



# Land Protection Plan

*Flint Hills Legacy Conservation Area*

*Kansas*

**July 2010**

**Prepared by**

U.S. Fish and Wildlife Service  
Flint Hills National Wildlife Refuge  
530 West Maple Avenue  
Hartford, Kansas 66854  
620/392 5553

*and*

U.S. Fish and Wildlife Service  
Mountain-Prairie Region  
Division of Refuge Planning  
Branch of Land Protection Planning  
134 Union Boulevard, Suite 300  
Denver, Colorado 80228  
303/236 4345



# Contents

<i>Abbreviations</i> .....	iii
<b>1 Introduction and Project Description</b> .....	1
Project Description .....	2
Issues .....	4
Biological Issues Identified During Scoping Meetings.....	5
Socioeconomic Issues Identified During Scoping Meetings .....	5
Issues Not Selected for Detailed Analysis .....	5
National Wildlife Refuge System and Authorities .....	5
Related Actions and Activities .....	6
Habitat Protection and the Easement Acquisition Process .....	7
Conservation Easements .....	7
<b>2 Area Description and Resources</b> .....	9
Biological Environment .....	9
Climate .....	9
Climate Change .....	10
Adaptation, Mitigation, and Engagement .....	10
Geological Resources .....	10
Habitat .....	11
Wildlife .....	14
Cultural Resources .....	16
Socioeconomic Environment .....	16
Landownership .....	17
Property Tax .....	17
Public Use and Wildlife-dependent Recreational Activities .....	17
<b>3 Threats to and Status of Resources</b> .....	19
Effects on the Biological Environment .....	20
Wildlife Habitat .....	20
Water and Soil Resources .....	22
Effects on the Socioeconomic Environment.....	22
Landownership and Land Use .....	22
Public Use.....	23
Development.....	23
Value of Intact Ecosystems .....	23
Unavoidable Adverse Impacts .....	24
Irreversible and Irretrievable Commitment of Resources .....	24
Short-term Use versus Long-term Productivity .....	25
Cumulative Impacts .....	25
Past Actions .....	25
Present Actions .....	25
Reasonably Foreseeable Actions.....	25
Development.....	26
Conservation Efforts .....	26

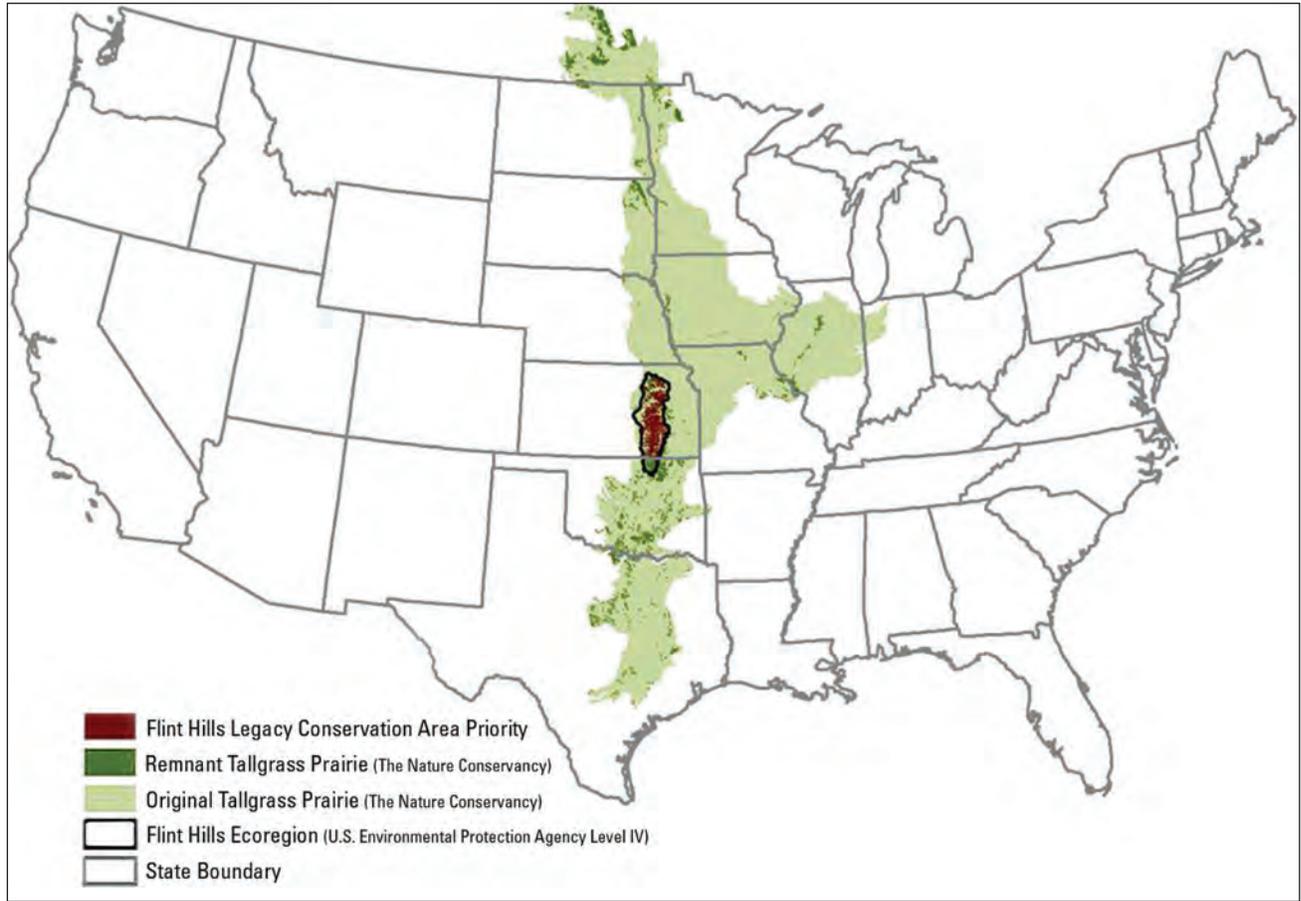
<b>4 Project Implementation</b> .....	27
Land Protection Options .....	27
No Action.....	27
Acquisition or Management by Others .....	27
Action and Objectives.....	27
Priority Areas .....	28
Acquisition Alternatives .....	30
Coordination.....	30
Conservation Cooperatives .....	30
Agency Coordination .....	32
Contaminants and Hazardous Materials .....	33
National Environmental Policy Act .....	33
Social and Cultural Impacts .....	33
Table—Summary of Proposed Action .....	33
Distribution and Availability .....	33
 <i>Appendixes</i>	
A List of Preparers and Reviewers .....	35
B List of Plants and Animals .....	37
C Finding of No Significant Impact .....	81
D Compliance Certificate .....	87
E Level 1 Report .....	91
F Section 7 Biological Evaluation .....	93
G Comments and Responses .....	101
 <i>Bibliography</i> .....	 143
 <b>Figures</b>	
1 Historical tallgrass prairie distribution in the United States .....	1
2 Flint Hills Legacy Conservation Area .....	3
3 Land cover and habitat types in the Flint Hills Legacy Conservation Area .....	12
4 Relative native and restored benefits of ecosystem goods and services .....	24
5 Priorities areas for the Flint Hills Legacy Conservation Area .....	29
 <b>Table</b>	
1 Protection priorities for the Flint Hills Legacy Conservation Area .....	33

