i>Myiarchus tuberculifer</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
Western Kingbird	<i>Tyrannus verticalis</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>
Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>

Shrikes

Loggerhead Shrike	<i>Lanius ludovicianus</i>
Northern Shrike	<i>Lanius excubitor</i>

Vireos

White-eyed Vireo	<i>Vireo griseus</i>
Bell's Vireo	<i>Vireo bellii</i>
Yellow-throated Vireo	<i>Vireo flavifrons</i>
Blue-headed Vireo	<i>Vireo solitarius</i>
Warbling Vireo	<i>Vireo gilvus</i>
Philadelphia Vireo	<i>Vireo philadelphicus</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>

Crows, Jays, and Magpies

Blue Jay	<i>Cyanocitta cristata</i>
American Crow	<i>Corvus brachyrhynchos</i>

Larks

Horned Lark	<i>Eremophila alpestris</i>
-------------	-----------------------------

Swallows

Purple Martin	<i>Progne subis</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Bank Swallow	<i>Riparia riparia</i>
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Barn Swallow	<i>Hirundo rustica</i>

Titmice and Chickadees

Tufted Titmouse	<i>Baeolophus bicolor</i>
-----------------	---------------------------

Bushtits

Bushtit	<i>Psaltriparus minimus</i>
---------	-----------------------------

Nuthatches

Red-breasted Nuthatch	<i>Sitta canadensis</i>
White-breasted Nuthatch	<i>Sitta carolinensis</i>

Creepers

Brown Creeper	<i>Certhia americana</i>
---------------	--------------------------

Wrens

Rock Wren	<i>Salpinctes obsoletus</i>
Carolina Wren	<i>Thryothorus ludovicianus</i>
Bewick's Wren	<i>Thryomanes bewickii</i>
House Wren	<i>Troglodytes aedon</i>
Winter Wren	<i>Troglodytes troglodytes</i>
Sedge Wren	<i>Cistothorus platensis</i>
Marsh Wren	<i>Cistothorus palustris</i>

Kinglets

Golden-crowned Kinglet	<i>Regulus satrapa</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>

Old World Warblers

Blue-gray Gnatcatcher *Poliophtila caerulea*
 Black-capped Gnatcatcher *Poliophtila nigriceps*

Thrushes

Eastern Bluebird *Sialia sialis*
 Townsend's Solitaire *Myadestes townsendi*
 Veery *Catharus fuscescens*
 Gray-cheeked Thrush *Catharus minimus*
 Swainson's Thrush *Catharus ustulatus*
 Hermit Thrush *Catharus guttatus*
 Wood Thrush *Hylocichla mustelina*
 American Robin *Turdus migratorius*

Mimic Thrushes

Gray Catbird *Dumetella carolinensis*
 Northern Mockingbird *Mimus polyglottos*
 Brown Thrasher *Toxostoma rufum*

Starlings

European Starling *Sturnus vulgaris*

Wagtails and Pipits

American (Water) Pipit *Anthus rubescens*
 Sprague's Pipit *Anthus spragueii*

Waxwings

Bohemian Waxwing *Bombycilla garrulus*
 Cedar Waxwing *Bombycilla cedrorum*

Wood Warblers

Blue-winged Warbler *Vermivora pinus*
 Tennessee Warbler *Vermivora peregrina*
 Orange-crowned Warbler *Vermivora celata*
 Nashville Warbler *Vermivora ruficapilla*
 Northern Parula *Parula americana*
 Yellow Warbler *Dendroica petechia*
 Chestnut-sided Warbler *Dendroica pensylvanica*
 Magnolia Warbler *Dendroica magnolia*
 Cape May Warbler *Dendroica tigrina*
 Black-throated Blue Warbler *Dendroica caerulescens*
 Yellow-rumped Warbler *Dendroica coronata*
 Black-throated Green Warbler *Dendroica virens*
 Blackburnian Warbler *Dendroica fusca*
 Yellow-throated Warbler *Dendroica dominica*
 Palm Warbler *Dendroica palmarum*
 Bay-breasted Warbler *Dendroica castanea*
 Blackpoll Warbler *Dendroica striata*
 Cerulean Warbler *Dendroica cerulea*
 Black-and-white Warbler *Mniotilta varia*
 American Redstart *Setophaga ruticilla*
 Prothonotary Warbler *Protonotaria citrea*
 Worm-eating Warbler *Helmitheros vermivorus*
 Ovenbird *Seiurus aurocapillus*
 Northern Waterthrush *Seiurus noveboracensis*
 Louisiana Waterthrush *Seiurus motacilla*
 Kentucky Warbler *Oporornis formosus*
 Mourning Warbler *Oporornis philadelphia*
 Common Yellowthroat *Geothlypis trichas*
 Wilson's Warbler *Wilsonia pusilla*
 Canada Warbler *Wilsonia canadensis*
 Yellow-breasted Chat *Icteria virens*

Tanagers

Summer Tanager *Piranga rubra*
 Scarlet Tanager *Piranga olivacea*

Sparrows and Towhees

Spotted Towhee *Pipilo maculatus*
 Eastern Towhee *Pipilo erythrophthalmus*
 American Tree Sparrow *Spizella arborea*
 Chipping Sparrow *Spizella passerina*
 Clay-colored Sparrow *Spizella pallida*
 Field Sparrow *Spizella pusilla*
 Vesper Sparrow *Pooecetes gramineus*
 Lark Sparrow *Chondestes grammacus*
 Lark Bunting *Calamospiza melanocorys*
 Savannah Sparrow *Passerculus sandwichensis*
 Grasshopper Sparrow *Ammodramus savannarum*
 Henslow's Sparrow *Ammodramus henslowii*
 Le Conte's Sparrow *Ammodramus leconteii*
 Nelson's Sharp-tailed Sparrow *Ammodramus nelsoni*
 Fox Sparrow *Passerelia iliaca*
 Song Sparrow *Melospiza melodia*
 Lincoln's Sparrow *Melospiza lincolni*
 Swamp Sparrow *Melospiza georgiana*
 White-throated Sparrow *Zonotrichia albicollis*
 Harris' Sparrow *Zonotrichia querula*
 White-crowned Sparrow *Zonotrichia leucophrys*
 Dark-eyed Junco *Junco hyemalis*
 Lapland Longspur *Calcarius lapponicus*
 Smith's Longspur *Calcarius pictus*
 Chestnut-collared Longspur *Calcarius ornatus*
 Snow Bunting *Plectrophenax nivalis*

Cardinals, Grosbeaks, and Allies

Northern Cardinal *Cardinalis cardinalis*
 Rose-breasted Grosbeak *Pheucticus ludovicianus*
 Blue Grosbeak *Guiraca caerulea*
 Lazuli Bunting *Passerina amoena*
 Indigo Bunting *Passerina cyanea*
 Painted Bunting *Passerina ciris*
 Dickcissel *Spiza americana*

Blackbirds and Orioles

Bobolink *Dolichonyx oryzivorus*
 Red-winged Blackbird *Agelaius phoeniceus*
 Eastern Meadowlark *Sturnella magna*
 Western Meadowlark *Sturnella neglecta*
 Yellow-headed Blackbird *Xanthocephalus xanthocephalus*
 Rusty Blackbird *Euphagus carolinus*
 Brewer's Blackbird *Euphagus cyanocephalus*
 Common Grackle *Quiscalus quiscula*
 Great-tailed Grackle *Quiscalus mexicanus*
 Brown-headed Cowbird *Molothrus ater*
 Orchard Oriole *Icterus spurius*
 Baltimore Oriole *Icterus galbula*

Finches

Purple Finch *Carpodacus purpureus*
 Red Crossbill *Loxia curvirostra*
 Common Redpoll *Carduelis flammea*
 Hoary Redpoll *Carduelis hornemanni*
 Pine Siskin *Carduelis pinus*
 American Goldfinch *Carduelis tristis*
 Evening Grosbeak *Coccothraustes vespertinus*

Old World Sparrows

House Sparrow *Passer domesticus* Introduced

Appendix E.

Flint Hills NWR

Mammal List

Mammals Of Lyon and Coffey Counties, Kansas
 Provided by the Kansas Biological Survey, University
 of Kansas, Natural Heritage Inventory

Didelphimorpha

Virginia Opossum* *Didelphis virginiana*

Insectivora

Eastern Mole *Scalopus aquaticus*
 Least Shrew *Cryptotis parva*

Chiroptera

Northern Myotis *Myotis keenii*
 Little Brown Myotis *Myotis lucifugus*
 Big Brown Bat *Eptesicus fuscus*
 Eastern Red Bat *Lasiurus borealis*
 Hoary Bat *Lasiurus cinereus*
 Evening Bat *Nycticeius humeralis*
 Brazilian Free-tailed Bat *Tadarida brasiliensis*

Xenarthra

Nine-banded Armadillo *Dasyus novemcinctus*

Lagomorpha

Eastern Cottontail *Sylvilagus floridanus*
 Black-tailed Jackrabbit *Lepus californicus*

Rodentia

Eastern Chipmunk *Tamias striatus*
 Woodchuck *Marmota monax*
 Thirteen-lined Ground Squirrel *Spermophilus tridecemlineatus*
 Franklin's Ground Squirrel *Spermophilus franklinii*
 Eastern Gray Squirrel *Sciurus carolinensis*
 Eastern Fox Squirrel *Sciurus niger*
 Southern Flying Squirrel *Glaucomys volans*
 Plains Pocket Gopher *Geomys bursarius*
 Hispid Pocket Mouse *Chaetodipus hispidus*
 American Beaver *Castor canadensis*
 Plains Harvest Mouse *Reithrodontomys montanus*
 Western Harvest Mouse *Reithrodontomys megalotis*
 Fulvous Harvest Mouse *Reithrodontomys fulvescens*
 Deer Mouse *Peromyscus maniculatus*
 White-footed Mouse *Peromyscus leucopus*
 Hispid Cotton Rat *Sigmodon hispidus*
 Eastern Woodrat *Neotoma floridana*
 Woodland Vole *Microtus pinetorum*
 Southern Bog Lemming *Synaptomys cooperi*
 Meadow Jumping Mouse *Zapus hudsonius*
 Muskrat *Ondatra zibethicus*

Carnivora

Coyote *Canis latrans*
 Red Fox *Vulpes vulpes*
 Common Gray Fox *Urocyon cinereoargenteus*
 Common Raccoon *Procyon lotor*
 Least Weasel *Mustela nivalis*
 Long-tailed Weasel *Mustela frenata*
 Mink *Mustela vison*
 American Badger *Taxidea taxus*
 Eastern Spotted Skunk *Spilogale putorius*
 Striped Skunk *Mephitis mephitis*
 River otters *Lutra canadensis*
 Bobcat *Lynx rufus*

Artiodactyla

White-tailed deer *Odocoileus virginianus*

Appendix F. Flint Hills NWR Threatened and Endangered Species List

Peregrine falcon	<i>Falco peregrinus</i>	T-PD
Bald eagle	<i>Haliaeetus leucocephalus</i>	T-PD
Neosho madtom	<i>Noturus placides</i>	T
Flat floater mussel	<i>Anodonta suborbiculata</i>	SE

Index

E	=	Endangered
PD	=	Proposed De-listed
T	=	Threatened
SE	=	State Endangered

***Appendix G.
Flint Hills NWR
Refuge Operating Needs
System (RONS)***

97026 ACTIVITY: Wetland Restoration

RANK - STA: 1 **MEASURES:** 600 refuge acres will be restored
GEO: 0
REG: 103
NAT:

Restoration of Refuge Wetlands

Restore the hydrology of Refuge wetlands that were drained from farming, road construction or other developments before the refuge was acquired. Many wetland have been restored, but more work needs to be done. Wetland/ hydrology restoration will help ensure that the biological needs of migratory waterfowl are met as required by the lease agreement with the U.S. Army Corps of Engineers (COE) which owns the land. As part of this project a wetland inventory and needs assessment will be completed by the Complex Biologist (hired 2000) to evaluate priority areas before work is started. Monitoring of wetland plant response and wildlife use will be conducted after wetlands are restored.

ADDITIONAL FUNDS NEEDED (\$000):

	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....		43	
Equipment Cost.....	30		
Facility Cost.....	5		
Services/Supplies.....		5	
Miscellaneous Costs.....	30	5	
TOTAL Operations Cost.....	65	53	118

ADDITIONAL RECURRING STAFF NEEDS:

	FTEs	Cost (\$000)
Managers.....		\$0
Biologists.....		\$0
Resource Specialists.....		\$0
Education/Recreation Staff.....		\$0
Law Enforcement.....		\$0
Clerical/Administrative.....		\$0
Maintenance/Equipment Operation.....	1.0	\$43
TOTAL FTEs Needed.....	1.0	\$43

:Approved minimum staffing need?

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	PED	FAR	PRC	TOT
		55	20	10			5	5		5	100

PLANNING LINKS: Station Goal/Objective; FWS Ecosystem Goal/Plan; Station CCP approved 10/97+; Other Major Plan

Wetland/hydrology restoration is outlined in the goal and objectives portion of habitat management in the station's CCP which will be approved this year. Restoring hydrology and creating wetlands is also an objective in the 1996 Arkansas/Red Rivers Ecosystem Plan. It is also a part of the Governors Water Quality Initiative.

99002 ACTIVITY: Law Enforcement

RANK - STA: 2 **MEASURES:** 50 incidents will be documented; 3000 other public contacts will be made; 20 cases will be assisted; 10 miles of boundary posted/maintained; 40 sites will be better secured

GEO: 0

REG: 999 Also includes work on Marais des Cygnes NWR

NAT:

Develop a Comprehensive Law Enforcement Protection Program

Develop a more comprehensive, pro active law enforcement program on the Flint Hills/Marais des Cygnes Refuge Complex. Each year these 2 Refuges experience increased public use, and increased threats to their natural resources. Hunting and fishing pressure have increased as there is little other public land available. Flint Hills has approximately 180 documented archeological sites which need better protection. Artifact hunters have been documented on the refuge and there is a growing concern about protecting this resource. Vandalism is becoming more of a problem on both refuges. An additional law enforcement officer (full time) is an integral part of this project. This project would help both Refuges offer safe opportunities for the visiting public while enhancing resource protection.

ADDITIONAL FUNDS NEEDED (\$000):

	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....		52	
Equipment Cost.....	30		
Facility Cost.....	5		
Services/Supplies.....		5	
Miscellaneous Costs.....	30	5	
TOTAL Operations Cost.....	65	62	127

ADDITIONAL RECURRING STAFF NEEDS:

	FTEs	Cost (\$000)
Managers.....		\$0
Biologists.....		\$0
Resource Specialists.....		\$0
Education/Recreation Staff.....		\$0
Law Enforcement.....	1.0	\$52
Clerical/Administrative.....		\$0
Maintenance/Equipment Operation.....		\$0
TOTAL FTEs Needed.....	1.0	\$52

:Approved minimum staffing need?

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	PED	FAR	PRC	TOT
		10	5	5			5	10	5	60	100

PLANNING LINKS: Station Goal/Objective; Other Major Plan; Legal Mandate; Station CCP approved 10/97+

The need for a more comprehensive law enforcement program is stated in the Flint Hills draft CCP, which is scheduled to be approved in 2000. The CCP also has goals and objectives written specifically for the protection of archeological sites. We are also required to enforce the provisions of the Endangered Species Act, Migratory Bird Treaty Act, and the Archeological Resources Protection Act along with others as they apply on each specific refuge. This project will also help implement Recommendation P1 in the "Fulfilling the Promise" document.

97023 ACTIVITY: Provide Visitor Services

RANK - STA: 3 MEASURES: 10000 new visitors will be served; 55000 existing visitors will be served; 90 % will support the top 6 priority public uses; 10 %
 GEO: 0 will support non-priority public uses
 REG: 54
 NAT:

Enhance the Outdoor Recreation Program and develop an Environmental Education Program

Enhance the refuge's outdoor recreation program and develop an active on/off refuge outreach and environmental education program. The Refuge has the potential to reach larger numbers of people with Emporia, Topaka (the State Capitol) and Kansas City 20, 45, and 100 miles from the refuge, respectively. The addition of an Outdoor Recreation Planner would allow the Refuge to implement this project and accomplish the Refuge's public use goals. This position would enhance the current program by concentrating on development of a Public Use Plan, develop/design facilities, brochures, etc. It would also increase involvement in developing/conducting educational programs on/off the refuge and become involved with State and Region-wide environmental education initiatives.

ADDITIONAL FUNDS NEEDED (\$000):

	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....		48	
Equipment Cost.....	30		
Facility Cost.....	5		
Services/Supplies.....		5	
Miscellaneous Costs.....	30	5	
TOTAL Operations Cost.....	65	58	123

ADDITIONAL RECURRING STAFF NEEDS:

	FTEs	Cost (\$000)
Managers.....		\$0
Biologists.....		\$0
Resource Specialists.....		\$0
Education/Recreation Staff.....	1.0	\$48
Law Enforcement.....		\$0
Clerical/Administrative.....		\$0
Maintenance/Equipment Operation.....		\$0
TOTAL FTEs Needed.....	1.0	\$48

-Approved minimum staffing need?