# Abbreviations

<b>EA</b>	environmental assessment
<b>FHLCA</b>	Flint Hills Legacy Conservation Area
<b>FONSI</b>	finding of no significant impact
<b>GIS</b>	geographic information system
<b>HAPET</b>	Habitat and Population Evaluation Team
<b>KLT</b>	Kansas Land Trust
<b>KDWP</b>	Kansas Department of Wildlife and Parks
<b>LCC</b>	landscape conservation cooperative
<b>LPP</b>	land protection plan
<b>LWCF</b>	Land and Water Conservation Fund
<b>NEPA</b>	National Environmental Policy Act
<b>NLCD</b>	National Land Cover Database
<b>NRCS</b>	Natural Resources Conservation Service
<b>NREL</b>	National Renewable Energy Lab
<b>NWRS</b>	National Wildlife Refuge System
<b>PFW</b>	Partners for Fish and Wildlife program
<b>RTK</b>	The Ranchland Trust of Kansas
<b>Service</b>	U.S. Fish and Wildlife Service
<b>SHC</b>	strategic habitat conservation
<b>TLA</b>	Tallgrass Legacy Alliance
<b>TNC</b>	The Nature Conservancy
<b>USDA</b>	U.S. Department of Agriculture
<b>USFWS</b>	U.S. Fish and Wildlife Service



# 1 Introduction and Project Description



**Figure 1. Historical tallgrass prairie distribution in the United States.**

In the environmental assessment (EA) completed during the planning process, several alternatives were considered initially, and two alternatives were selected for further analysis. The first, alternative A, called the no action alternative, considered the consequences of not doing anything. Alternative B considered the positive and negative consequences of purchasing conservation easements and establishing the Flint Hills Legacy Conservation Area (FHLCA). After completion of the EA and after conducting a public comment period, the proposed alternative of acquiring conservation easements was chosen as the land protection plan (LPP). The project was found to have no significant impacts on the quality of the environment, thus a finding of no significant impact (FONSI) has been completed and signed. The FONSI document is basically the EA modified to reflect all applicable comments and responses. Appendix A lists the preparers and reviewers for the EA and LPP.

The lands east of the Rocky Mountains were once a vast sea of grass extending as far east as the deciduous forests of Kentucky and Ohio. The eastern third of this vast grassland is called the tallgrass prairie, often called the “true” prairie. Tallgrass prairie once covered more than 170 million acres from Texas to Canada (Samson et al. 1999) (figure 1). As America expanded westward during the 19th century, settlers found the rich soils associated with the tallgrass prairie ideal for growing crops and converted much of the original landscape to farmland.

Today, less than 4 percent of this once vast grassland region remains (Steinauer and Collins 1996). Given that amount of loss, it is no wonder grassland birds are the fastest declining group of avians in North America. Cultivation, agriculture, tree encroachment, and development activities have pushed grassland-dependent species into ever-shrinking areas of tallgrass prairie. Approximately three-fourths of

the remaining tallgrass prairie lies within the Flint Hills ecoregion of eastern Kansas and northeastern Oklahoma, with about 6 million acres present in the Kansas portion. The outer edge of this region is presently suffering a rapid conversion to forest partly due to a declining understanding of the historical importance of fire for habitat management within the agricultural communities of the region. The inner core of this region (approximately 3.3 million acres) is to date relatively intact, offering potential for long-term social stability, sustainability, and ecosystem function.

The Flint Hills area is a treasured landscape of gently-sloping limestone and chert hills. Today, two hundred years after Zebulon Pike explored the Flint Hills, one can still witness the same unobstructed vistas that he described in his journal. The central core, running in a north-south configuration, has persisted as a relatively unfragmented expanse of tallgrass prairie because of limestone outcrops that discouraged plowing and because of a ranching culture that recognized the ecological importance of fire when living and working within a fire climax ecosystem. Since about 1860, the predominant use of the Flint Hills uplands has been cattle ranching.

The plan to create the FHLCA is part of a landscape-scale, strategic habitat conservation effort to protect a unique, highly diverse, and largely unfragmented area of tallgrass prairie. Located in eastern Kansas, the region provides important habitat for a diverse array of native wildlife species, including the threatened Topeka shiner, greater prairie-chicken, Henslow's sparrow, short-eared owl, Bell's vireo, American golden-plover, grasshopper sparrow, dickcissel, eastern meadowlark, upland sandpiper, buff-breasted sandpiper, scissor-tailed flycatcher, loggerhead shrike, Smith's longspur, Harris' sparrow, northern harrier, Swainson's hawk, and other grassland-dependent species. Rich with history, the Flint Hills ranching culture has used grazing and fire, both necessary components for tallgrass ecosystem health.

While ranching has helped maintain the last intact portion of tallgrass prairie and much of the region's biodiversity, there are concerns that industrial and residential development could threaten this unique landscape. Left unabated, such development will likely diminish this important agricultural and biological resource for future generations.

The U.S. Fish and Wildlife Service (Service) will establish a voluntary conservation easement program in eastern Kansas which will be called the Flint Hills Legacy Conservation Area (figure 2). The project boundary encompasses roughly 3.3 million acres, within which the Service will strategically acquire conservation easements on up to 1.1 million acres of private land.

The Service will seek all acquisition in the form of perpetual conservation easements from willing sellers. The project will not involve fee-title acquisitions. The easement program will rely on voluntary participation from landowners. Grazing and prescribed fire will continue on the land included in the easement contract. All land within an easement will remain in private ownership and, therefore, property tax and grassland management activities such as invasive plant and tree control, grazing, and prescribed fire will remain the responsibility of the landowner. Public access to the land will also remain under the control of the landowner.

Easement restrictions may include, but are not limited to preventing development (residential, commercial, and industrial), altering the natural topography, converting native grassland to cropland, draining wetlands, and introducing plants that are not native to the Flint Hills.

The easements will help maintain a relatively large, unfragmented block of habitat that will compliment efforts by other land trusts and entities, such as the Ranchland Trust of Kansas (RTK), Kansas Land Trust (KLT), The Nature Conservancy (TNC), National Park Service, Kansas Department of Wildlife and Parks (KDWP), U.S. Department of Agriculture, and the U.S. Army Corps of Engineers.