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	<u>PED</u>	FAR	<u>PRC</u>	<u>TOT</u>
								60		40	100

PLANNING LINKS: Station Goal/Objective; FWS Ecosystem Goal/Plan; Other Major Plan; Station CCP approved 10/97+

There is a need on the refuge to improve the visitor services and outreach program which is stated in the 1994 Public Use Minimum Requirement Evaluation. Our CCP, which will be final in 2000, has specific goals and objectives which addresses the need to expand our Visitor Services and Outreach programs. The public will be better served, informed and educated about the mission of the refuge system, ecosystem goals, and the opportunities that are available on refuges. This project will also help implement Recommendations P2, P3, P6, and P7 of the Service's "Fulfilling the Promises" document.

99009 **ACTIVITY: Pest Plant Control**

RANK - STA: 4 MEASURES: 100 acres will be treated; 100 acres infested by target species; 100 acres will be treated chemically; 50 acres will be treated mechanically
 GEO: 0
 REG: 999
 NAT:

Control Noxious Weed Infestations

Control two species of invasive noxious weeds found on Flint Hills NWR before more infestations occur. Johnson grass and sericea lespedeza are two noxious plant species that are invading Refuge grasslands. Both must be controlled as mandated by state law. The addition of a Range technician would offer the Refuge the ability to research and monitor the results of new biological, mechanical and chemical control methods for these species. The range technician would also support the ongoing partnership between the Refuge and the two County Extension Offices and Kansas State University in developing new control techniques to manage these invasive species. This position will also be involved with habitat restoration, water management, and biological surveys.

ADDITIONAL FUNDS NEEDED (\$000):

	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....		39	
Equipment Cost.....	30		
Facility Cost.....	5		
Services/Supplies.....		5	
Miscellaneous Costs.....	30	5	
TOTAL Operations Cost.....	65	49	114

ADDITIONAL RECURRING STAFF NEEDS:

	FTEs	Cost (\$000)
Managers.....		\$0
Biologists.....		\$0
Resource Specialists.....	1.0	\$39
Education/Recreation Staff.....		\$0
Law Enforcement.....		\$0
Clerical/Administrative.....		\$0
Maintenance/Equipment Operation.....		\$0
TOTAL FTEs Needed.....	1.0	\$39

Approved minimum staffing need?

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	PED	FAR	PRC	TOT
				100							100

PLANNING LINKS: Station Goal/Objective; FWS Ecosystem Goal/Plan; Legal Mandate; Station CCP approved 10/97+; Other Major Plan

The control of noxious and invasive species is mandated by State Law. It is also covered in the habitat management portion of the CCP. Noxious and invasive species contribute to the degradation of the native grass communities and severely limit the refuge's ability to establish healthy grass stands. The Federal Noxious Weed Act also requires the Refuge to use integrated management system to control or contain undesirable plant species and an interdisciplinary approach with cooperation of other Federal and state agencies. Conserving grasslands is also an objective listed in the 1996 Arkansas/Red Rivers Ecosystem Plan.

99008 **ACTIVITY: Provide Visitor Services**

RANK - STA: 5 MEASURES: 10000 new visitors will be served; 55000 existing visitors will be served; 80 % will support the top 6 priority public uses; 20 %
 GEO: 0 will support non-priority public uses
 REG: 999
 NAT:

Enhance Visitor Services and Customer Service

Enhance Visitor Services and Customer Service on Flint Hills NWR. The Refuge Complex has grown with the addition of the Partners for Wildlife Program, Marais des Cygnes NWR, and the Kansas Army Ammunitions Plant. The administrative duties continue to grow as each program becomes larger and more complex, making it harder to provide the quality of Customer Service that our visiting public deserves and demands. The addition of a part-time clerk would give the Refuge the ability to offer more services to our public by providing information faster, assisting in the administration of hunting and fishing programs, keeping the Web site current, and scheduling school programs and special events.

ADDITIONAL FUNDS NEEDED (\$000):

	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....		16	
Equipment Cost.....	15		
Facility Cost.....	3		
Services/Supplies.....		3	
Miscellaneous Costs.....	15	3	
TOTAL Operations Cost.....	33	21	54

ADDITIONAL RECURRING STAFF NEEDS:

	FTEs	Cost (\$000)
Managers.....		\$0
Biologists.....		\$0
Resource Specialists.....		\$0
Education/Recreation Staff.....		\$0
Law Enforcement.....		\$0
Clerical/Administrative.....	.5	\$16
Maintenance/Equipment Operation.....		\$0
TOTAL FTEs Needed.....	.5	\$16

:Approved minimum staffing need?

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	PED	FAR	PRC	TOT
								50		50	100

PLANNING LINKS: Station Goal/Objective; Station CCP approved 10/97+; Other Major Plan

The Flint Hills CCP includes goals and objectives that specifically state the need to enhance Visitor Services and Customer service. This project will also help implement Recommendation P3 of the "Fulfilling the Promise" document.

97027 ACTIVITY: Upland Restoration

RANK - STA: 6 MEASURES: 600 refuge acres will be restored
 GEO: 0
 REG: 999
 NAT:

Restoration of Native Plant Communities

Restore the natural diversity to degraded and noxious weed infested native tallgrass prairie sites, riparian and other sites with threatened habitats (eg. savannas, oxbows, wet meadow, bottomland hardwoods) on the refuge. Due to the fact that the Flint Hills NWR is situated on an Army Corps of Engineers flood control project, few native plant communities remain above the flood pool. More thorough habitat evaluations and inventories need to be completed within the native prairie and other sites on the refuge. The biologist (hired in 2000) will conduct these inventories with the help of refuge staff. These evaluations will determine which sites are the most threatened and where to direct restoration efforts. The project should take 7-10 years to complete.

ADDITIONAL FUNDS NEEDED (\$000):

	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....			
Equipment Cost.....	20		
Facility Cost.....	5		
Services/Supplies.....	15	15	
Miscellaneous Costs.....	10	5	
TOTAL Operations Cost.....	50	20	70

ADDITIONAL RECURRING STAFF NEEDS:

	FTEs	Cost (\$000)
Managers.....		\$0
Biologists.....		\$0
Resource Specialists.....		\$0
Education/Recreation Staff.....		\$0
Law Enforcement.....		\$0
Clerical/Administrative.....		\$0
Maintenance/Equipment Operation.....		\$0
TOTAL FTEs Needed.....		\$0

Approved minimum staffing need?

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	PED	FAR	PRC	TOT
	10		10	55			10	10	5		100

PLANNING LINKS: Station Goal/Objective; FWS Ecosystem Goal/Plan; Other Major Plan; Station CCP approved 10/97+; Legal Mandate

This project will help attain the grassland management, riparian, and bottomland hardwood goals as stated in the draft CCP which is scheduled to be approved in 2000. Protecting native grasslands and habitats of concern are also objectives stated in the 1996 Arkansas/Red Rivers Ecosystem Plan.

00001 ACTIVITY: Cultural Resource Management

RANK - STA: 7 **MEASURES:** 2 investigations will be conducted; 100 sites will be documented
GEO: 999
REG: 999
NAT: 999

Conduct Survey on Refuge Archaeological Sites

Conduct a survey of the Refuge's archaeological sites. Several archaeological surveys have been conducted on Flint Hills NWR, the most recent being in 1983. Approximately 180 sites have been documented but there is a strong feeling that more sites exist on the Refuge. The known sites represent occupations ranging from approximately 12,000 BC to the earliest day of Euro-american settlement. This project is two-fold. The first part would focus on relocating the known sites, recording their location using GIS mapping technology, and assessing their condition. The second step would be to survey the Refuge for additional sites not yet documented. This information is needed to provide the Refuge staff information to protect these cultural resources from degradation through management practices, vandalism and illegal excavation.

ADDITIONAL FUNDS NEEDED (\$000):	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....			
Equipment Cost.....			
Facility Cost.....			
Services/Supplies.....	20	20	
Miscellaneous Costs.....	10	5	
TOTAL Operations Cost.....	30	25	55

ADDITIONAL RECURRING STAFF NEEDS:	FTEs	Cost (\$000)
--	-------------	---------------------

Approved minimum staffing need?

Managers.....	\$0
Biologists.....	\$0
Resource Specialists.....	\$0
Education/Recreation Staff.....	\$0
Law Enforcement.....	\$0
Clerical/Administrative.....	\$0
Maintenance/Equipment Operation.....	\$0
TOTAL FTEs Needed.....	\$0

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	PED	FAR	PRC	TOT
						<u>90</u>		<u>10</u>			<u>100</u>

PLANNING LINKS: Station CCP approved 10/97+; Legal Mandate; Station Goal/Objective
 The station's CCP has goals and objectives written specifically for management and protection of our cultural resources. We are also mandated by the Archaeological Resources Protection Act to protect these resources.

00002 **ACTIVITY: Provide Visitor Services**

RANK - STA: 8 MEASURES: 10000 new visitors will be served; 55000 existing visitors will be served; 80 % will support the top 6 priority public uses; 20 %
 GEO: 999 will support non-priority public uses
 REG: 999
 NAT: 999

Development of Accessible Facilities and Interpretive Exhibits and Programs

Develop quality interpretive exhibits and educational programs to enhance the current public use program. This project links directly with #97023 which provides for a Refuge Outdoor Recreation Planner (ORP). Flint Hills NWR currently has older interpretive exhibits that do not meet Service standards. As the Refuge visitation increase, the Refuge needs to be able to offer high quality exhibits promoting the Service, Refuge System, as well as Flint Hills NWR. This project is to develop interpretive exhibits on Refuge history, archaeological sites, wildlife, and habitat management. Information/directional signs will also be developed to ensure that visitors experience the refuge in a safe manner while learning more about its role in the conservation of public lands.

ADDITIONAL FUNDS NEEDED (\$000):

	One-Time	Recurring Base	First Year Need
Operations: Personnel Costs.....			
Equipment Cost.....			
Facility Cost.....	10		
Services/Supplies.....	40	10	
Miscellaneous Costs.....	10	10	
TOTAL Operations Cost.....	60	20	80

ADDITIONAL RECURRING STAFF NEEDS:

	FTEs	Cost (\$000)
Managers.....		\$0
Biologists.....		\$0
Resource Specialists.....		\$0
Education/Recreation Staff.....		\$0
Law Enforcement.....		\$0
Clerical/Administrative.....		\$0
Maintenance/Equipment Operation.....		\$0
TOTAL FTEs Needed.....		\$0

Approved minimum staffing need?

OUTCOMES*:	ES	WF	OMB	HEC	IAF	SDA	RW	<u>PED</u>	FAR	<u>PRC</u>	<u>TOT</u>
								70		30	100

PLANNING LINKS: Station CCP approved 10/97+; Station Goal/Objective; Other Major Plan

The Refuge CCP states the need for high quality interpretation and educational materials to ensure positive experiences for the visitor. The Refuge Public Use Minimum Requirement Evaluation (July 1994) states the need for interpretive and informational materials and signs as a high priority for the Refuge. The Service's "Fulfilling the Promise" document clearly states the need for visitors to have a quality experience while at a Refuge and get a deeper sense of the tremendous contribution refuge's make toward wildlife conservation.

Appendix H. Flint Hills NWR Arkansas/Red Rivers Ecosystem Plan

Table of Contents

Introduction	91
Ecosystem Vision Statement	91
Map	92
Ecosystem Resource Description	93
Objectives, Strategies and Action Items	
A. Water Conservation	
Objective 1. Water Quantity Maintenance and Improvement ...	98
Objective 2. Water Quality Maintenance and Improvement	99
B. Species and Habitat	
Objective 1. Focus Species Conservation and Restoration	100
Objective 2. Conserve and Restore Focus Habitats	101
C. Quality of Human Life	
Objective 1. Increase Public Outreach Efforts Relative to Service Programs	103
Objective 2. Improve Outdoor Recreational Opportunities	104

Introduction

This Ecosystem Plan and its subsequent updates will help guide the U.S. Fish and Wildlife Service (Service) as it sets priorities, allocates resources, and conducts its activities and programs in the Arkansas/Red Rivers Basins to meet the mandates established for it by the American public. The Service intends to accomplish the objectives, strategies, and action items contained in this Plan by focusing its activities on key ecosystem components and other influences on fish and wildlife resources in cooperation with partner agencies, organizations and individuals from throughout the Arkansas/Red Rivers Ecosystem.

The terms "Arkansas/Red Rivers Ecosystem", "ecosystem", "Ark/Red", and "Arkansas/Red Rivers Basin" are used interchangeably throughout this document, and are meant to refer to the biological resources of the Arkansas and Red river basins and the habitats upon which they depend.

Reference should be made to the memorandum and accompanying concept document of March 8, 1994, from the Service Directorate ("Ecosystem Approach to Fish and Wildlife Resource Conservation") for a discussion of the genesis and principles espoused by our agency related to this endeavor. Above all, the reader should realize that this is not an effort to manage the entire ecosystem, but rather a concept by which the Service will discharge its particular responsibilities with the needs of the ecosystem in mind.

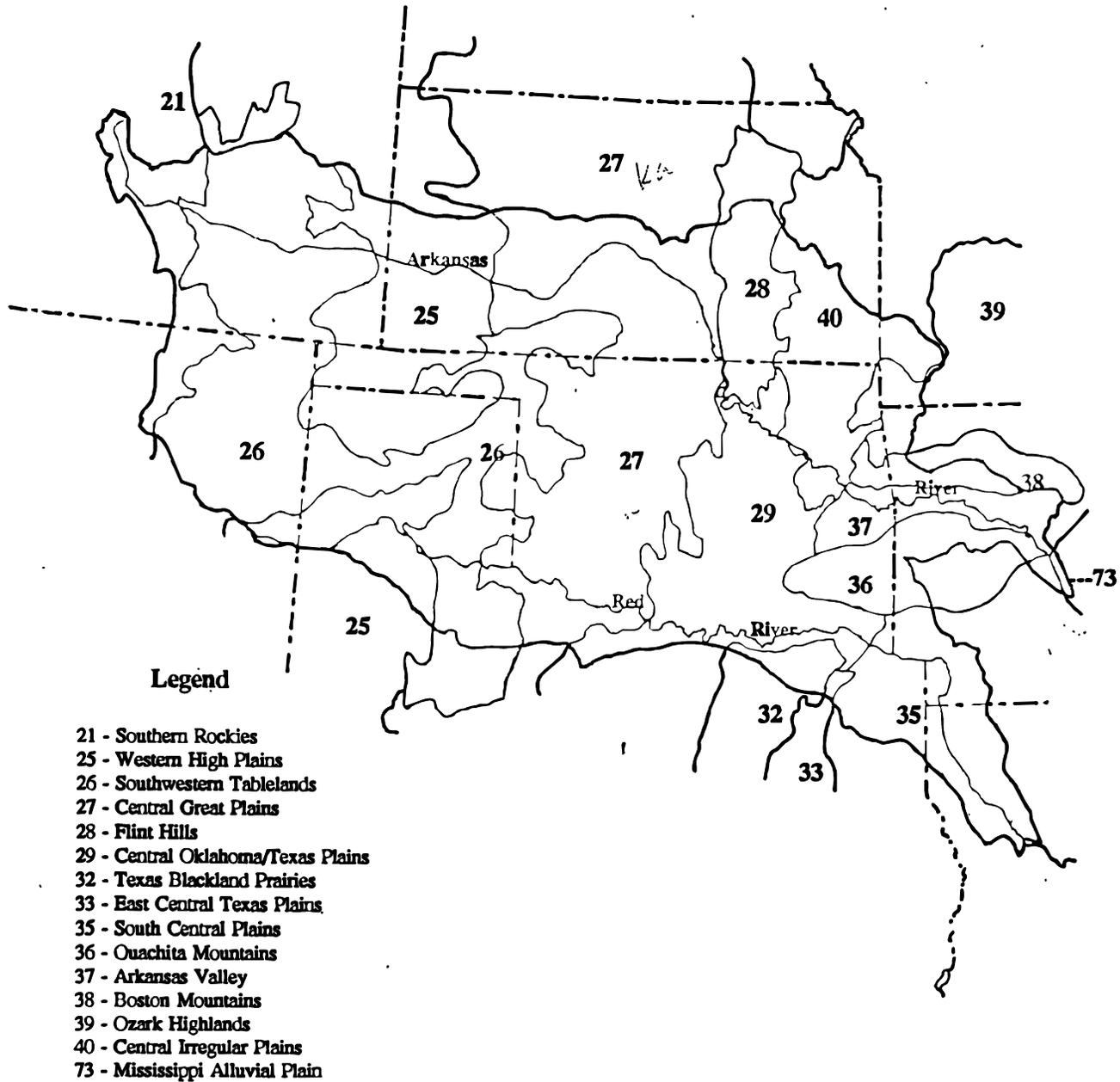
While the efforts of the Service are keyed to managing Federal trust fish and wildlife resources of the Arkansas/Red Rivers Ecosystem, a parallel concern is maximizing the quality of human life, both within this ecosystem and nationwide. Maintaining a healthy biological heritage within the ecosystem is inextricably tied to the well-being of its human population; the reverse also is true. To achieve our goal and objectives, we must successfully communicate these concepts to the public.