## PROJECT DESCRIPTION

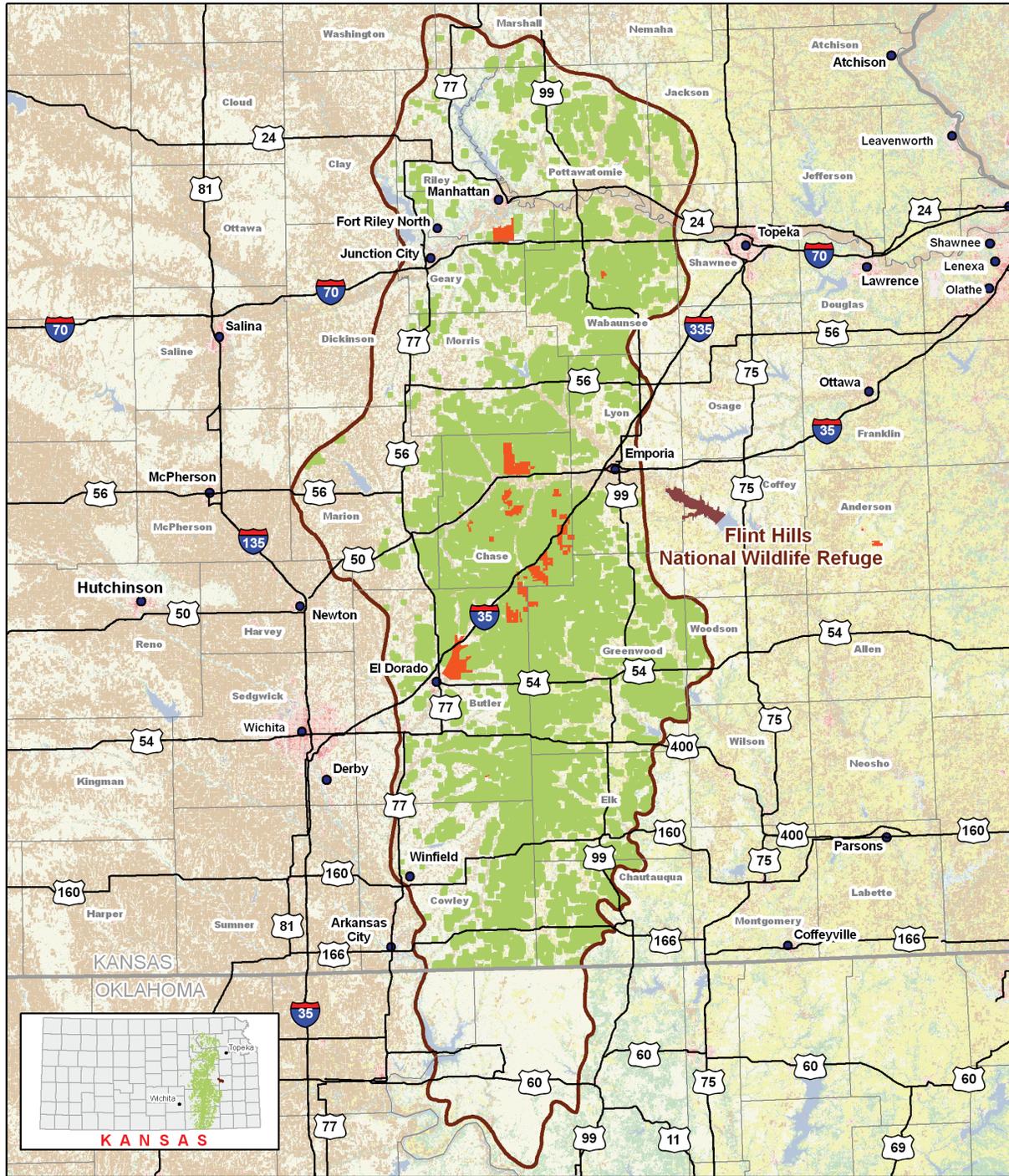
This Flint Hills Legacy Conservation Area Land Protection Plan provides a general description of the operations and management of the area. The Service developed this LPP during the planning process to provide local landowners, governmental agencies, and the interested public with a general understanding of the anticipated management approaches for the easement program. The purpose of the LPP is to present a broad overview of the Service's management approach to wildlife and associated habitats, public uses, interagency coordination, public outreach, and other operational needs. During the planning process, an environmental assessment was also prepared. Its purpose was to evaluate the biological and socioeconomic impact of a no action alternative and a proposed alternative for creating the FHLCA through conservation easements. The EA and LPP were published in April 2010. Subsequently, revisions were made to the EA and a final EA was published in August 2010.

The FHLCA is a narrow band of tallgrass prairie that extends from the northern to the southern border of the state in eastern Kansas. The boundary area includes approximately 3.3 million acres within the Flint Hills ecoregion of Kansas (Omernick 1987). This remaining, high quality, ecologically functioning tallgrass is as narrow as 20 miles wide (see figure 2). The project boundary takes this narrow shape,



U.S. Fish & Wildlife Service  
**Flint Hills Legacy Conservation Area**  
 Eastern Kansas

*Base Map*



PRODUCED IN THE DIVISION OF REFUGE PLANNING  
 DENVER, COLORADO  
 MAP DATE: 04/06/10  
 BASEMAP: N/A  
 W\KSI\FLH\_LEGACY\MAPS\FLH\_LGCIY\_BASE\_040610.MXD



**Figure 2. Flint Hills Legacy Conservation Area.**

being constrained on the east and west by tillage agriculture, woody vegetation, and development.

The main habitat type found within the project area is eastern tallgrass prairie, represented by over ninety native grasses and 500 broadleaf species. The Flint Hills ecoregion contains the largest concentration of freshwater springs in Kansas (Kansas Geologic Survey 2008) and is the source of the Caney, Cottonwood, Elk, Fall, Marais des Cygnes (Osage), Neosho, Verdigris, and Walnut rivers.

Portions of Butler, Chase, Chautauqua, Clay, Cowley, Dickinson, Elk, Geary, Greenwood, Harvey, Jackson, Lyon, Marion, Marshall, Morris, Pottawatomie, Riley, Shawnee, Washington, Woodson and Waubanssee counties are within the project boundary. As elsewhere in Kansas, where less than 2 percent of the land area is federally owned, private ownership dominates the FHLCA.

The Service will purchase the easements on tallgrass prairie grasslands, and the associated riparian corridors, which will connect and expand upon existing protected conservation lands within the project area. The physical shape and juxtaposition of the 1.1 million acres in the priority area targeted for easements is an important component of the project's long-term success. The goal of this project is to provide the landscape-scale, strategic habitat conservation necessary to maintain ecological community function for eastern tallgrass prairie. This is especially important for grasslands, because they do not have the localized diversity of geological and elevational gradients that most other ecosystems contain.

The purposes of the Flint Hills Legacy Conservation Area are to:

- preserve landscape-scale ecological integrity of the Flint Hills tallgrass prairie by maintaining and enhancing the historical native plant, migratory bird, and other wildlife species with the support of the associated ranching culture;
- support the recovery and protection of threatened and endangered species and reduce the likelihood of future listings under the Endangered Species Act;
- protect the integrity of tallgrass prairie, riparian woodland, and prairie watersheds by preventing further habitat fragmentation;
- provide a buffer against climate change, by providing resiliency for the tallgrass prairie ecosystem through landscape-scale conservation;
- protect an intact north-south migration corridor for grassland-dependent wildlife;
- use the built-in resiliency to climate variability of native tallgrass prairie to ensure the continuation of wildlife habitat in the face of the uncertain effects of climate change.