This Plan was assembled by a team of Service personnel from stations within the Arkansas/Red Rivers Basin. Valuable information on ecosystem issues and solutions was received from numerous sources outside the Service, which included personnel from other Federal agencies, State agencies, universities, conservation organizations, and most especially interested citizens. We thank those who took the time to contribute their thoughts and ideas.

Finally, this document constitutes neither regulation nor binding policy, and at most constitutes internal guidance that will be revisited regularly and often.

Ecosystem Vision Statement

The vision of the Arkansas/Red Rivers Ecosystem Team is the efficient and effective management of Federal trust fish and wildlife resources of the ecosystem to conserve and restore biodiversity for the benefit of the people.



Arkansas/Red Rivers Ecosystem - Omernick Ecoregions¹

Ecosystem Resource Description

The Arkansas/Red Rivers Ecosystem contains approximately 245,000 square miles and extends from the Rocky Mountains of Colorado to the bayous of Louisiana, and includes all of Oklahoma and parts of seven other states (see Figure I map). Elevations within the Ark/Red range from over 14,000 feet ngvd (national geodetic vertical datum) to less than 300 feet ngvd along the Red River in Louisiana. Because of the diversity in land forms, soils, average annual precipitation, and other factors, the Arkansas/Red Rivers Ecosystem supports the greatest diversity of fish and wildlife resources of any Service ecosystem nationwide.

Portions of four Service Regions occur within the Arkansas/Red Rivers Ecosystem (i.e., Regions 2, 3, 4, and 6). Twenty-four Service field stations are located here, including 16 National Wildlife Refuges (NWR), four National Fish Hatcheries (NFH), three Law Enforcement Offices, two Fishery Resources offices, and one Ecological Services Field Office. In addition, numerous other Service installations have jurisdiction over portions of the Arkansas/Red Rivers Ecosystem. Overall, more than 40 Service installations administer programs within the ecosystem.

Omemick' defined 15 ecoregions that occur within the Arkansas/Red Rivers Ecosystem. Each of these is discussed briefly below, as a background to the management objectives and strategies that follow. We have added a 16th ecoregion, the Big Rivers. Because of the importance and uniqueness of the habitats found along the larger streams of the Ark/Red, and because these streams and their floodplains traverse multiple ecoregions, we believe such an addition to be appropriate.

Southern Rockies - This ecoregion extends from central Colorado southward in an irregular band into northeastern New Mexico. Elevations vary from above 14,000 feet ngvd to below 6,000 feet ngvd in some intermontane "parks." Native forest communities of ponderosa pine and Douglas fir dominate the montane zone, with aspen and lodgepole pine occurring on disturbed sites. Below the montane zone, grasses, pinyon-juniper and shrub species predominate. The Leadville NFH and Colorado Fishery Resources Office are located in this ecoregion.

Threats to the biological integrity of this ecoregion include logging, mining activities and recreational development. Opportunities exist to work with public land management and regulatory agencies to conserve and restore important fish and wildlife resources in the Southern Rockies.

Southwestern Tablelands - The Southwestern Tablelands extend throughout much of eastern Colorado, northeastern New Mexico, and portions of northwestern Oklahoma and Texas. The topography consists largely of sandstone and gypsum mesas and outcrops bisected by tributaries of the Arkansas, Cimarron, North Canadian, and Canadian rivers. The natural communities of this ecoregion are dominated by shortgrass prairies and shinnery oak scrub. Average annual precipitation ranges from less than 15 inches to about 21 inches. Maxwell NWR, Washita NWR and Mora NFH are located within this ecoregion.

Resource threats in this ecoregion center on conversion of native grasslands and scrublands to agricultural production, and overgrazing by domestic livestock. Management opportunities include improvements in grazing regimes, fencing riparian zones, and restoration of native grasslands. Species of special management concern in this ecoregion include the lesser prairie chicken, other ground nesting grassland birds, and swift fox.

Western High Plains - Southwestern Kansas, southeastern Colorado, much of the Oklahoma panhandle, and portions of the Texas panhandle north and south of Amarillo fall within this Omernick ecoregion. Much of this area slopes gently to the east, with elevations ranging from 4,400 feet ngvd to 2,800 feet ngvd. Shortgrass prairie dominates the natural communities of this ecoregion, with playa lakes occurring throughout. Average annual precipitation is about 20 inches. Optima NWR and Buffalo Lake NWR occur in the Western High Plains.

Large areas of the ecoregion have been converted to irrigated agriculture, drawing upon the Ogallala aquifer as a water source. In the remaining areas of shortgrass prairie habitat, invasion by honey mesquite has degraded habitat for native wildlife species as well as for livestock grazing. Restoration of playa lakes and surrounding shortgrass prairie habitat in cooperation with partner agencies and landowners is a high priority.

Central Great Plains- This ecoregion extends in a broad band from south-central Kansas through western Oklahoma and the northwestern portion of the body of Texas, sloping from 2,000 feet ngvd in the west to about 1,000 feet ngvd in the east. The area consists of rolling plains bisected by most of the major east-west flowing rivers of the Arkansas/Red Rivers Ecosystem. Annual precipitation averages about 27 inches. Native vegetative communities are dominated by mid- to tallgrass prairie, with riparian forest of varying widths occurring within the floodplains of the major streams. A notable geographic feature of this ecoregion is the Wichita Mountains of southwestern Oklahoma. Quivira NWR, Salt Plains NWR and Wichita Mountains NWR are found in this ecoregion. In addition, Cheyenne Bottoms Wildlife Management Area, one of two Internationally recognized Ramsar wetland sites located in the Ark/Red, is located in the northern part of the Central Great Plains ecoregion.

Cultivated agriculture and livestock grazing have altered nearly all of the natural communities of this Ark/Red ecoregion. Invasion of much of the remaining native grasslands by eastern red cedar has appreciably decreased its wildlife resource and grazing value. Opportunities exist to improve grazing regimes and restore native grasslands through a variety of Federal, State and local programs and initiatives.

Flint Hills - Within the Arkansas/Red Rivers Ecosystem the Flint Hills ecoregion extends in a roughly 30-mile wide band from north-central Oklahoma northward to the northern Arkansas/Red Rivers Ecosystem boundary in Kansas. Precipitation averages up to 40 inches annually in this ecoregion. The limestone derived soils support a native tallgrass prairie community, which is probably the most intact of any of the ecoregions in the Arkansas/Red Rivers Ecosystem. Flint Hills NWR occurs in the northern portion of this ecoregion.

Threats to important fish and wildlife resources within this ecoregion include construction and operation of stream impoundments, livestock grazing and further fragmentation of the tallgrass prairie ecosystem by transportation, utility and municipal development. Opportunities exist to improve grazing regimes on private lands, and to work with Federal and State agencies and private organizations, such as The Nature Conservancy and Sutton Avian Research Center to gain more information to better manage declining resources such as grassland birds within the Flint Hills and other ecoregions.

Central Oklahoma/Texas Plains - This ecoregion is found from north-central Oklahoma to southern Oklahoma, and includes much of the Red River drainage in northern Texas. The overall slope is to the southeast, from 1,200 feet ngvd in the north to 600 feet ngvd along the Red River. Average annual precipitation is about 40 inches. The natural vegetation consists of a mixture of post oak-blackjack oak forest and savannah and tallgrass prairie communities. The topography is generally rolling to hilly, with the Arbuckle Mountains of south-central Oklahoma forming a distinct feature of this ecoregion. Deep Fork NWR, Tishomingo NWR, Hagerman NWR, Little River NWR, and Tishomingo NFH occur within this ecoregion.

The majority of this ecoregion has been fragmented into relatively small private ownerships, making management of key biological components difficult. The opportunities that exist for management of important fish and wildlife resources center on the few larger public holdings and smaller private ownerships where cooperative projects designed to protect or restore wetland, prairie and savannah habitats can be implemented.

Texas Black Prairies - The northern portion of this ecoregion extends into the Arkansas/Red Rivers Ecosystem in northeastern Texas. The natural communities are dominated by tallgrass prairies, although the vast majority have been converted to cultivated agriculture. The topography is generally level to gently rolling and averages about 600 feet ngvd. Opportunities for cooperative restoration of wetland and native prairie habitat exist on individual private land holdings.

East Central Texas Plains - A very small portion of this ecoregion occurs in the Arkansas/Red Rivers Ecosystem just east of the Texas Black Prairies. The natural communities of this ecoregion are similar to those of the southeastern part of the Central Oklahoma/Texas Plains, with post oak-blackjack oak and tallgrass prairie species predominating. Management opportunities here are similar to those in that ecoregion through cooperative efforts with private landowners.

Central Irregular Plains - Large portions of northeastern Oklahoma and southeastern Kansas are included in this ecoregion. Precipitation averages about 40 inches annually. The predominant natural community is tallgrass prairie. Low rolling hills dominate the landscape, which slopes gently to the southeast. Some post oak-blackjack forest and cave habitats also occur in this ecoregion, largely in areas of limestone outcrops and locations with thinner soils. The Arkansas River bisects the southern portion of this ecoregion, with the Neosho River and its tributaries draining the majority of the area.

Much of this ecoregion has been converted to cultivated agriculture and introduced grassland pasture. Various development activities also have resulted in habitat fragmentation in additional areas. Conservation and restoration of wetlands and native prairies are possible on private lands throughout the ecoregion on a relatively small scale through Service programs and partnerships with public and private cooperators.

Ozark Highlands/Boston Mountains - These ecoregions extend into northeastern Oklahoma and northwestern Arkansas, with topography consisting of rugged hills and low mountains bisected by numerous streams. The highest elevations reach above 1,500 feet ngvd, with the general slope of the area to the southwest, and drainage primarily to the Illinois and Neosho rivers. Annual precipitation averages over 42 inches. The natural communities of this ecoregion are dominated by a western extension of the oak-hickory forest. More mesic floodplain forests occur along the major streams of the region. An additional dominant feature of these ecoregions is the extensive network of cave habitats formed in the underlying limestone parent material. Numerous rare, endangered and endemic fish and wildlife species are associated with and dependent upon these habitats. The Ozark Plateau NWR, Logan Cave NWR and Neosho NFH are located within these ecoregions.

Opportunities exist to work with private landowners to manage various biological components of these ecoregions. Special emphasis is given to formation of partnerships with private landowners for protection and management of cave resources within these ecoregions.

Arkansas Valley - The lower portion of the Arkansas River valley from the confluence with the Neosho River downstream to eastern Arkansas form this ecoregion. Annual precipitation here averages over 45 inches. In addition to the river floodplain, this ecoregion also includes several isolated hills, including the Sans Bois Mountains in Oklahoma which rise over 1,200 feet above the surrounding floodplain. Dominant natural vegetation of the Arkansas River floodplain includes forests of oak, elm and hackberry, with well-developed understories. Sequoyah NWR and Holla Bend NWR are located in this ecoregion. Natural communities of the isolated hills are typical of the Ozark Highlands/Boston Mountains and Central Oklahoma/Texas Plains.

The natural communities of this ecoregion have been significantly altered by timber harvesting, cultivated agriculture, and development of the McClellan-Kerr Arkansas River Navigation System. The series of locks, dams and reservoirs associated with the latter have inundated vast areas of this ecoregion, and resulted in additional fish and wildlife resource impacts from secondary development activities. Opportunities exist to work with other Federal and State agencies and private landowners to conserve and restore wetland and forested habitats in this ecoregion.

Ouachita Mountains - This ecoregion is located in southeastern Oklahoma and southwestern Arkansas. Elevations vary from nearly 3,000 feet ngvd to about 700 feet ngvd. Annual precipitation in this ecoregion approaches 60 inches annually in some locations. The dominant vegetation of the natural communities include shortleaf pine savannah with an understory of tall grasses. Oak-hickory forest communities are found in more mesic north-facing slopes and in ravines. In addition bottomland hardwood forests occur in the floodplains of the larger streams draining this ecoregion, including the Kiamichi, Glover, Cossatot, and Little rivers.

Significant impacts to the natural communities of this ecoregion are largely associated with commercial forest management and conversion to other uses, such as agriculture and reservoir impoundments. Large areas of the Ouachitas have been clear-cut and converted to loblolly pine plantations, with significant effects on sensitive species such as the red-cockaded woodpecker and leopard darter. Distinct opportunities exist to coordinate with other Federal and State agencies and large corporate landowners in this ecoregion to restore pine savannah, floodplain forest and stream habitat. A proposed large-scale land exchange between the Weyerhaeuser Corporation and U.S. Forest Service potentially can provide considerable opportunity for such cooperative recovery efforts.

South Central Plains - Portions of southeastern Oklahoma, Southwestern Arkansas, northeastern Texas, and northwestern Louisiana drained by the Red River make up this ecoregion. Precipitation in this ecoregion averages over 45 inches annually. Dominant natural communities consist of moist upland forests of gums and oaks, as well as true bottomland hardwood forests along streams and rivers. Stands of loblolly pine also occur in the more mesic upland sites. The Little River and Cossatot NWR's and Natchitoches NFH are located in this ecoregion, as well as Caddo Lake, one of two Ramsar wetland sites found in the ecosystem.

Major threats to the biological resources of the South Central Plains include drainage of floodplain wetlands for agricultural and forestry management purposes, stream channelization for navigation and other related developments, and clearing of forested habitats. Despite the many threats to the fish and wildlife resources of this ecoregion, many opportunities also exist to restore wetland and forested habitats in cooperation with Federal and State agencies, and with private landowners.

Mississippi Alluvial Plain - A very small part of this ecoregion enters the Ark/Red along the Arkansas River in eastern Arkansas. This area experiences about 50 inches of precipitation annually. The natural vegetation of this ecoregion was dominated by bottomland hardwood forest species, although the vast majority of the area has been converted to cultivated Agriculture.

In cooperation with other agencies and individual landowners, there is a great opportunity to restore wetland and forested habitats to the Mississippi Alluvial Plain.

Big Rivers - While not defined by Omernick as an ecoregion, due to the importance of the Big Rivers within the Arkansas/Red Rivers Ecosystem to management of important fish and wildlife resources, the river beds and associated riparian zones of the following streams are included within a separate ecoregion: Arkansas, Red, Cimarron, Beaver/North Canadian, Canadian, Washita, Deep Fork, and Neosho rivers. A similar characteristic of the natural habitat of all of these rivers is the presence of a shifting alluvial substrate which is periodically scoured of vegetation and formed into gravel and sandbar habitat and braided stream habitat by recurring flood events. Sandhill cranes, Interior least terns, waterfowl, bald eagles, shorebirds, numerous other migratory and resident bird species, and a distinct assemblage of fish and other aquatic species depend upon these habitats for roosting, nesting, spawning, and feeding habitat.

Much of the original habitat provided by the Big Rivers ecoregion has been lost to reservoir inundation, channelization, urbanization, water depletion, and other human induced impacts. Opportunities exist, in cooperation with land and water management agencies, to restore some degree of the habitat value provided by this riverine habitat for important fish and wildlife resources.

Objectives, Strategies and Action Items

A. Water Conservation

Objective 1. Water Quantity Maintenance and Improvement

With partners, and under the constraints of State primacy in matters concerning water allocation, the Service will seek methods to facilitate the conservation of water resources for the management of important fish and wildlife species and habitats, with emphasis on areas downstream of Federal water management facilities. Efforts will concentrate on the maintenance of instream flows and groundwater resources to support native flora and fauna. Maintenance and development of an adequate water supply for wetlands management on existing Service lands and partners' projects also will be emphasized. Specific areas of concern include instream flows, springs, caves, and groundwater and alluvial aquifers.

Strategy 1. Facilitate adequate stream flows for conservation of fish and wildlife resources.

- A. Participate in water needs assessments to inventory water resources in the Arkansas/Red Rivers Ecosystem and provide background on available water resources.
- B. Participate in stream compact commissions and similar organizations to better understand and influence water resources allocation in the Ark/Red.
- C. Determine recommended stream flows regimes for major rivers and their tributaries within the Ark/Red; emphasize flow needs downstream of federally-controlled facilities.
- D. Identify principal water quantity management authorities and their user groups in the Ark/Red Ecosystem.
- E. Maintain adequate system flows in the Arkansas/Red Rivers Ecosystem by protecting, restoring, and enhancing riparian/floodplain wetlands as natural water storage and release areas.
- F. Obtain ready access to discharge and water level records via Internet and CD-ROM technology.

Strategy 2. Facilitate conservation of groundwater resources.

- A. Identify recharge and outflow areas for the major aquifers of the Ark/Red.
- B. Identify conservation methods to maintain and restore groundwater levels.

Strategy 3. Facilitate adequate water supplies for wetland management.

- A. With partners, identify water resources essential to management of existing wetland habitats, and restoration of degraded wetland habitats, both on and off Service lands.

Objective 2. Water Quality Maintenance and Improvement

With partners and stakeholders, assure that Federal and State water quality standards are established and applied in a manner that protects and enhances all aquatic resources. These strategies and actions will promote restoration of focus species and habitats while contributing to overall biodiversity conservation in the Ark/Red.

Strategy 1. Maintain and improve surface water quality for conservation of fish and wildlife resources.

- A. Cooperate with Federal/State agriculture agencies to improve non-point source water quality in Ark/Red streams.
- B. Increase use of the Partners for Wildlife Program (PWP) and other available programs to enhance riparian wetlands on private lands as a method of improving stream water quality.
- C. Assure adequate monitoring of contaminant effects on and off Service lands within the Ark/Red.
- D. Assure adequate treatment of any effluents generated on or leaving Service lands or facilities.
- E. Protect/restore riparian habitat on Service lands as an aid to water quality improvement.
- F. Demonstrate the use of constructed and restored wetlands for water quality improvement.
- G. Establish upland vegetated buffers around important wetland habitats to reduce sedimentation and contaminant/nutrient inputs.
- H. Determine water quality impacts of confined animal feeding operations (i.e., CAFO'S) in the Ark/Red.
- I. Work with State and Federal agencies to strengthen water quality standards, discharge limits and use designations of aquatic and wetland resources throughout the Ark/Red.
- J. Participate in contaminant contingency planning and establish a Service/partner response team to protect and restore trust resources.
- K. Identify principal water quality-related authorities and potential partners in the Ark/Red.
- L. Identify and prioritize areas of the Arkansas/Red Rivers Ecosystem where water quality does not meet Federal and State water quality standards or otherwise impairs support for native flora and fauna.
- M. Use Service statutory authorities, in conjunction with partners, to ensure that water quality standards are met to protect native flora and fauna.
- N. Use Service authorities under Superfund to protect and restore native species and habitats in the Arkansas/Red Rivers Ecosystem, with emphasis on early involvement.
- O. Use Service authorities under ESA, MBTA, Refuge Administration Act, Oil Pollution Act, and other statutes to ensure protection/restoration for native species and habitats affected by oil and gas operations.

Strategy 2. Maintain and improve groundwater quality for conservation of fish and wildlife resources.

- A. Conduct or facilitate water quality monitoring of groundwater resources related to important fish and wildlife resources of the Ark/Red.

B. Species and Habitat

Objective 1. Focus Species Conservation and Restoration

The Arkansas River and its tributaries drain portions of seven states. As a result of the large area contained within the ecosystem, an enormous number of species occupy its diverse habitats. Identified focus species groups include migratory birds, federally-listed, proposed, candidate, and species of concern, as well as interjurisdictional fisheries, and non-indigenous species. Some non-indigenous species are perceived as beneficial and desired while others are considered harmful. Even though this objective treats the needs of individual or groups of species, the majority of action items identified seek to conserve, restore or enhance the habitats upon which these species depend.

Strategy 1. Conserve and restore migratory birds

- A. Increase aerial surveillance for enforcement of illegal take of migratory birds.
- B. Continue and increase raptor electrocution enforcement.
- C. Continue investigation of oilfield and chemical hazards causing migratory bird mortality.
- D. Conduct and facilitate research related to diseases of migratory birds.
- E. Improve important habitat on NWR's for migratory birds.
- F. Ecological Services and Law Enforcement to cooperate to develop case to prosecute take of habitat (i.e., under MBTA).
- G. Increase LE budget for migratory bird enforcement in the Ark/Red.
- H. Conduct and facilitate investigations to identify neotropical bird species use of Ark/Red NWR'S.
- I. Use Service authorities under the Clean Water Act (Section 404), Fish and Wildlife Coordination Act, Migratory Bird Treaty Act, Endangered Species Act, and Bald and Golden Eagle Protection Act to ensure protection/restoration of migratory birds on and off Service lands.

Strategy 2. Conserve and restore interjurisdictional fisheries.

- A. Perform status surveys for listed, rare and declining aquatic interjurisdictional species.
- B. Propagate and restore listed, rare and declining aquatic interjurisdictional species to their native ranges within the Ark/Red.
- C. With partners, facilitate and conduct assessments of the aquatic resources in Ark/Red.
- D. Conserve and restore interjurisdictional fishery resources on Service lands throughout the Ark/Red.

Strategy 3. Conserve and recover listed, proposed, candidate, and species of concern.

- A. Develop a species list with known ranges for all vertebrate species within the Arkansas/Red Rivers Ecosystem.
- B. Increase emphasis on LE activities to protect essential wintering and nesting areas for endangered species.
- C. Protect and restore the diversity and integrity of important aquatic, wetland and terrestrial habitats within the Ark/Red for listed, proposed, candidate, and species of concern.
- D. Implement priority recovery tasks for all listed species within the Ark/Red.
- E. Conduct and facilitate investigations related to prioritized species of concern.
- F. Assess, develop and utilize capability at NFH's to hold and possibly propagate native mussels and other declining aquatic species.
- G. Continue to develop MOU's with other agencies for conservation of species of concern.
- H. Maintain ongoing surveys and monitoring efforts for listed, proposed, candidate, and species of concern.
- I. Conduct baseline survey for 18 imperiled fish species in Ark/Red.
- J. Prioritize recovery efforts among 0 listed, candidate and species of concern within the Ark/Red in order to efficiently manage limited funds and recovery opportunities.
- K. Develop BMP's for listed, candidate and species of concern for use by Ark/Red landowners; facilitate HCP's and Safe Harbor agreements.

Strategy 4. Management of non-indigenous species

- A. Monitor spread of zebra mussels throughout the Ark/Red.
- B. Coordinate with State contacts on non-indigenous species issues and participate in existing multi-agency teams addressing non-indigenous species.
- C. Provide information to the public explaining the hazards of introductions of non-indigenous species, and encourage control methods.

Objective 2. Conserve and Restore Focus Habitats

The Ark/Red contains a tremendous variety of important habitats. Many are under threat due to human alterations and developments such as urban and agricultural expansions, forestry practices, and cave exploration and development. Habitats of significant importance which are under threat include wetlands, streams (including Big Rivers) and floodplain forests (including bottomland hardwoods), native grasslands, upland forests and cave systems.

Strategy 1. Conserve and restore wetland and bottomland hardwood habitats.

- A. Establish an organized protection plan and funding base for important wetland and bottomland hardwood habitats throughout the Ark/Red.
- B. Acquire wetlands/bottomland hardwoods with Duck Stamp/LWCF on suitable sites throughout the Ark/Red.
- C. Restore wetlands/bottomland hardwoods on suitable sites throughout the Ark/Red, on and off Service lands.
- D. Monitor representative aquatic and wetland habitats for data base development.
- E. Construct moist soil units on NWR's throughout the Ark/Red.
- F. Acquire and utilize tree planters and related equipment at field stations throughout the Ark/Red.
- G. Cooperate with agency partners and landowners in implementing forestry BMP'S, especially in bottomland hardwood habitat.
- H. Encourage forest product companies to insure reforestation of private lands following timber harvest, especially in bottomland hardwoods.
- I. With partners, accomplish wetland delineation per national Memorandum of Understanding among DOI, DOD, USDA, and EPA.
- J. Identify and prioritize bottomland hardwood and wetland habitats in the Arkansas/Red Rivers Ecosystem.
- K. Utilize the PWP to accomplish habitat restoration projects for priority areas, habitats, and target species.
- L. Meet Service responsibilities for ensuring mitigation in the Arkansas/Red Rivers Ecosystem to reduce habitat and species impacts caused by human development. Pursue innovative partnership opportunities to complete priority mitigation projects, including use of the mitigation banking concept.
- M. Complete Congressionally mandated management planning and data collection on NWR's throughout the Ark/Red.
- N. Conduct and facilitate investigations designed to identify optimum management procedures for bottomland hardwoods and wetlands throughout the Ark/Red.

Strategy 2. Conserve and restore Big River habitats.

- A. Conserve and restore the aquatic diversity of Ark/Red Big Rivers.
- B. Conserve and restore sandbar habitat in Ark/Red Big Rivers.
- C. Conserve and restore backwater and oxbow habitats associated with Ark/Red Big Rivers.

Strategy 3. Conserve and restore prairie stream and riparian habitats.

- A. Conserve and restore the aquatic diversity of prairie stream and riparian habitats.

Strategy 4. Conserve cave systems.

- A. Control human access to important NWR and other public cave habitats throughout the Ark/Red.
- B. Work with partners via PWP to cooperatively gate caves on private lands to protect cave habitat and species.

Strategy 5. Conserve and restore native grassland habitats.

- A. Conduct and facilitate inventories, studies, and assessments on prairie species (i.e., flora and fauna) within Ark/Red.
- B. Determine cause and effect of decline of prairie species (emphasis on migratory birds and species of concern).
- C. Establish cooperative partnerships to conserve and restore native grasslands and savannahs on private lands throughout the Ark/Red.
- D. Conserve and restore NWR native grasslands throughout the ARRE.
- E. Conduct needed research activities on NWR's relative to management of native grassland species and systems.
- F. Develop management plans to protect shortgrass prairie.

Strategy 6. Conserve and restore native upland forest and savannah habitats.

- A. Cooperate with agency partners and landowners in implementing forestry BMP's on private lands

C. Quality of Human Life

Objective 1. Increase Public Outreach Efforts Relative to Service Programs

Conservation of our wildlife heritage can only be accomplished by increasing public knowledge of the related problems and opportunities through environmental education, exhibits, pamphlets, and other means.

Strategy 1. Increase public awareness of relationship between fish and wildlife resource conservation and quality of human life.

- A. Establish an ecosystem-wide outreach position for the Ark/Red.
- B. In consultation with partners, develop a cross-program, ecosystem-wide public outreach strategy addressing major habitat-related problems, threats and opportunities.
- C. Increase staffing for outreach personnel at Ark/Red field stations.
- D. Develop a media symbol for the Ark/Red.
- E. Restore and enhance wetlands on private lands and establish outdoor classrooms throughout the Ark/Red.
- F. Develop an ecosystem-specific vision statement for the Ark/Red associated with the media symbol, logo, displays and other outreach material.
- G. Develop an Ark/Red newsletter.
- H. Develop traveling display on Biodiversity and general Biological Information concerning the Ark/Red.
- I. Expand the existing database for media contacts to include all of the Ark/Red.
- J. Develop posters: Plight of the Prairies - FY97, Bottomland Hardwoods - FY98.
- K. Develop public service announcements (PSA) on Biodiversity and Endangered Species in Ark/Red. Fund airtime (television and radio) for PSA'S. Increase print media distribution (newspapers, magazines, etc.) for PSA'S.
- L. Provide information booths at International Airports within the Ark/Red on biodiversity and import/export regulations.
- M. Develop/purchase school book covers promoting the ecosystem approach to managing fish and wildlife resources.
- N. Establish study/outreach centers at Ark/Red NWR's and NFH's for focus species and habitats.
- O. Support National Fishing Week and other outreach efforts by sponsoring annual fishing clinics, derbies, and develop programs for target groups.
- P. Coordinate with the State fish and wildlife resource agencies in development of environmental education center and other outreach facilities.
- Q. Construct and staff needed visitor centers, environmental education centers, and other interpretive resources at Ark/Red NFH's and NWR'S.
- R. Develop habitat and species-specific endangered species regulations information for distribution to private landowners within the Ark/Red.
- S. Purchase biodiversity display from Smithsonian Institution.
- T. Explore possibility of obtaining educational media relating to biodiversity from television science series Bill Nye - "The Science, Guy".
- U. Develop demonstration area (possibly at a NWR) for "Backyard Habitat" plantings.
- V. Develop curriculum/classroom projects relating to Ark/Red issues.
- W. Develop an identification brochure for selected Ark/Red species to increase public awareness, and as an aid to increase monitoring efforts, and to help establish status and trends.
- X. Encourage resource agencies to conduct environmental education programs in the public schools.
- Y. Encourage corporate support of environmental education programs in the public schools.
- Z. Identify partners and resources available to cooperatively educate target audiences (i.e., "publics") in the Ark/Red.

- AA. Develop professional outreach efforts to inform the general public and potential partners of ecosystem management principles and priorities (e.g. partnerships, bottom-up approach, ongoing and long-term effort) in the Service.
- BB. Increase public awareness of hunting and fish opportunities as essential elements of good ecosystem management.
- CC. Increase public awareness of nontraditional resource opportunities as valued inputs to ecosystem management.
- DD. Increase public awareness of people as an important component and an important concern in the Arkansas/Red Rivers Ecosystem.
- EE. Develop educational programs related to urban wildlife-human conflict awareness and resolution.

Objective 2. Improve Outdoor Recreational Opportunities

There is an increased demand for outdoor recreational activities with the expanding human population in the Ark/Red Ecosystem. Popular activities include bird watching, fishing, hiking, and hunting, among others.

Strategy 1. Provide recreational opportunities to increase public enjoyment and awareness of relationships between fish and wildlife resource conservation and quality of human life.

- A. Assist in the management of recreational fishes and related habitats (on federal and trust lands) within the Ark/Red.
- B. Develop recreation plans for Ark/Red NWR's and NFH'S, where appropriate.
- C. Encourage other agencies, such as the Corps of Engineers and State parks departments, to emphasize fish and wildlife resource-related outdoor recreation on lands under their jurisdiction.
- D. Identify partners involved in traditional and non-traditional recreational programs within the Arkansas/Red Rivers Ecosystem.
- E. Identify partners and areas where sustainable recreational opportunities can be enhanced without impacts on natural resources in the Arkansas/Red Rivers Ecosystem.
- F. Maintain traditional hunting and fishing programs (e.g., Pathways to Fishing, National Recreational Fishing Policy, Refuge hunting and fishing) that provide direct public access and enjoyment of natural resources and promote public awareness and participation in ecosystem concepts.
- G. Develop non-traditional fish and wildlife management programs that provide direct public access and enjoyment of natural resources and promote public awareness and participation in ecosystem concepts/ programs.
- H. Promote urban and youth fish and wildlife programs to increase ecosystem awareness and participation.

Summary

This Arkansas/Red Rivers Ecosystem Plan was designed as a communication tool to alert decision makers within the Service, as well as partners, to the resources that occur here, and the priorities established by the Ecosystem Team for management of Trust resources. The Plan will be updated periodically as resource management needs and opportunities evolve. The key to successful implementation of the Plan is involvement of partners from Federal, State and local governments, and the private sector, especially landowners. To this end, the Ark/Red Team dedicates this Plan to the Trust resources and people we serve.

Appendix I.

Flint Hills NWR

Key Legislation and Policies

Antiquities Act (1906): Authorizes the scientific investigation of antiquities on Federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Migratory Bird Treaty Act (1918): Designates the protection of migratory birds as a Federal responsibility. This Act enables the setting of seasons, and other regulations including the closing of areas, Federal or non-Federal, to the hunting of migratory birds.

Migratory Bird Conservation Act (1929): Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934): Authorized the opening of part of a refuge to waterfowl hunting.

Fish and Wildlife Act (1956): Established a comprehensive national fish and wildlife policy and broadened the authority for acquisition and development of refuges.

Fish and Wildlife Coordination Act (1958): Allows the Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Refuge Recreation Act (1962): Allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.

Land and Water Conservation Fund Act (1965): Uses the receipts from the sale of surplus Federal land, outer continental shelf oil and gas sales, and other sources for land acquisition under several authorities.

National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee. (Refuge Administration Act): Defines the National Wildlife Refuge System and authorizes the Secretary to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The Refuge Improvement Act clearly defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, or environmental education and interpretation); establishes a formal process for determining compatibility; established the responsibilities of the Secretary of Interior for managing and protecting the System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

National Historic Preservation Act (1966) as amended: Establishes as policy that the Federal Government is to provide leadership in the preservation of the nation's prehistoric and historic resources.

Architectural Barriers Act (1968): Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

National Environmental Policy Act (1969): Requires the disclosure of the environmental impacts of any major Federal action significantly affecting the quality of the human environment.

Endangered Species Act (1973): Requires all Federal agencies to carry out programs for the conservation of endangered and threatened species.

Rehabilitation Act (1973): 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.

Archaeological and Historic Preservation Act (1974): Directs the preservation of historic and archaeological data in Federal construction projects.

Clean Water Act (1977): Requires consultation with the Corps of Engineers (404 permits) for major wetland modifications.

Executive Order 11988 (1977): Each Federal agency shall provide leadership and take action to reduce the risk of flood loss and minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

American Indian Religious Freedom Act (1978): Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Archaeological Resources Protection Act (1979) as amended: Protects materials of archaeological interest from unauthorized removal or destruction and requires Federal managers to develop plans and schedules to locate archaeological resources.