## ISSUES

The Service has discussed the proposal to establish the Flint Hills Legacy Conservation Area with landowners; conservation organizations; other federal agencies; tribal, state, and county governments; and other interested groups and individuals.

The Service held six public meetings to provide information and discuss the proposal with landowners and other interested citizens. Information on the FHLCA project has been made available to county commissioners in each of the twenty-one counties included in the project area.

Open houses were held in Alma, Cottonwood Falls, and Wichita Kansas in November and December 2009. Public comments were taken to identify issues to be analyzed for the proposed project. Approximately 148 landowners, citizens, and elected representatives attended the meetings and most expressed positive support for the project. Additionally, ninety letters providing comments and identifying issues and concerns were also submitted.

In addition, the Service's field staff has contacted local government officials, other public agencies, and conservation groups. Approximately 400 factsheet flyers were mailed out, and project information was also made available on the Flint Hills National Wildlife Refuge and regional planning websites.

At the federal level, Service staff has briefed Senators Brownback and Roberts, as well as the Congressional delegation, and coordinated with representatives from other federal agencies such as the U.S. Department of Agriculture (Natural Resources Conservation Service), Department of Defense (Fort Riley Army Installation), National Park Service, and the Environmental Protection Agency. At the state level, Governor Parkinson's staff and Kansas' State Congressional delegation, along with KDWP, were briefed on the project. In addition, the Service provided information to eleven tribes on this project.

Nongovernmental conservation groups are vital to the success of the proposed project. Service staff has coordinated with partner organizations such as The Nature Conservancy, Tallgrass Legacy Alliance, The Ranchland Trust of Kansas, and Kansas Land Trust.

Many of the comments received addressed the need for a balance between natural and cultural systems. There are two main categories of commonly expressed issues and concerns, biological issues and socioeconomic issues.

## ***Biological Issues Identified During Scoping Meetings***

The biological issues mentioned were:

- Effects of wind energy development, oil and gas exploration and development, and residential development
- Concern that only a small percentage of tallgrass prairie remains
- Concern about the conservation of the remaining tallgrass prairie in Oklahoma
- Concern about short-term activities (including annual prescribed fires and early, intensive grazing) having long-term impacts to the tallgrass prairie
- Effects of tree encroachment from a lack of fire use due to absentee landowners, different land management priorities by some landowners, and development
- Possible reintroduction of species historically occurring in the region
- Possible effects to the air and water quality of the area with increasing development

## ***Socioeconomic Issues Identified During Scoping Meetings***

Socioeconomic issues mentioned were:

- Effect of wind energy development, and oil and gas exploration and development
- Possible tax implications of conservation easements
- Need to preserve the working ranches, and culture of the region
- Need to preserve history (natural, Native American and ranching heritage)
- Possible long-term implications of easements on land management
- Potential impacts to the aesthetics, scenic vistas, and natural beauty of the area resulting from development
- Potential for the development of agri-tourism as a source of income
- Changing, aging population in rural areas
- Need for increased understanding and appreciation for the tallgrass prairie and area

## ***Issues Not Selected for Detailed Analysis***

Historically, there has been concern about the amount of tax generated in surrounding counties when land protection programs are in place. Since the project is a conservation easement program, the land enrolled in the program does not change hands and therefore, the property taxes paid by the landowner to the county are not affected. Kansas property taxes are based on agricultural value. Since

easements will not affect the agricultural value of the property, no changes to the tax base are anticipated.

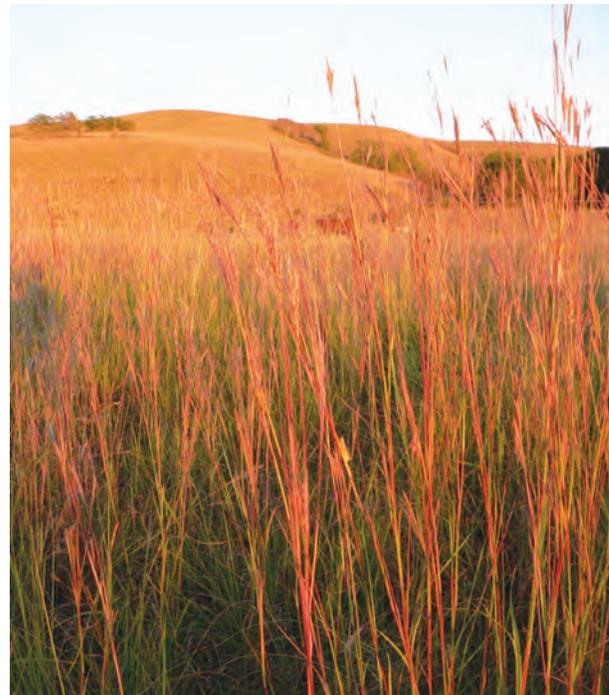
Development of rural landscapes often leads to increased demand for services and higher costs to rural counties. There will generally be an offset to any perceived reduction in the tax base since the county will not incur the expense of providing services to rural developments.

## **NATIONAL WILDLIFE REFUGE SYSTEM AND AUTHORITIES**

The mission of the National Wildlife Refuge System is to preserve a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. The Flint Hills Legacy Conservation Area project will be administered as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, executive orders, regulations, and policies.