Emergency Wetlands Resources Act (1986): The purpose of the 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."

Federal Noxious Weed Act (1990): 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.

Native American Graves Protection and Repatriation Act (1990): Requires Federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Americans With Disabilities Act (1992): Prohibits discrimination in public accommodations and services.

Executive Order 12996 Management and General Public Use of the National Wildlife Refuge System (1996): Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the System.

Executive Order 13007 Indian Sacred Sites (1996): Directs Federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Appendix J.
Flint Hills NWR
Cooperative Agreements



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR,
BUREAU OF SPORT FISHERIES
AND WILDLIFE

*R. K. ...
H. ...
B. ...*

*copy to Reulter
RBS
Cadeiry*

14. General William F. Cassidy
Chief of Engineers
Corps of Engineers
Department of the Army
Washington, D. C. 20315

SEP 1 1966

LA-Cooperation
Corps of Engineers - Kansas
John Redmond Dam and
Reservoir Project- Kansas
LA- Kansas
Flint Hills

Dear General Cassidy:

Reference is made to Mr. Sherry E. Myers' letter of August 11, transmitting three copies of the executed Cooperative Agreement for the John Redmond Dam and Reservoir Project, Kansas.

This Cooperative Agreement is designed to implement the General Plan approved by the Director, Forests, Forestry, Fish and Game Commission on March 11, 1965; by the Secretary of the Army on June 26, 1965; and by the Secretary of the Interior, on August 19, 1965. The area of approximately 18,549.77 acres will be managed by this Bureau as a national wildlife refuge.

This Agreement has been executed on behalf of the Bureau of Sport Fisheries and Wildlife and we are returning two copies as requested. One copy is being retained by this Bureau.

We appreciate your efforts in making this land available to the Bureau for management for the national migratory bird resource. Our field people will work with your District Office in implementing the refuge program.

Sincerely yours,

(Sgd) A. V. Tunison

Acting Director

Enclosures 2

cc: Regional Director, Albuquerque, New Mexico w/c Agreement w/o Exhibit

E/z pls issue Newsrelease AT TIME APPROPRIATE FOR HUNTING ARRANGEMENT. 2/25/66

RECEIVED
BSF&W-REG. 2
SEP 6 1966
OFFICE OF THE
REGIONAL DIRECTOR

DEPARTMENT OF THE ARMY
Washington, D.C.

11 AUG 1966

Director, Bureau of Sport Fisheries
and Wildlife
Department of the Interior
Washington, D. C.

Dear Sir:

Reference is made to the General Plan for Use of Project Land and Water Areas for Wildlife Conservation and Management within the John Redmond Dam and Reservoir Project, Kansas, approved by the Director, Kansas Forestry, Fish and Game Commission on 11 March 1965, by the Secretary of Army on 24 June 1965, and by the Secretary of Interior on 19 August 1965.

Inclosed is a proposed Cooperative Agreement designed to implement the said General Plan by making available to the Bureau of Sport Fisheries and Wildlife, Department of the Interior, approximately 13,545.71 acres of land and water at the said project for wildlife conservation purposes. The approval of the Acting Regional Director, Bureau of Sport Fisheries and Wildlife, Albuquerque, New Mexico, dated 12 May 1966, is inclosed (Incl 2). The proposed agreement has been executed in triplicate on behalf of the Department of the Army. It is requested that, if satisfactory, the proposed Cooperative Agreement be executed in triplicate on behalf of the Department of Interior and that two executed copies be returned to this department. The remaining copy is intended for the files of your department.

Sincerely,

(Signed)

- 2 Incls
1. Cooperative Agreement (trip)
2. Cy ltr 12 May 1966

Sherry B. Myers
Deputy Director
Mil Const and Real
Property, OASA(I&L)

COOPERATIVE AGREEMENT
BETWEEN THE DEPARTMENT OF THE ARMY
AND THE DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE

THIS AGREEMENT, made and entered into this 9th day of August 1966 between the Department of the Army and the Department of the Interior through the United States Bureau of Sport Fisheries and Wildlife hereinafter referred to as the Bureau, WITNESSETH THAT:

WHEREAS, the United States, through the Department of the Army, has acquired certain lands in fee (minerals subordinated) for the John Edmond Dam and Reservoir Project; and

WHEREAS, pursuant to the authority contained in Section 3 of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), there has been formulated a General Plan for fish and wildlife management in the John Edmond Dam and Reservoir Project, and said Plan has been approved by the Secretary of the Army, the Secretary of the Interior, and the head of the agency of the State of Kansas exercising administration of wildlife resources within the State:

NOW THEREFORE, in accordance with Section 4 of the Act of Congress approved 22 December 1944, as amended (76 Stat. 1195; 16 U.S.C. 460d), and the aforesaid Fish and Wildlife Coordination Act and General Plan, the parties hereto enter into this Cooperative Agreement.

THE DEPARTMENT OF THE ARMY hereby makes available to the Bureau the land and water areas of the John Edmond Dam and Reservoir Project as shown substantially in red on the attached drawing numbered JR-0 1/2 and labeled Exhibit "A" and as described in Exhibit "B". for the purpose of development, conservation and management of wildlife resources thereon in accordance with said General Plan. Said exhibits are attached hereto and made a part hereof. This Cooperative Agreement shall be subject to the provisions and conditions of the said General Plan and to the following additional conditions:

1. The Department of the Army reserves all rights, in and to the lands above described, which are not herein specifically granted, and the right to use existing roads as a means of ingress and egress to and from the John Edmond Reservoir, the Strawn, Hartford and Lebo ramps and to any areas which the Department of the Army administers. In those cases where no roads exist, the Department of the Army reserves the right to designate, construct, maintain, and use roads or routes

across said lands. No part of the foregoing shall be construed as a commitment by the Department of the Army to construct, improve, or maintain any road or route.

2. The use and occupation of the said premises shall be without cost or expense to the Department of the Army, under the general supervision of the District Engineer, Corps of Engineers, Tulsa District, 616 South Boston Avenue, Tulsa, Oklahoma, hereinafter referred to as the "District Engineer", and subject also to such rules and regulations in the interest of flood control as he may from time to time prescribe,

3. That the Bureau shall, subject to the availability of funds for this purpose, correct any damage to the land and water areas included in this agreement which results as an incident to the use of said areas by the Bureau.

4. That the use of the land and water areas for wildlife conservation and management shall be subject at all times to occupation and use by the Department of the Army for all primary purposes of the project. The District Engineer shall give notice to the Bureau prior to conducting any activities on the premises covered by this agreement which may substantially affect the wildlife conservation and management program.

5. That it is understood and agreed that the ownership of the United States in the area described in Exhibit "B" is subject to certain outstanding rights in third parties, such as easements for public roads and highways, access roads, pipelines, transmission lines, livestock watering locations and similar matters. It is therefore agreed that the uses and administration of the area described herein shall be subject to all such existing rights and to subsequent rights granted in accordance with the procedures prescribed in Condition 8 of this Cooperative Agreement.

6. It is understood that the privileges hereby granted do not preclude the necessity of obtaining from the Department of Army permits for work and structures, in, under or over navigable waters as may be required under the provisions of Section 10 of the Act of March 3, 1899 (30 Stat. 1151; 33 U.S.C. 403).

7. No additions to or alterations of the premises shall be made without the prior written consent of the said District Engineer.

8. That the Department of the Army reserves unto itself the right to grant easements, leases and licenses for any purpose whatsoever.

Any application for easement, lease or license received by the Bureau shall be referred with recommendations to the said District Engineer for processing. Applications for easements, leases and licenses received by the Department of the Army will be coordinated with the Bureau for its recommendations. The Department of the Army will give full consideration to any adverse effect any proposed grant may have upon the wildlife management program prior to the execution of any such easement, lease or license. That the Bureau, in exercising its Governmental or proprietary functions, may plant and harvest crops, either directly or by service contract or under sharecrop agreements with local farmers, to provide (a) food for wildlife; (b) necessary compensation to farmers under any sharecrop agreement; and (c) a reasonable reserve to allow for a poor crop season. This reserve, if not needed for wildlife feeding purposes, may be sold by the Bureau and the proceeds from sales used to defray other costs of administering the fish and wildlife program at this project. Furthermore, the lands will not be utilized by the Bureau for the production of crops or any other purpose solely to produce revenue. Lands within the area available for lease for agricultural, grazing, or other purposes other than the farming and sharecropping activities of the Bureau will be leased by the District Engineer. The Bureau will establish and maintain adequate records regarding its management and farming activities. In the event that the Bureau should derive any net revenue from the management of this land, such revenue shall be paid the District Engineer at the end of each fiscal year.

9. That the Bureau assumes all responsibility for any mosquito abatement and/or control program that may be required for the premises.

10. That, as of the commencement date of this agreement, an inventory and condition report of all property and improvements of the Department of the Army included in this agreement shall be made by a representative of the Department of the Army and a representative of the Bureau to reflect the then present condition of said property. A copy of said inventory and condition report shall be attached hereto as Exhibit "C" and become a part hereof as fully as if originally incorporated herein. Upon the expiration, revocation, or termination of this agreement, a similar inventory and condition report shall be prepared and submitted to the said officer, said inventory and condition report to constitute the basis for settlement by the Bureau with said officer for property shown to be lost, damaged or destroyed, any such property to be either replaced or restored to the condition required by Condition 14 hereof, or at the election of the Department of the Army reimbursement made therefor by the Bureau at the then current market value thereof.

11. That the Bureau shall administer and maintain the area included in this agreement in accordance with its Master Plan for wildlife development which shall be prepared by the Bureau and submitted to the District Engineer. There shall be included within this plan those areas that are designated for public hunting, for wildlife sanctuaries, and for the production of food for wildlife or other purposes; it shall also include the nature, site and plans of proposed construction and improvements, and their estimated costs. The District Engineer shall be informed, prior to the effective date, of any amendment to this Master Plan. Until such time as the Master plan is completed by the Bureau, the District Engineer will be furnished upon request an annual report by the Bureau setting forth operational information. Further, the Bureau will furnish upon request data and other information to the District Engineer relative to Bureau use or public use of the area covered by this agreement.

12. That this agreement may be revoked at the discretion of the Secretary of the Army when a national emergency is declared by the President. In the event of failure of the Bureau to observe any of the provisions or conditions set out in this agreement, the District Engineer will so notify the Bureau of the particular violation and the Bureau shall act immediately to correct any such violation. Unless the Bureau shall have so acted within a reasonable time, not to exceed one year, this agreement may be terminated by the Department of the Army.

13. This agreement may be relinquished by the Bureau at any time by giving to the District Engineer at least thirty (30) days' notice in writing.

14. If this agreement is relinquished or revoked as provided above, the Bureau shall vacate the said premises, remove all property of the Bureau therefrom, and restore the premises to a condition satisfactory to the said District Engineer, ordinary wear and tear and damage beyond the control of the Bureau excepted, within such time as the Secretary of the Army may designate.

IN WITNESS WHEREOF I have hereunto set my hand this 9th
day of August, 1966, by direction of the Assistant
Secretary of the Army.

W. P. D. O.
W. P. D. O.
Wildlife Conservation
Property (WCP)
Wild Game and Fish
Property (WGF)
Property (WGF)

Supplemental Agreement No. 1
Cooperative Agreement No.
DA-34-066-CIVENG-67-247
Department of the Interior
Bureau of Sport Fisheries and
Wildlife
John Redmond Dam and Reservoir

SUPPLEMENTAL AGREEMENT
between
THE DEPARTMENT OF THE ARMY
and
THE DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE

THIS SUPPLEMENTAL AGREEMENT, made and entered into by and between the Department of the Army, of the first part, and the Department of the Interior through the Bureau of Sport Fisheries and Wildlife, hereinafter referred to as the Bureau, of the second part:

WITNESSETH THAT:

WHEREAS, the Bureau and the Department of the Army entered into Cooperative Agreement No. DA-34-066-CIVENG-67-247 on 9 August 1966 for the purpose of development, conservation, and management of wildlife resources covering 18,545.71 acres, more or less, at John Redmond Dam and Reservoir in Coffey and Lyon Counties, Kansas, as shown on map marked Exhibit A, attached to the Cooperative Agreement.

WHEREAS, it is agreed between the contracting parties hereto that it would be to their mutual benefit to amend the Original Cooperative Agreement to delete approximately 82.50 acres of land, being the Hartford and Strawn public use areas.

NOW, THEREFORE, the parties do hereby amend and supplement the Original Cooperative Agreement in the following respects and none other:

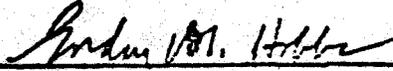
The map attached hereto and marked (Exhibit "A-1") supersedes and is hereby substituted for the map marked Exhibit A and attached to the Original Cooperative Agreement.

Supplemental Agreement No. 1
Cooperative Agreement No. DA-34-066-CIVENG-67-247
John Redmond Dam and Reservoir

IT IS FURTHER UNDERSTOOD AND AGREED that the Cooperative Agreement,
as amended, shall in all other respects remain in full force and effect.

IT IS FURTHER AGREED that the effective date of this Supplemental
Agreement shall be 1 January 1974.

IN WITNESS WHEREOF, I have hereto set my hand this 9th day of
MAY, 19 74, by direction of the
Assistant Secretary of the Army.


Gordon M. Hobbs
Assistant for Real Property
OASA(I&L)

THIS SUPPLEMENTAL AGREEMENT is also executed by the Department of
the Interior, Bureau of Sport Fisheries and Wildlife, this _____
day of JUN 11 1974, 19 _____.

DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE

(Sgd.) Harvey Willoughby
By: _____

Deputy Regional Director

(Title)

MEMORANDUM OF UNDERSTANDING

between
U.S. FISH and WILDLIFE SERVICE
Flint Hills National Wildlife Refuge
and
LYON COUNTY FIRE DISTRICT # 5
PO Box 157
Hartford, KS 66854

I. PURPOSE

- A. This Memorandum of Understanding between the U.S. Fish and Wildlife Service, Flint Hills NWR, hereinafter referred to as the Service, and the Lyon County Fire District # 5, hereinafter referred to as the Fire Department, is hereby entered into for the purpose of providing adequate fire protection and fire suppression within and adjacent to the boundaries of the Flint Hills NWR, located in Lyon and Coffey Counties, Kansas.

II. AUTHORITY

- A. The Fire Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C. 594), and the Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66, 67; 42 U.S.C. 1856, 1856a and b).

III. SCOPE OF WORK

- A. The Fire Department shall:
1. Furnish, at its own expense, firefighting equipment and labor for the suppression of fires on lands within the boundaries of the Flint Hills NWR located in Lyon and Coffey Counties, Kansas. The Fire Department will report any fire discovered on Service lands to the Service as soon as possible upon taking suppression action.
 2. Provide storage for a Service 1000 gallon fire tanker truck within the Hartford Volunteer Fire Department (District # 5) fire building for response both within and outside Flint Hills NWR.

B. The Service shall:

- 1. Provide, at its own expense, first response and initial attack with such equipment and labor as are available on wildland fires occurring on lands within the boundaries of the Refuge and on adjacent private lands.**
- 2. Assist in wildland fire suppression on lands surrounding the Refuge, not covered by this agreement, when requested by the Fire Department and deemed practical by the Project Leader. This assistance will be provided to the Fire Department at the Service's expense.**

IV. PERIOD OF PERFORMANCE

- A. The terms of this agreement shall remain in effect from the date of execution through September 30, 2004.**

V. FINANCIAL ADMINISTRATION

When requested assistance is provided by either party, each shall be responsible for and pay its own incurred costs, and no reimbursement shall be made to the providing party by the other.

VI. PROJECT OFFICERS

**U.S. Fish and Wildlife Service
Jerre Gamble, Project Leader
Flint Hills NWR
PO Box 128
Hartford, Kansas 66854
316-392-5553**

**Lyon County Fire District # 5
Wade A. Barrett, Fire Chief
115 South Main Street
Neosho Rapids, KS 66864
316-343-8939**

VII. MODIFICATIONS

Any change to this agreement shall not be binding unless said change is mutually agreeable to both parties, issued in writing, and signed by the Project Leader of the U.S. Fish and Wildlife Service and an authorized official of the Fire Department.

VIII. SPECIAL PROVISIONS

- A. Neither party will be responsible to the other for any loss, damage, personal injury, or death occurring in the performance of this agreement.
- B. Repairs and maintenance necessary to keep any equipment, covered by this agreement, in operation, will be made by and at the expense of each party, to their own equipment, except as noted in D.
- C. In the execution of this MOU, volunteers of the Lyon County Fire District # 5 are not considered employees of the Refuge or Service.
- D. **Indemnification.** The Fire Department will indemnify and hold harmless the United States from any and all damages, including claims of third parties, arising out of or in any way connected with the operation by the Fire Department of the fire tanker truck outside the boundaries of the Refuge. The Fire Department shall carry insurance to come with this provision and to reimburse the Refuge for damages to or total loss of the fire tanker truck should such an event occur in connection with the fire suppression activities outside the boundaries of the Refuge. The Fire Department shall furnish proof of such insurance coverage to the Refuge by submitting a copy of the policy or a certification from the insurance company by January 30 each year of the term thereof. This indemnification is specifically limited to the insurance coverage carried by the Fire Department. The Fire Department shall not be liable to nor indemnify the United States for any amount nor for any damages not covered by the Fire Department's insurance policies.
- E. Government firefighting equipment and vehicles may be stored at Lyon County Fire District #5. It is understood that the Fire Department shall be liable for Government property while stored in their facility.

IX. TERMINATION

- A. The Service, by (30) thirty days written notice, may terminate this agreement in whole or in part when it is in the best interest of the Government to do so. The Fire Department may also terminate the agreement by giving (30) thirty days written notice to the Government.

X. SIGNATURES:

Lyon County Fire District # 5

U.S. Department of the Interior
U.S. Fish and Wildlife Service

Signature: Wade A Barrett

Signature: Jerre L Gamble

Name: Wade A Barrett

Name: JERRE L. GAMBLE

Title: Fire chief

Title: PROJECT LEADER

Date: 7-7-99

Date: 7/9/99

Reviewed: Phil Steep
Regional Fire Management Coordinator

Date: 7/15/99

Approved: Larry Shanko
Associate Manager

Date: 7/26/99

MEMORANDUM OF UNDERSTANDING

between

U.S. FISH and WILDLIFE SERVICE

Flint Hills National Wildlife Refuge

and

BOARD OF TRUSTEES, FIRE DISTRICT # 1,

COUNTY OF COFFEY, STATE OF KANSAS

113 N 5th Street

Burlington, KS 66839

I. PURPOSE

- A. This Memorandum of Understanding between the U.S. Fish and Wildlife Service, Flint Hills NWR, hereinafter referred to as the Service, and the Board of Trustees, Fire District # 1, County of Coffey, State of Kansas, hereinafter referred to as the Fire Department, is hereby entered into for the purpose of providing adequate fire protection and fire suppression within and adjacent to the boundaries of the Flint Hills NWR, located in Lyon and Coffey Counties, Kansas.

II. AUTHORITY

- A. The Fire Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C. 594), and the Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66, 67; 42 U.S.C. 1856, 1856a and b).

III. SCOPE OF WORK

- A. The Fire Department shall:
1. Furnish, at its own expense, firefighting equipment and labor for the suppression of fires on lands within the boundaries of the Flint Hills NWR located in Lyon and Coffey Counties, Kansas. The Fire Department will report any fire discovered on Service lands to the Service as soon as possible upon taking suppression action.

B. The Service shall:

- 1. Provide, at its own expense, first response and initial attack with such equipment and labor as are available on wildland fires occurring on lands within the boundaries of the Refuge and on adjacent private lands.**
- 2. Assist in wildland fire suppression on lands surrounding the Refuge, not covered by this agreement, when requested by the Fire Department and deemed practical by the Project Leader. This assistance will be provided to the Fire Department at the Service's expense.**

IV. PERIOD OF PERFORMANCE

- A. The terms of this agreement shall remain in effect from the date of execution through September 30, 2004.**

V. FINANCIAL ADMINISTRATION

When requested assistance is provided by either party, each shall be responsible for and pay its own incurred costs, and no reimbursement shall be made to the providing party by the other.

VI. PROJECT OFFICERS

**U.S. Fish and Wildlife Service
Jerre Gamble, Project Leader
Flint Hills NWR
PO Box 128
Hartford, Kansas 66854
316-392-5553**

**Board of Trustees, Fire District # 1, Coffey County
Jim Bloomer, Chairman, Fire Board
404 S 10th Street
Burlington, KS 66839
(316) 364-2459**

VII. MODIFICATIONS

Any change to this agreement shall not be binding unless said change is mutually agreeable to both parties, issued in writing, and signed by the Project Leader of the U.S. Fish and Wildlife Service and an authorized official of the Fire Department.

VIII. SPECIAL PROVISIONS

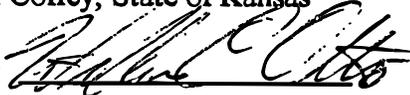
- A. Neither party will be responsible to the other for any loss, damage, personal injury, or death occurring in the performance of this agreement.
- B. Repairs and maintenance necessary to keep any equipment, covered by this agreement, in operation, will be made by and at the expense of each party, to their own equipment.

IX. TERMINATION

- A. The Service, by (30) thirty days written notice, may terminate this agreement in whole or in part when it is in the best interest of the Government to do so. The Fire Department may also terminate the agreement by giving (30) thirty days written notice to the Government.

X. SIGNATURES:

Board of Trustees, Fire District # 1,
County of Coffey, State of Kansas

Signature: 

Name: William C. Otto

Title: Vice Chairman

Date: June 21, 1999

Reviewed: 
Regional Fire Management Coordinator

Approved: 
Associate Manager

U.S. Department of the Interior
U.S. Fish and Wildlife Service

Signature: 

Name: JERRE L. GAMBLE

Title: PROJECT LEADER

Date: 6/23/99

Date: 7/15/99

Date: 7/26/99

Appendix K. Flint Hills NWR Contaminant Assessment Process

Biomonitoring of Environmental Status and Trends Program Contaminant Assessment Process

Final CAP Report for Flint Hills NWR

CAP Information (Contaminants Assessment Process)

A Contaminant Assessment Process or CAP has been conducted for this Refuge. A CAP is an information gathering process and initial assessment of a U.S. Fish and Wildlife Service National Wildlife Refuge in relation to environmental contaminants. You will find information in this report on particular contaminants of concern to fish and wildlife resources on the Refuge and areas of the Refuge of particular interest with regard to these contaminants.

Primary Investigator Information

Analysis started 14:12 June 25,1999

Analysis completed 08:30:35 September 09,1999

Report produced 06:59:49 April 11,2000

Susan Blackford

U.S. Fish and Wildlife Service

315 Houston, Suite E

Manhattan, KS 66502

Phone: 785-539-3474

email: Susan_Blackford@fws.gov

Notes on Primary Investigator

Assistant Contaminant Specialist, Ecological Services, Kansas Field Office.

Narrative Report of Contaminant Issues

Problem Narrative:

Flint Hills National Wildlife Refuge

Contaminant Assessment Process Narrative September 9, 1999

The Flint Hills National Wildlife Refuge (Refuge) was established in 1966 and consists of 18,463 acres. The Refuge is part of the Arkansas/Red Rivers Ecosystem. It lies in the broad, flat Neosho River Valley in the Neosho Basin. The Refuge is managed primarily to benefit migrating and wintering waterfowl in the central flyway. A variety of management practices are utilized to meet the needs of wildlife. Along with large numbers of migrating birds, the Refuge is also a haven for white-tailed deer, bobwhite quail, wild turkey, river otter and a diversity of other mammals, neotropical birds, reptiles and insects.

Activities associated with agriculture, flood control, and public recreation are the most likely pathways for contaminants input to the Refuge.

The Refuge is an overlay on and is entirely located within the Corps of Engineers John Redmond Reservoir Flood control project (Reservoir). As such, the management of the Reservoir profoundly affects the Refuge. Land use on the Refuge has limitations when the flooding impacts are factored in. Flooding of the Refuge (caused from the reservoir holding water) occurs on a fairly frequent basis, generally in the spring and fall months. On average, the entire Refuge (95 percent of the Refuge is flooded) is flooded once in ten years, severe flooding (75 percent of the Refuge is flooded) occurs one in seven years, moderate flooding (50 percent of the Refuge is flooded) occurs one in four years, while minor flooding (25 percent of the Refuge is flooded) occurs yearly. However, 95 percent of the Refuge was flooded during the years of 1973, 1985, 1986, 1993, 1995, 1998, and the current year of 1999.

Flood waters can bring in substantial amounts of contaminants onto the Refuge and should be considered a major contaminant pathway. Because the reservoir is holding water, the flood water covers the Refuge for extended periods of time. Any contaminants present in the water might tend to settle out while the water is standing over the Refuge.

Nearly 1.5 million people live within 100 miles of the Refuge. Most of this population live in the four large cities, Topeka, Wichita, Kansas City, or Emporia, within this area. Although the population of Emporia is considerably smaller than the other three cities, it probably has the biggest impact on the Refuge. It lies approximately 25 miles west of the Refuge and sits between the Neosho and Cottonwood Rivers just upstream from the confluence of the two Rivers. It is the only one of the four cities that is in the same basin as the Refuge. Emporia has several large industries including a slaughter house and meat packing plant, automobile parts manufacturing, a large commercial bakery, and a dog food plant.

Several smaller towns near the Refuge have petroleum products storage facilities and power generating plants. Wolf Creek Nuclear Power Plant is located eight miles east of the Refuge. Accidents at these types of facilities could contribute significant amounts of contaminants to the Refuge.

The Neosho River runs through the Refuge. Several smaller streams also enter the Refuge including Four Mile Creek, Lebo Creek, Eagle Creek, and Troublesome Creek along with several drainage canals and unnamed intermittent streams. There are documented contaminant concerns for most of the surface water entering the Refuge.

Consumption advisories are issued most years for the Neosho River due to chlordane compound concentrations in fish. In the 1970's, there were documented water quality problems on the Neosho River resulting in many publicized fish kills. These fish kills were reported to be caused primarily from confined animal feedlot runoff. Recent investigations by the USFWS Kansas Field Office have found PCB, atrazine and heavy metals, including lead, mercury, and arsenic, in biota samples and lead in sediment samples collected from the River. A Refuge staff person reported that he often smells a strong chemical/pesticide odor emanating from the River following precipitation events during the spring planting season.

Analysis of surface water conducted during 1997 with ELISA field tests kits found agricultural chemicals such as triazines, 2,4-D, and alachlor are entering the Refuge via the surface water. These chemicals were found to be fairly persistent in the Refuge's streams (Lebo Creek, Troublesome Creek, Four Mile Creek, Eagle Creek and unnamed creeks and drainage canals) which supply the wetlands. Chief among the chemicals found were triazine compounds. Most of the streams entering the Refuge are very turbid. Eagle Creek also has documented heavy metal contamination concerns.

Recently, Refuge Manager Jerre Gamble found a feedlot on Eagle Creek that directly abuts the Refuge Boundary. He estimates that the feedlot handles approximately 300 to 400 head of cattle. There is no buffer area between the feedlot and the creek, and the feed bunkers are right on the fence line. In all probability, wastes from the feedlot are washed into Eagle Creek and the Refuge during precipitation events.

The Refuge has approximately 3,917 acres of cropland. Limited chemical use is permitted on cropland within the Refuge. This is a concern due to the frequency of flooding and the potential of those chemicals to enter surface water in runoff. However, several steps have been taken to attempt to minimize unintentional impacts. The Refuge has an Integrated Pest Management plan (IPM). No insecticides have been used on the Refuge in 11 years according to the 1996 to 2001 IPM plan. Refuge management has recently initiated the mandatory creation of buffers along streams in agricultural lands on the Refuge. The buffers will serve to control erosion and reduce the amount of contaminants entering the surface waters of the Refuge. The buffers will be phased in as contracts are renewed. Refuge cropland is usually double cropped. Refuge management feels that this practice combats the weed problems and reduces the amount of herbicides that are applied. Refuge staff estimates that more pesticides are used on the cropland following flood event years.

The Refuge has approximately 4,572 acres of wetlands. One type of water-right currently used on the Refuge allows pumping from the Neosho River and Eagle Creek into wetlands. Wetlands receiving these waters should be monitored to determine if there are any detrimental effects to the wetland associated with contaminants in the pumped water. Benthic invertebrate community structure and population analysis should be included in the monitoring. Willow tree invasion is considered a problem in the moist soil wetlands. Mowing, flooding, and occasional dozer work have been used for control. The use of Rodeo chemical has been approved; but as of 1996, no applications have been made.

The Refuge has received heavy hunting and fishing pressure. No investigations of lead deposition from fishing or past hunting activity have been undertaken. It is possible that if such lead deposition has occurred that the dozer activity used to control willow tree invasion could bring the lead to the surface of the sediments and into contact with waterfowl, shorebirds, and fish who eat it along with food items or mistake it for food items. Also, the use of any chemical in a wetland is a cause for concern, and if Rodeo is used for willow control occurs in the future, it might be beneficial to conduct benthic invertebrate population studies both pre- and post-treatment to determine if the chemical is affecting those populations.

Mudflats most likely are associated with water drawdowns after flooding events and the number of acres available will vary yearly. These areas may act as a sink for contaminated sediments deposited from flood waters. No investigations have taken place to determine if this is occurring.

The Refuge has approximately 120 acres of administrative and recreational roadways. These roadways are often under flood waters. Due to the frequent flooding, erosion of the roadway materials, e.g., dirt and gravel, and contaminants associated with roadways from vehicle use, e.g., oils, grease, petroleum, antifreeze, etc., Refuge roads should be considered a likely contaminant pathway. Another source of contamination associated with the roadways would be spills of chemicals from the transport of agricultural chemicals to the cropland on or near the Refuge. Road sides may become infested with noxious weeds. Refuge IPM plans are to maintain the road sides by mowing unless *Sericea Lespedeza* becomes a problem. If that occurs some spraying may take place.

There are currently 3,200 acres of grasslands on the Refuge. Sericea Lespedeza and Johnson grass invasions are causing serious problems on the grasslands. Some chemical spot treatments to control Sericea Lespedeza and Johnson grass will take place on the grasslands along with other control techniques such as mowing, haying, and burning.

There are several pathways for transportation linked spills to reach the Refuge. Three of these are roads in close proximity to the Refuge. K-130 cuts through the western end of the Refuge. 22nd Road borders the north side of the Refuge. Both of these roads receive heavy semi-truck use along with local traffic. 16th Lane which borders the south side of the Refuge receives heavy local traffic including vehicles transporting farm chemicals. Other spill sources include oil/gas pipelines north of the Refuge and railroad lines near the town of Neosho Rapids near the northwest end of the Refuge.

The most likely pathways for contamination to reach the Refuge are from the surface water entering the Refuge and the flood waters that frequently inundate portions of the Refuge. Recommendations for future actions concerning contaminant issues include monitoring of wetlands receiving water from the Neosho River and Eagle Creek to determine if there are any adverse effects, identify mudflat areas that may act as contaminant sinks and ascertain if that is happening, and determine if lead shot and fishing sinkers are available to wildlife and if they are causing lead poisoning in wildlife.

CAP Final Report Generated on 4/11/2000, 6:59
Last refuge data update: TAT/MESC -- 1-MAR-1999

Appendix L.

Flint Hills NWR

Compatibility Determinations

Station Name: Flint Hills National Wildlife Refuge

Date Established: September 27, 1965

Establishing and Acquisition Authorities:

Fish and Wildlife Coordination Act; Coordination Act Agreement with the U.S. Army Corps of Engineers

Purpose(s) for which Established:

16 U.S.C. 664 (Fish and Wildlife Coordination Act): "... shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements ... and in accordance with such rules and regulations **for the conservation, maintenance, and management of wildlife, thereof, and its habitat thereon, ...**"

National Wildlife Refuge System Improvement Act of 1997: "each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which the refuge was established."

"... plan an direct the continued growth of the System in a manner that is best designed to accomplish the mission of the System, to contribute to the conservation of the ecosystems of the united States, to complement the efforts of the States and other Federal agencies **to conserve fish and wildlife and their habitats**, and to increase support for the System and participation from conservation partners and the public."

"The mission of the 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 Proposed Use:

Wildlife-dependent recreation i.e., hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

Anticipated Impacts on Service Lands, Waters, or Interests:

Minimal disturbance to wildlife and wildlife habitat will result from these uses at current and proposed levels.

Justification:

We agree with Congress, as stated in the National Wildlife Refuge System Improvement Act, that “When managed in accordance with principles of sound fish and wildlife management and administration, fishing, hunting, wildlife observation, and environmental education in national wildlife refuges have been and are expected to continue to be generally compatible uses.”

Wildlife-dependent recreational use help carry out the purposes of Refuge enabling legislation, cooperative agreements, CCP, and National Wildlife Refuge System Act mandate to “ensure that opportunities are provided within the System for compatible wildlife-dependent recreational uses.”

These activities, at or below expected levels, provide the public with opportunities to learn and appreciate the values of wetlands, riparian areas, and the dependence of wildlife upon them. This is especially true in Kansas where less than 2 percent of the land is in public stewardship.

Approximately 60 percent of the Refuge is closed to general public access, from October into February, to provide wildlife sanctuary. Current and proposed wildlife management projects will provide wildlife population levels sufficient to sustain hunting, fishing, and the other recreational uses at current and projected levels with minimal impacts to wildlife and its habitats.

Determination: Wildlife-dependent recreation is compatible.