Conservation of additional wildlife habitat in the Flint Hills region will also continue to be consistent with the following policies and management plans:

- Land and Water Conservation Fund Act (1965)
- Migratory Bird Treaty Act (1918)
- Endangered Species Act (1973)
- Bald Eagle Protection Act (1940)



*Bluestem grass in tallgrass prairie.*

- Migratory Nongame Birds of Management Concern in the U.S. (2002)
- U.S. Fish and Wildlife Act (1956)
- North American Waterfowl Management Plan (1994)

## RELATED ACTIONS AND ACTIVITIES

The Service is working with other public and private entities to maintain wildlife habitat within the project area. Many organizations in Kansas have recognized the ecological significance of the Flint Hills area and the need to bring about conservation in concert with the region's ranching heritage. Ranchers, biologists, federal agencies, and nongovernmental organizations all see a need to protect this remaining tallgrass prairie. Grassroots organizations such as the Tallgrass Legacy Alliance (TLA) have been working for more than a decade to conserve grasslands in the Flint Hills area. The Ranchland Trust of Kansas, Kansas Land Trust, United States Department of Agriculture, Kansas Department of Agriculture, and The Nature Conservancy have all also been active in preserving portions of the Flint Hills area using conservation easements. Organizations or agencies that are currently holding conservation easements within the conservation boundary include TNC, The Grassland Reserve Program, RTK, and KLT.

**The Nature Conservancy (TNC)** is one of many stakeholders who wish to see the ecology and culture of the Flint Hills persist. As part of The Nature Conservancy's ongoing efforts to preserve this impressive prairie landscape, a community-based conservation program called the Flint Hills Initiative was launched in 2001. The Conservancy's conservation goal for the Flint Hills is to maintain the unfragmented nature of this last expanse of tallgrass prairie and to improve the quality of site-specific habitats for target species and natural communities. The Nature Conservancy currently holds 31,436 acres of conservation easements within the Service's project area.

**The Grassland Reserve Program (GRP)** is a voluntary conservation program administered through the U.S. Department of Agriculture that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of grassland under threat of conversion to other uses. Participants voluntarily limit future development and cropping uses of the land while retaining the right to conduct common grazing practices and operations related to the production of forage and seeding, subject to certain restrictions during nesting seasons of bird species that are in significant decline or are protected under federal or state law. A grazing management plan is required for participants. The easement acreage under the Grassland Reserve Program within the Service project area is currently 17,357 acres.

**Ranchland Trust of Kansas (RTK)**, which is an affiliate of the Kansas Livestock Association, was organized as an agricultural-based land trust to hold conservation easements in Kansas. Ranchland Trust of Kansas's mission is to preserve Kansas' ranching heritage and its open spaces for future generations through the conservation of working landscapes. RTK currently has a 655-acre conservation easement in the project area.

**Kansas Land Trust (KLT)** is dedicated to conserving natural ecosystems, farm and ranch lands, and scenic open spaces; and preserving outdoor recreational opportunities and historical uses of land. Founded in 1990, KLT advocated in its early years for the passage of conservation easement-enabling legislation by the Kansas Legislature, which passed in 1993. The Kansas Land Trust accepted its first easement in 1994, and has completed thirty-six easements, 3,311 acres of which are in the Service's project area.

**Tallgrass Legacy Alliance (TLA)** is a not-for-profit grassroots organization dedicated to preserving the ecological, cultural, and economic integrity of the tallgrass prairie. TLA is a diverse group with ecological and agricultural interests that has been active on a landscape scale providing information on issues of concern in regards to the Flint Hills region. The Tallgrass Legacy Alliance has also been providing assistance with innovative grazing systems, prescribed fire, and invasive species control (particularly sericea lespedeza) through the use of grants and cost-shares with landowners throughout the Flint Hills area.

**Private landowners and ranchers** have been instrumental in working with various organizations and agencies to implement conservation projects. More than 98 percent of the project area, including much of the critical habitat for wildlife, is in private landownership.

**The Kansas Department of Wildlife and Parks (KDWP)** has been a strong partner in the Flint Hills by supporting effective grassland management through landowner technical assistance, Farm Bill implementation, and educational programs.

**Partners for Fish and Wildlife (PFW)** is a program administered by the Service that provides financial and technical assistance, and works cooperatively with landowners to voluntarily restore and enhance wildlife habitat on private land. Since the inception of the PFW program in 1992, the Service has a long and successful history of working with private landowners in Kansas—over 349,342 acres of tallgrass prairie have been restored or enhanced.

Infestations of invasive plants such as sericea lespedeza, eastern red cedar, and Osage orange currently are not pervasive in the FHLCA. However, they are present in many watersheds and threaten

to spread throughout the project area. In the absence of fire, woody species such as red cedar and Osage orange rapidly invade the tallgrass prairie. In an effort to control invasive plants, the Service's PFW program, TNC, TLA, county weed districts, and private landowners have initiated region-wide cooperative efforts, including educational efforts demonstrating the benefits of prevention with the use of prescribed fire, and financial assistance for mechanical, biological, and chemical treatments.

## **HABITAT PROTECTION AND THE EASEMENT ACQUISITION PROCESS**

Habitat protection will occur through the purchase of conservation easements. It is the long-established policy of the Service to acquire minimum interest in land from willing sellers to achieve habitat acquisition goals.