The Following Stipulations are Necessary to Ensure Compatibility:

- P All activities will be monitored by the refuge manager to ensure that wildlife-dependent recreation does not exceed projected levels.
- P Participants will be monitored to ensure that the permitted activities are conducted in compliance with Refuge regulations.

Description of Proposed Use:

Firewood cutting for personal use to remove down and drift wood in areas easily accessible to the public. Firewood cutting is also allowed when the Refuge is preparing to conduct activities where tree removal is necessary or desirable i.e. road rehabilitation or dike construction.

Anticipated Impacts on Service Lands, Waters, or Interests:

Minimal disturbance to wildlife and wildlife habitat will result from such harvesting at current and anticipated levels.

Justification:

Firewood cutting is used as a means to help accomplish Refuge wildlife and recreation objectives. Also, it provides the public with opportunities to learn and appreciate the values of wetlands, riparian areas, and the dependence of wildlife upon them. This is especially true in Kansas where less than 2 percent of the land is in public stewardship. Approximately 60 percent of the Refuge is closed to general public access, from October into February, to provide wildlife sanctuary.

Determination: Firewood cutting for personal use is compatible.

The Following Stipulations are Necessary to Ensure Compatibility:

- P Cutting areas will be monitored by the Refuge to ensure that firewood harvesting does not exceed compatible levels.
- P Participants will be monitored to ensure that the permitted activities are conducted in compliance with Refuge regulations.

Description of Proposed Use:

Wild food gathering for personal use; including fruit picking, nut picking, and mushrooming.

Anticipated Impacts on Service Lands, Waters, or Interests:

Minimal disturbance to wildlife and wildlife habitat will result from such harvesting at current and anticipated levels.

Justification:

Approximately 60 percent of the Refuge is closed to general public access, from October into February, to provide wildlife sanctuary. At current and anticipated levels, these activities are sustainable. There will continue to be a surplus of wild foods, of interest to visitors, sufficient for wildlife needs.

Also it provides the public with opportunities to learn and appreciate the values of wetlands, riparian areas, and the dependence of wildlife upon them. This is especially true in Kansas where less than 2 percent of the land is in public stewardship.

Determination: Wild food gathering for personal use is compatible.

The Following Stipulations are Necessary to Ensure Compatibility:

- P Gathering areas will be monitored by the Refuge to ensure that wild food harvesting does not exceed expected levels.
- P Participants will be monitored to ensure that the permitted activities are conducted in compliance with Refuge regulations.

Description of Proposed Use:

Primitive camping.

Anticipated Impacts on Service Lands, Waters, or Interests:

Minimal localized disturbance to wildlife and wildlife habitat will result from this use at current and anticipated levels.

Justification:

This wildlife oriented activity supports other wildlife-dependent activities especially hunting. Also, it provides the public with opportunities to learn and appreciate the values of wetlands, riparian areas, and the dependence of wildlife upon them. This is especially true in Kansas where less than 2 percent of the land is in public stewardship.

Determination: Primitive camping is compatible.

The Following Stipulations are Necessary to Ensure Compatibility:

- P Camping areas will be monitored by the Refuge to ensure that primitive camping does not exceed expected levels.
- P Participants will be monitored to ensure that primitive camping is conducted in compliance with Refuge regulations.

Description of Selected Management Actions:

Cooperative farming and haying.

Anticipated Impacts on Service Lands, Waters, or Interests:

Farming will provide high caloric food and browse for migrating and wintering migratory birds and resident wildlife. This food source is in addition to other habitat provided in the form of wildland wetlands and vegetation and the moist soil/marsh units.

Haying (in addition to prescribed burning) benefits grassland and edge dependent wildlife by preventing woody vegetation encroachment into grassland.

Justification:

These actions are needed to accomplish Refuge purposes.

At this Refuge's latitude in the great plains, wildlife often use croplands during migration and wintering. Refuge maintenance of a cropland program provides crops sought by migratory birds, and in some instances prevents depredation of crops on private lands. The cropland program also serves as an example of how best to farm in riverine systems with minimal use of chemicals.

Determination:

Taking actions to accomplish a purpose is ipso facto compatible with that purpose. Therefore, management to accomplish Refuge purposes is compatible with those purposes.

The Following Stipulations are Necessary to Ensure Compatibility:

Not applicable.

Signatures:

Project Leader: _____

Review and Concurrence _____

Appendix M.

Environmental Assessment

for Flint Hills National Wildlife Refuge
Comprehensive Conservation Plan

Table of Contents

Purpose	132
Need	132
Affected Environment	132
Alternatives Including the Proposed Action	
Alternative 1. Continuation of Ongoing Management (No Action) ..	134
Alternative 2. Refuge Closure - Elimination of Public Use and Habitat Management	134
Alternative 3. Planned Management Program - Minimal Habitat Manipulation, Moderate Increase in Public Use, and Improvements to Public Use Facilities (Proposed Action)	135
Alternative 4. Full Public Use Development with Expanded Management Program	136
Environmental Consequences	
Alternative 1. Continuation of Ongoing Management (No Action) ..	137
Alternative 2. Refuge Closure - Elimination of Public Use and Habitat Management	138
Alternative 3. Planned Management Program - Minimal Habitat Manipulation, Moderate Increase in Public Use, and Improvements to Public Use Facilities (Proposed Action)	139
Alternative 4. Full Public Use Development with Expanded Management Program	140
Cumulative Impacts and Mitigation	142
Consultation and Coordination	142

Purpose

The purpose of management of the Flint Hills NWR is to facilitate the restoration, maintenance, and management of natural diversity including endangered species. Additionally, the CCP facilitates continuity of management and effective decision making to achieve these ends. The Plan is intended to provide long-range guidance for the management of this Refuge based on careful consideration of the physical and biological characteristics of the land base. It is designed to facilitate achievement of the Service mission and Refuge goals which center on the protection and enhancement of wildlife and their habitats and the provision of appropriate compatible public recreation. The Service supports ecosystem management. Therefore, a primary focus of Refuge programs is to contribute toward the accomplishment of the goals of the Arkansas/Red Rivers Ecosystem Plan.

Need

This action addresses both the needs of the Service to meet its trust responsibilities and the needs of the local community and the general public.

The Service has responsibility for stewardship over species that occupy Service lands and for the protection of cultural resources on these lands. Flint Hills NWR was established in September 1966 for the following purpose:

"... for the conservation, maintenance, and management of wildlife resources thereof, and habitats thereon, ..." 16 U.S.C. (Fish and Wildlife Coordination Act).

Specifically, this CCP proposes a planned management program to implement actions that meet the operational needs of the Refuge to conduct management to benefit wildlife, particularly the fall and spring needs of migratory waterfowl populations and endangered species.

To meet its trust responsibilities, the Service needs to provide a diversity of quality habitats for wildlife and protection for the species using these habitats. The Service also needs to ensure that all recreational activities occurring on the Refuge are compatible with the purposes for which the Refuge was established. To facilitate management and ensure these ends are achieved, the Service needs to develop plans which will maximize the cost/benefit ratio of management actions.

The needs of the public, primarily the local area communities, are for a place where traditional recreational activities such as hunting, fishing, and wildlife observation can be enjoyed. There is increased public interest for more interpretive and educational activities on the Refuge such as interpretive hiking trails, canoeing areas, display exhibits, wildlife viewing areas, and outdoor classrooms for field ecology investigations.

This Environmental Assessment (EA) will accompany the Flint Hills CCP. Both of these documents will be available for public review and comment prior to the issuance of a final CCP.

Affected Environment

Flint Hills NWR is located on the western edge of the tallgrass prairie region and lies within the broad, flat Neosho River Valley in Lyon and Coffey Counties, Kansas. The Refuge was established in September 1966 on 18,500 acres of land within the flood pool of the John Redmond Reservoir. The Service manages the lands through a cooperative agreement with the Corps. Nearby towns include Burlington, Hartford, Neosho Rapids, and Emporia.

Flint Hills NWR is readily accessible to more than 1.5 million Kansans within a 100-mile radius of the Refuge from such major cities as Wichita, Topeka, and Kansas City.

The major recreation activities in the area include hunting, fishing, and boating at reservoirs, lakes, State parks, and waterfowl and game management areas. In addition to John Redmond Reservoir, numerous other lakes are within 50 miles of the Refuge. The existing recreational activities occurring on the Refuge are not necessarily unique to the area as these activities can be found at other nearby facilities.

Historically, the lands that comprise the present day Refuge were periodically inundated by naturally occurring floods. The John Redmond Reservoir now impounds the Neosho River downstream from the Refuge. Depending on the flood pool of the Reservoir, portions of the Refuge are inundated with water for extended periods during the rainy season. As a result, many plant communities on the Refuge, particularly those in lower elevations, are more often inundated by flood water and vulnerable to the invasion of weed species and exotics. Depending on the extent and duration of inundation, the flooding can disrupt management operations and destroy habitat restoration projects.

The valley grassland soils are typical of the Neosho floodplain and have been plowed since the turn of the century. Part of the Flint Hills area remains as a grassland prairie with only a few remnant tracts of native cordgrass. Historically, the majority of lands within the Refuge have been in agricultural use with this continuing to be the major land use even after the Corps acquired the land for flood control purposes. Based on national Service guidelines, the purpose of farming on Flint Hills NWR is for maintenance of migratory waterfowl; however, the amount of land in production is more than that needed for Refuge waterfowl maintenance objectives. Over time, the amount of land farmed has decreased primarily due to the Corps raising the conservation pool (lake level) two feet in elevation resulting in a significant portion of farmland being flooded. Other reasons for decreasing farmland has been the establishment of riparian buffers, wetland development, and creation or attrition of cooperators. The majority of productive farmland is located on the higher elevation lands of the western half of the Refuge.

The Refuge habitats consist of wooded riparian areas along the Neosho River; river floodplain, seasonally flooded and permanent wetlands (annually flooded lands), grasslands (cordgrass prairie and tallgrass prairie), hardwood forest, brushland, and croplands. The Refuge hosts a diversity of wildlife on these habitats. Management of these habitats for migratory waterfowl in fall and spring is a primary focus of the Flint Hills NWR. Many other species benefit from this management such as shorebirds, marsh birds, amphibians, fish, aquatic plants, and insects. Grain production for geese and ducks also provide forage for white-tailed deer and habitat for quail, turkey, and many small mammals. Riparian, grassland, and forested areas provide a variety of valuable habitats for neotropical migrants, raptors, mammals, and reptiles. These varied habitats are also home to the bald eagle with other areas containing suitable habitat for the Neosho madtom.

The bald eagle and peregrine falcon are endangered or threatened species documented on the Refuge. Several species occur that are considered endangered or threatened by the State of Kansas, although none of these species have been directly observed on the Refuge. Adequate habitat does exist for their survival, and they could potentially be inhabitants on Refuge lands in the future. These species include: Mead's milkweed, western prairie fringed orchid (both federally listed), alligator snapping turtle, warty-backed mussel, heel splitter mussel, northern crayfish frog, Neosho madtom, and the blue sucker.

A full description of the Refuge, its resources, and its economic setting are included in the CCP.

Alternatives Including the Proposed Action

Alternative 1: Continuation of Ongoing Management (No Action)

The No Action alternative would continue current management and would not involve extensive restoration of riparian and grassland habitats, the development of moist soil units from unproductive farmlands, and improvements to roads, interpretive, and administrative facilities.

This alternative would result in access roads remaining as they are with only minor upgrades or maintenance. Recreational opportunities would continue to be limited to traditional programs under existing approved hunting and fishing plans. The Neosho River will continue to provide public fishing, and the primary Refuge hunt area will remain south of the River. Public use facilities would remain essentially the same except for maintenance. New directional or interpretive signs would not be installed, facilities would not be upgraded to withstand flooding, and viewing opportunities for wildlife would be limited to the existing roads open to the public. The current headquarters facilities would not be improved or expanded to accommodate more visitors. This alternative would assume no significant increases in public use which would remain at 50,000 visitors.

Current habitat management practices would continue, including approximately 3,500 acres of Refuge lands farmed with decreases only occurring as a result of individual withdrawals from the Refuge cooperative farming program. Total wetland acres would remain the same unless increased by natural flooding. No active management practices such as prescribed fire, moist soil management, or re-vegetation techniques would be implemented to restore retired croplands into native grasses, restore habitats inundated by flooding, control exotic weeds, and enhance wetlands and riparian areas. Management actions that protect wildlife habitat, such as law enforcement, would continue at current levels. Additional biological information on Refuge resources would be obtained through incidental surveys and appropriate information would not necessarily be available to evaluate current management decisions.

Under this alternative no effort would be made to acquire prime habitat on land made available by the pending closure of the KAAP near Parsons, Kansas.

Alternative 2 : Refuge Closure - Elimination of Public Use and Habitat Management

This alternative would close the Refuge entirely to the public through closure of all access roads. Traditional public recreational activities such as hunting, fishing, and wildlife observation would be discontinued. Management practices would not be implemented to improve habitats. All agricultural areas would be taken out of production. Refuge habitats, including retired croplands, flood damaged areas, and altered areas, would evolve through natural succession of native annual and perennial species as well as exotic weed species. Management would consist of flood damage repairs that affect adjacent landowners and road maintenance on those roads needed by the Refuge staff to conduct minimal enforcement and ensure Refuge closure. Because the Refuge lands are owned by the Corps and managed under a cooperative agreement between the Service and the Corps, this alternative would violate the terms of this agreement. Therefore, this alternative was not considered a viable option. Terms of the agreement can be found in Appendix J.

Alternative 3 : Planned Management Program - Minimal Habitat Manipulation, Moderate Increase in Public Use, and Improvements to Public Use Facilities (Proposed Action)

The proposed action is to adopt and implement the actions presented in the Flint Hills NWR CCP. The objectives and strategies detailed in the Plan will provide for short- and long-term conservation and enhancement of Refuge resources and values.

Under this alternative, existing roads would be maintained and improved, and roads would be expanded as necessary to accommodate increasing recreational use of the Refuge. As recreational use of the Refuge increased, improvements would be made to accommodate additional traffic, including more parking areas, automobile pull-outs, and placement of informational and educational signs.

The Refuge would gradually expand educational and outreach programs to meet the increasing visitation and public interest in Refuge environmental education programs. This will include the installation, in phases, of viewing and photo blinds, improving existing nature trails, and developing materials and programs for outreach and education. Hunting for migratory birds, upland game, and big game will continue to be restricted on the Refuge as it currently exists and within compliance of the regulations of the State of Kansas. Fishing regulations and access points will also remain the same. Hunting and fishing programs will be reviewed for opportunities to improve the quality of these public uses while still remaining compatible with the purpose of the Refuge in maintaining wildlife resources. The law enforcement program will become more effective through the addition of a law enforcement officer to the Refuge staff.

The Refuge habitat management program will involve implementing active management practices such as prescribed fire, establishing buffer strips, and control of weed species to accelerate restoration of native species and enhance the quality of these habitats for wildlife. Refuge lands adjacent to the Neosho River, including marginal farm lands due to flooding potential, will be restored to natural habitats to improve the hydrology of the River system and benefit native aquatic and riparian communities. Moist soil management strategies will be implemented on 2,000 acres of Refuge lands to increase and enhance wetlands and provide forage and protected resting areas for migrating waterfowl and shorebirds. Approximately 2,500 to 3,000 acres of Refuge lands optimal for crop production will continue to be farmed to provide forage for migratory birds and resident wildlife. A prescribed fire program will be implemented to burn approximately 800 acres annually over a 15-year period, and more than 400 acres of Refuge land annually will be treated to control noxious weeds and nonnative species. Existing areas of native bluestem and cordgrass prairie, old oxbows, naturally occurring low water areas, riparian, timber, floodplain, and hardwood forest as well as the aquatic riverine habitats will continue to be protected and enhanced through planned management strategies.

The Refuge's biological program will become more focused and include comprehensive inventories of wildlife species and habitats improving the Refuge's basic biological information. This will allow the staff to better evaluate habitat management decisions in the future.

Acquisition of prime habitat on land made available by the pending closure of the KAAP near Parsons, Kansas would be pursued under this alternative.

Alternative 4 : Full Public Use Development with Expanded Management Program

This alternative would incorporate the changes to the habitat and wildlife management components of the program called for in the proposed alternative. However, this alternative would involve more concentrated efforts in developing the Refuge's public use programs and facilities beyond the existing program.

This alternative would develop extensive public use facilities including a wildlife observation and interpretive system with the following features: approximately 15 to 24 miles of hiking trails with parking and pull-outs, a 10-mile interpretive canoe trail along the Neosho River from the Highway 130 bridge into Hartford, south to the Strawn Recreation Area with parking, put-in and take-out areas at either end of the trail, and development of two motorized tour routes east of Hartford and over the railroad grade south of the River which will require additional road improvement on a total of 12 miles of road and construction of a new bridge.