The acquisition authority for the Flint Hills Legacy Conservation Area is the U.S. Fish and Wildlife Act of 1956 (16 U.S.C.742 a-742j). The federal money used to acquire conservation easements is received from the Land and Water Conservation Fund, which is derived primarily from oil and gas leases on the outer continental shelf, motorboat fuel tax revenues, and sale of surplus federal property. There could be additional funds to acquire lands, waters, or interest therein through possible sources such as congressional appropriations and donations from nonprofit organizations.

The basic considerations in acquiring an easement interest in private land are the biological significance of the area, the biological requirements of wildlife species of management concern, existing and anticipated threats to wildlife resources, and landowner interest in the program. The purchase of conservation easements will occur with willing sellers only, and will be subject to available funding.

## **CONSERVATION EASEMENTS**

The easement program will be a conservation tool, complementing other efforts on the front. Conservation easements are the most cost-effective and socially acceptable means to ensure protection of important habitats within the project area.

Fee-title acquisition is not required for, nor is it preferable to conservation easements to achieve habitat protection. Fee-title acquisition will triple or quadruple the cost of land acquisition, add significant increases in management costs, and will not be accepted by landowners.

A strong and vibrant rural lifestyle, with ranching as the dominant land use, is one of the key components for ensuring habitat integrity and wildlife resource protection. Conservation easements are the only viable means to protect wildlife values on a landscape scale.



## 2 Area Description and Resources



*Tallgrass prairie flowers.*

This chapter describes the biological, cultural, and socioeconomic resources of the Flint Hills Legacy Conservation Area. The FHLCA project area consists of 3.3 million acres within the Flint Hills ecoregion of Kansas (Omernick 1987). A narrow band running north-south located within 21 counties in eastern Kansas (see figure 2), and stretches from the northern to the southern border of the state. Some tallgrass prairie extends south into Oklahoma, where it is referred to as the Osage Hills. As elsewhere in Kansas where less than 2 percent of the land area is federally owned, private ownership dominates the project area. The main habitat type found within the project area is eastern tallgrass prairie, represented by over ninety native grasses and 500 broadleaf species. The Flint Hills ecoregion contains the largest concentration of freshwater springs in Kansas (Kansas Geologic Survey 2008) and represents the ultimate source of the Caney, Cottonwood, Elk, Fall, Marais des Cygnes (Osage), Neosho, Verdigris, and Walnut rivers.

This physiographic region represents the world's last intact tallgrass prairie landscape of sufficient size to offer full ecological function. The physical shape and juxtaposition of the up to 1.1 million acres in the priority area targeted for easements is an important component of the project's long-term success. This remaining, high quality, ecologically functioning stretch of tallgrass prairie runs along a north-south axis and is as narrow as 20 miles wide (see figure

2). This narrowness is not a biological choice; it is by default that the project boundary takes this shape, constrained on the east and west by tillage agriculture, woody vegetation, and development.

### BIOLOGICAL ENVIRONMENT

In this section climate; climate change; adaptation, mitigation, and engagement responses to climate change; geologic resources; habitat; and wildlife of the Flint Hills are discussed.

#### *Climate*

The climate of Kansas is continental, with characteristic hot summers, subject to periodic drought coupled with very cold winters. Temperatures can range from  $-40^{\circ}\text{F}$  to  $121^{\circ}\text{F}$ .

There is a distinct east-west precipitation gradient across Kansas. The western edge of Kansas lies in a rain shadow of the Rocky Mountains, and receives only 16 inches of precipitation on average. The Flint Hills area receives approximately 33 inches of precipitation, most of which comes in the form of rain between the months of April and September.

Moist Gulf of Mexico air flows over the eastern portion of the state, providing at the easternmost counties on average 42 inches of precipitation. Rainfall events often exceed 3 inches or more. The

moist air flow and warm temperatures are the source for convectional thunderstorms and tornadic activity in the area.

## **Climate Change**

Climate change presents additional challenges to habitat conservation in the Great Plains. Temperatures are predicted to increase in future decades throughout the Great Plains (Fagre et al. 2009). The FHLCA provides the elements necessary to minimize the impact on wildlife: resilience, redundancy, adaptation potential, habitat connectivity, drought-tolerant plant communities, large and connected ecosystem segments, and the presence of natural disturbances (fire and grazing).

Due to its plant diversity, tallgrass prairie has a built-in resilience to climate variability. The hundreds of grass and broadleaf species represent a wide range of tolerance for annual rainfall and air temperature. Dominated by perennials, many tallgrass prairie species withstand multiple years of drought, as evidenced by the droughts of the 1950s. Within this diverse plant community, a particular group of species usually grows well, regardless of weather conditions.

Although the species composition of the prairie may shift if a multi-decade drought were to occur, the character of the tallgrass prairie will not be lost. During wet years, some species express themselves and show greater vigor. The same holds true for growing seasons with moderate rainfall and heat. However, overall biomass is generally greater during years of abundant rainfall. Climate predictions vary, however some suggest warmer winters and similar spring precipitation in the mid-latitudes of the Great Plains (Fagre et al. 2009). Those rainfall events might be more episodic, bringing fewer, yet heavier rains. Whichever climate prediction holds true, the strength of the tallgrass prairie comes from its diverse species that are adapted to a wide range of climatic conditions.