This alternative also considers the future development of an Interpretive Visitor Center at a site east of Highway 130 near Hartford, Kansas. A visitor center would expand public use of the Refuge, particularly from people traveling in the area to other recreational sites. The capital expense to relocate this facility to gain additional exposure to passing motorists was determined not to be cost effective during the master planning process initiated in the 1980's. At that time, national standards and criteria did not warrant the expenditure for a full-scale interpretation of the Refuge in a single structure for Flint Hills NWR.

Management efforts to develop the Refuge's public use programs with this intensity would require a substantial increase in annual operational funding and the addition of 1 or 2 ORP's or Public Use Specialists within five years.

Although it is evaluated here for its environmental impacts, it is not considered a viable alternative with the existing budgetary constraints.

Environmental Consequences

Alternative 1 : Continuation of Ongoing Management (No Action)

Impacts on Wildlife and Habitat

Implementing the No Action alternative would assume no significant changes in Refuge operations. This alternative offers a strong level of protection for the natural resources of the Refuge without a planned long-term management approach. By adopting the No Action alternative, the Refuge would anticipate no negative impacts to the overall landscape. Unlike the proposed alternative, efforts to re-vegetate lands and restore wetlands would be minimal. While the existing management would have no negative effects on biological resources, a lack of a strategic context of publicly accepted goals and objectives would make it difficult for Refuge Managers to implement resource priorities and justify annual budget requests. Indirectly, this could slow progress toward improving habitat and wildlife conditions.

Because the KAAP property would not be acquired, the protection of the encompassed habitat would not take place.

Impacts on Endangered and Threatened Species

Little or no impacts on listed species are anticipated under current management practices. Existing hunting and fishing programs have been reviewed, and these uses were determined not to impact bald eagles or their habitats. Eagles prefer extensive woodland edges adjacent to open water and wetlands with high levels of waterfowl and fish. The Refuge provides those habitat features within a sanctuary closed to public use. Under current Refuge management strategies, the protection of bald eagles is a primary concern; future conflicts regarding public use development would always be resolved in favor of the endangered species. Other State listed species have not been documented on the Refuge at this time.

Impacts on Public Use

The Refuge would not increase opportunities for recreational activities such as hunting, fishing, and wildlife observation. The Neosho River would continue to provide public fishing, and the primary Refuge hunt area will remain south of the River. Approximately 43 miles of existing roads would have minor upgrades and maintenance. Public use facilities would remain essentially the same except for maintenance. New directional or interpretive signs would not be installed, facilities would not be upgraded to withstand flooding, and the current headquarters facilities would not be improved or expanded to accommodate more visitors. Without facility upgrades, increased signs, and implementation of outreach programs, public use is expected to remain at approximately 50,000 visitors annually.

Impacts on Air and Water Quality

This alternative would have no impact on air quality. Automobile traffic through the Refuge would not be at levels that could result in measurable air pollution. With the conversion of retired farm lands to native habitats and restoration of riparian and wetlands, water quality would improve through a decrease of non-point source pollution.

Impacts on Aesthetic and Visual Resources

Limited change would occur from the current conditions with the exception of natural changes as a result of habitat restoration.

Impacts on Archaeological and Historical Resources

This alternative would have no known impact on archaeological and historical resources.

Impacts on Socio-economic Resources

This alternative provides for continuation of existing hunting and fishing opportunities for citizens. Under this alternative, the Refuge would not have any new programs or facilities to encourage more visitors to the area and would not generate additional revenue to the community.

Refuge croplands will continue to be farmed for the benefit of wildlife and to reduce cropland depredation by waterfowl on neighboring lands by the most efficient means such as multi-year sharecropping or cooperative agreements. Under this alternative, the Refuge would not seek to withdraw lands from production. Decreases would be the result of decisions not to farm by the cooperators. The economic impacts of these decisions are unrelated to this alternative.

Alternative 2 : Refuge Closure - Elimination of Public Use and Habitat Management

Under this alternative, no management practices would be implemented to restore or enhance habitats, and Refuge lands would evolve through natural succession. An increased invasion of weed species and exotics would occur in areas frequently inundated by flood water. Hunting, fishing, or other public use would not be allowed, and no active management of wildlife except enforcement of the Refuge closure. This was not considered a viable option since the Service has entered into a cooperative agreement with the Corps for the management of this area to benefit wildlife and to provide recreational opportunities for the public. This agreement can be found in Appendix J.

Alternative 3 : Planned Management Program - Minimal Habitat Manipulation, Moderate Increase in Public Use, and Improvements to Public Use Facilities (Proposed Action)

Impacts on Wildlife and Habitat

This alternative offers a planned long-term approach for the active management of the Refuge wildlife populations, habitats, and public use opportunities. It involves the expansion of existing efforts for habitat restoration and enhancement. Active management will primarily involve providing food, sanctuary, and water needs to meet the Refuge wildlife population objectives and the objectives of the Central Flyway Plan for waterfowl management. This alternative includes the following management strategies that will benefit nesting grassland birds, foraging raptors, migrating and nesting waterfowl, geese, marsh birds, and neotropical migrants, reseeding retired croplands to native grasses and cordgrass, creating native vegetation buffers to protect feeding waterfowl from disturbance, restoring riparian vegetation to improve floodplain and river hydrology, implementation of moist soil wetland management, and control of weeds and exotic species.

Acquisition of the KAAP property would allow for the protection of species not currently found at Flint Hills NWR.

Impacts on Endangered Species

Under this alternative, listed species would be provided added protection through increased surveillance and law enforcement. The Service will actively pursue opportunities to strengthen or improve partnerships and cooperative efforts with other agencies and individuals to improve habitat protection for endangered species. Also under this alternative, systematic biological surveys and inventories of the Refuge resources would identify threatened and endangered species using the Refuge. Management actions could then be implemented to protect them and enhance their habitats.

Impacts on Air and Water Quality

This alternative involves expanded use of fire as a management tool on the Refuge which could cause temporary impacts to air quality. Prescribed fires would be managed and monitored in accordance with Service policy. Lack of good pre-suppression and suppression capability would probably result in larger and more intense fires.

This alternative involves improving visitor services and facilities which would increase the volume of traffic on the Refuge tour route. Increased visitation could have detrimental affects by disturbing feeding and resting wildlife. Air pollution and oil leaks could also impact vegetation and water quality. However, automobile traffic through the Refuge would not increase to such levels that would result in measurable air pollution. These public uses would be periodic with recovery possible between high use periods.

Water quality will be improved by Refuge management operations. Through a decrease in croplands and restoration of native habitats, river sediment loading and natural filtration would reduce non-point source pollution into the Neosho River.

Impacts on Aesthetic and Visual Resources

Development of various educational, interpretive, or public use sites on the Refuge would reduce the natural atmosphere that many visitors seek. Open vistas or other views might be degraded by the addition of a parking area or directional signs.

Impacts on Cultural and Historic Resources

Impacts on cultural and historic resources would be evaluated at the time of construction of roads, parking areas, outdoor classrooms, hiking trails, and other developed public use areas. However, such development would be designed to have little or no impact.

Impacts on Socio-economic Resources

With a reduction in croplands, a decrease will occur in local cooperators farming the Refuge and a potential decrease in revenue in the community. However, improved visitor services and facilities would encourage more public use opportunities and more visitors. The potential for increased tourism in the area would generate revenue for the local economy.

Alternative 4 : Full Public Use Development with Expanded Management Program

While this alternative is similar to Alternative 3, it does involve more concentrated efforts in developing the Refuge's public use programs and facilities beyond the current program.

Impacts on Wildlife and Habitat Management

As in Alternative 3, this Alternative involves implementing active management strategies in a planned effort to protect, restore, and enhance Refuge habitats to increase biological diversity and benefit wildlife populations. Like Alternative 3, this Alternative involves expansion of existing efforts to restore habitats including the control of nonnative species and weeds, riparian and grassland restoration, enhancing wetland habitats through the implementation of moist soil management strategies, and retirement of excess croplands and conversion to natural habitats. This alternative would potentially increase disturbance to feeding and resting wildlife by increasing wildlife observers in the field and traffic on tour routes. Vegetation buffers will diminish the disturbance to wildlife from increased vehicular traffic.

The expansion of wildlife observation, photography, educational opportunities, hunting, and fishing, even if determined compatible, would have certain negative impacts on habitat, plants, and wildlife species depending on locations selected for development, the level of control imposed on the hunting, and the duration of hunts. Compatibility determinations for the expansion of any such proposed uses beyond the current program would have to be undertaken prior to implementation. Coordination with the Kansas Department of Wildlife and Parks would need to take place.

Impacts on Endangered Species

Under this Alternative, listed species would be provided added protection through increased surveillance and law enforcement. The Service would actively pursue opportunities to strengthen or improve partnerships and cooperative efforts with other agencies and individuals to improve habitat protection for endangered species. Also under this Alternative, systematic biological surveys and inventories of the Refuge resources would identify threatened and endangered species using the Refuge. Management actions could then be implemented to protect them and enhance their habitats. Expansion of fishing and hunting opportunities could affect endangered species recovery efforts if these opportunities occur in areas used by bald eagles. Although important habitats for endangered species would be protected from the impacts of increased and expanded public use programs, all developments would necessitate analysis with respect to the requirements of Section 7 of the Endangered Species Act. Compatibility determinations for hunting, fishing, and other public uses would be revised.

Impacts on Air and Water Quality

This alternative involves improving visitor services and facilities which would increase the volume of traffic on the Refuge tour route. Increased visitation could have detrimental effects by disturbing feeding and resting wildlife. Air pollution and oil leaks could also impact vegetation and water quality. It is anticipated that these public uses would be periodic with recovery possible between high use periods. As in Alternative 3, this Alternative involves expanded use of fire as a management tool on the Refuge which could cause temporary impacts to the Refuge's air quality. Prescribed fires would be managed and monitored in accordance with Service policy. Lack of good pre-suppression and suppression capability would probably result in larger and more intense fires.

Habitat restoration efforts, particularly in wetlands adjacent to the Neosho River and riparian floodplain vegetation, would capture sediment from runoff, provide natural filtration, and reduce non-point source pollution into the River.

Impacts on Aesthetic and Visual Resources

Development of various educational, interpretive, or public use sites on the Refuge would reduce the natural atmosphere that many visitors seek. Open vistas or other views might be degraded by the addition of a parking area or directional signs.

Impacts on Cultural and Historic Resources

Impacts on cultural and historic resources would be evaluated at the time of construction of roads, parking areas, outdoor classrooms, hiking trails, and other developed public use areas. However, development most likely would have little or no impact.

Impacts on Socio-economic Resources

With a reduction in croplands, a decrease will occur in local cooperators farming the Refuge and a potential decrease in revenue in the community. Expansion and development of visitor services, outreach efforts, educational programs, and facilities would encourage more public use opportunities and more visitors to the area. The Refuge staff would seek partnerships with the local community in developing the public use program and facilities. By promoting the Refuge as an asset to local tourism, this partnership would benefit the Service by providing local support for its mission and benefit the surrounding communities by generating revenue for the local economy.

Cumulative Impacts and Mitigation

Cumulative impacts include impacts on the environment which result from incremental effects of the proposed action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Implementing Alternative 3 (Proposed Action) would reduce the potential for cumulative impacts because of the strategic approach to managing Refuge programs including wildlife-dependent public uses and the consideration of resource conflicts and opportunities within a broad management framework. This would be a change from the fragmented issue/problem oriented approach inherent in the No Action Alternative 1.

Where site development activities are to be proposed during the next 5 to 10 years, each activity would be given appropriate NEPA consideration. At that time, any required mitigation activities would be designed into the specific project to protect fish and wildlife and their habitats and to reduce the level of impacts to the environment.

Mitigation measures are necessary when effects determined through the NEPA process are anticipated to significantly impact wildlife, habitats, or the human environment. The management activities proposed in Alternative 3 are not intended to produce environmental impacts at significant levels to warrant mitigation measures. However, the activities listed below will help reduce the risks that any negative effect will occur. Long-term monitoring will help in determining actual effects and how the Service should respond.

- P** The Refuge would closely regulate proposed activities to lessen any potential impacts to plant and wildlife species particularly during sensitive periods such as breeding and nesting seasons.
- P** Public use would be restricted by season or specific areas would be closed to minimize disturbance.
- P** The Refuge would prohibit any activities in areas where endangered species would be negatively effected.

Consultation and Coordination

In an ongoing effort to involve the local community and officials in the CCP process, the Service and RMCI prepared and distributed a fact sheet on October 14, 1998. The fact sheet described the CCP process and defined the comment period. The 45-day comment period started October 14, 1998, and ended November 28, 1998. An information repository has also been established and is maintained with information relevant to the Refuge for public review. The repository is located at Flint Hills NWR headquarters located near Hartford, Kansas. RMCI continues to update the mailing list based on responses from interested parties. An Open House was held at Flint Hills NWR headquarters on November 5, 1998, based on public response to the CCP process. The Service published a formal notice in the Federal Register requesting comments and advice from the public in September 1998. Comments were received, considered, and to the degree possible, they have been incorporated into this document.

Appendix N. Flint Hills NWR CCP Mailing List

Federal Officials

- P Senator Sam Brownback, Washington, D.C. and Topeka, KS
- P Senator Pat Roberts, Washington, D.C. and Topeka, KS
- P Congressman Jerry Moran, Washington, D.C. and Hutchinson, KS
- P Congressman Jim Ryun, Washington, D.C. and Topeka, KS

Federal Agencies

- P US Army Corps of Engineers, Burlington, KS
- P USDA Natural Resource Conservation Service, Burlington, KS
- P Farm Services Agency, Burlington, KS
- P USDA Natural Resource Conservation Service, Emporia, KS
- P Farm Services Agency, Emporia, KS
- P Hartford Post Office, Hartford, KS
- P U.S. Fish and Wildlife Service, Air Quality Branch, Lakewood, CO;
Albuquerque, NM; Anchorage, AK; Arapaho NWR, CO;
Arlington, VA; Arrowwood NWR, ND; Atlanta, GA; Crescent
Lake/N. Platte, NE; Denver, CO; Fort Snelling, MN; Hadley, MA;
Juneau, AK; Medicine Lake NWR, MT; Portland, OR;
Sacramento, CA; Sand Lake NWR, SD; Shepherdstown, WV;
Sherwood, OR; Tewaukon NWR, ND; Waubay NWR, SD; Quivira
NWR, KS; Kirwin NWR, KS; Marais des Cygnes NWR, KS;
Kansas Ecological Services, Manhattan, KS.
- P National Park Service, Tallgrass Prairie National Preserve, KS
- P USGS, Biological Resources Division, Fort Collins, CO
- P US EPA, Denver, CO

State Officials

- P Bill Graves, Governor, Topeka, KS
- P Peggy L. Long, State Representative, Hamilton, KS
- P Harry Stephens, State Senator, Topeka, KS and Emporia, KS

State Agencies

- P Kansas Department of Wildlife and Parks, Pratt, KS
- P Kansas Department of Wildlife and Parks, Emporia, KS

City/County/Local Governments

- P Lyon County Commissioners, Emporia, KS
- P Coffey County Commissioners, Burlington, KS
- P Chamber of Commerce, Burlington, KS
- P Chamber of Commerce, Emporia, KS
- P USD 252, Hartford, KS
- P Hartford City Hall, Mayor Steve Burriss, Hartford, KS

Libraries

- P Emporia Library, Emporia, KS

Organizations

- P Ducks Unlimited, Manhattan, KS
- P Flint Hills Audubon, Madison, KS
- P The Nature Conservancy, Topeka, KS
- P Western Resources, Topeka, KS
- P Kansas Livestock Association, Topeka, KS
- P Wild Turkey Federation, Emporia, KS
- P Basin Advisory Board, Pittsburg, KS
- P National Wildlife Refuge Association, Colorado Springs, CO
- P Central Mountain & Plain Section, TWS, Fort Collins, CO
- P Wildlife Management Institute, Washington, D.C.
- P KRA Corporation/Fish and Wildlife Reference Ser., Bethesda, MD
- P Audubon Society, Washington, D.C.
- P Defenders of Wildlife, Washington, D.C.
- P The Wilderness Society, Washington, D.C.

Newspapers

- P Emporia Gazette, Emporia, KS
- P Coffey County Republican, Burlington, KS

Schools/Universities

- P Professor H. Paul Friesema, Evanston, IL

Individuals

Donald Atherly
Bill's Hardware & Electric
Dennis Darbyshire
Kenneth B. Dill
Mark Dill
Pat Finnerty
Jack Freund
Orville Gilkison
Hartford State Bank
Bill Hamman
Jay Hamman
Kenny Hamman
James Hines
Dave Pace
Bruce Pearson
Jim Peterson
Jim Rivers
Randall Schemm
Ron St. Bonnett
George Walker
Dean Wilson
Larry Wilson

Flint Hills National Wildlife Refuge
P.O. Box 128
530 West Maple
Hartford, KS 66854
316/392 5553
r6rw_flh@fws.gov

U. S. Fish and Wildlife Service
<http://www.fws.gov>

For Refuge Information
1 800/344 WILD

June 2000