With the species diversity providing resilience to climate change, the current condition of the Flint Hills region provides habitat representation and redundancy. Currently, the FHLCA provides a significant north-south migration corridor for grassland birds, and links many areas of high quality tallgrass habitat. Retaining migratory corridors is a key adaptation strategy for wildlife response to climate change (USFWS 2009).

## **Adaptation, Mitigation, and Engagement**

The Service's strategic response to climate change involves three core strategies: adaptation, mitigation, and engagement (USFWS 2009). Through adaptation, the impacts of climate change on wildlife can be reduced by conserving habitats expected to



© Kansas State University

*Flint Hills hillside.*

be resilient. The FHLCA provides an anticipatory, rather than a reactive response. As preserving migratory corridors becomes increasingly important, the Flint Hills will provide a contiguous north-south stand of tallgrass prairie within the Central Flyway. Furthermore, if spring/summer precipitation were to increase in a changing climate, tree encroachment would present an accelerating threat of fragmentation to the Flint Hills. Thus conservation actions are warranted to maintain the intactness of the tallgrass prairie character of the Flint Hills.

Carbon sequestration forms one of the key elements of mitigation. The FHLCA easement program could secure the carbon already stored within Flint Hills soils. Prairie vegetation stores carbon in its deep fibrous roots, with approximately 80% of the plant biomass located belowground. It is equally as important to protect existing carbon stores as it is to sequester atmospheric carbon.

Engagement involves cooperation, communication, and partnerships to address the conservation challenges presented by climate change (USFWS 2009). The FHLCA serves as a model for engagement by working with producers, nongovernmental organizations (Tallgrass Legacy Alliance, The Nature Conservancy, Quail Unlimited, and the Kansas Livestock Association), state and local agencies (Kansas Department of Wildlife and Parks, Kansas Department of Health and Environment, Kansas Farm Bureau, Kansas Association of Conservation Districts) and federal agencies including the Natural Resources Conservation Service.

## **Geological Resources**

The eastern margin of the Flint Hills is marked by a major escarpment that is especially prominent in northwestern Greenwood, southeastern Chase, and eastern Butler counties. Maximum elevations exceed 1,600 feet, with local relief up to 320 feet, and deeply entrenched stream valleys. The prominent

escarpment that defines the eastern edge of the Flint Hills is the most rugged surface feature in Kansas. The Walnut, Verdigris, Cottonwood, and Fall river drainage basins meet at divides on the Flint Hills crest in this region. From their eastern crest, the Flint Hills slope gently westward, down the regional bedrock dip, to the western limits of the Walnut and Cottonwood drainage basins.

The Flint Hills are underlain by lower Permian limestone, shale, and evaporites. This bedrock generally dips gently toward the west or northwest. Local variations in bedrock dip are found over the crest of the buried Nemaha uplift. Erosion of shale and limestone strata has resulted in landscapes with steep east-facing escarpments separated by gentle west-sloping cuestas. Thick cherty limestone weathers to produce residual chert lag deposits that are highly resistant to chemical breakdown. Such residual chert, or flint, as it is commonly known, is responsible for maintaining high topographic relief and gives the Flint Hills their name. Unconsolidated sediments are common, especially within river valleys and on some upland areas. Soils are developed in residual (weathered) bedrock material, alluvial deposits, and loess sediment (Aber 1997).

The steep slopes and the thin, rocky soils of the Flint Hills limited crop cultivation to the flatter river and stream bottoms where there are deeper river-deposited sediments. The same rocky limestone soils which made crop cultivation difficult helped to preserve the native characteristics of the Flint Hills, and made the area ideal for cattle grazing. In fact, over a period of time the calcium in the limestone erodes into the soil, making the native prairie plants highly nutritious for grazing animals.

## **Habitat**

Numerous hydrological features bisect the Flint Hills eastward into the prairie. Many other tributaries provide a diversity of riparian plant communities. More than 600 species of vascular plants occur within the project boundary, representing roughly 25% of all the plant species found in Kansas and indicating the significant biological diversity of the Flint Hills. (See figure 3 for land cover and habitat types.)

## **Fire History**

The historic tallgrass prairie, or “true” prairie, occurred along the eastern Great Plains, with Prairie Peninsula radiating north and east into Indiana and Ohio during Pleistocene interglacials (Samson et al. 1999). Tallgrass prairie is considered by ecologists as a “fire climax” system, meaning without fire the tallgrass prairie will begin to shift towards a forest environment (Heisler et al. 2003). The tallgrass prairie we know today began taking shape during the close of North America’s most recent glaciation period. This glacial epic, known as the Wisconsin

period, caused dramatic topographical, climatic, and ecological changes across the landscape (Axelrod 1985). Throughout this period, broad-scale climate gradients, driven by continental climate change, significantly influenced the composition, species richness, and distribution of the tallgrass prairie communities (Steinauer and Collins 1996).

With an existing fire-climax prairie in place, prehistoric man first entered the North America continent approximately 12,000 years ago (Meltzer 1989). Previously, lightning was the sole source of grassland fire ignition. It is noteworthy that the Flint Hills landscape experiences the second highest frequency per square kilometer of lightning strikes in North America (Higgins 1986). Lightning-caused fires presumably drove the region’s early beginnings as a fire- and herbivore-driven plant community (Mulchunas et al. 1998). As prehistoric man gained a landscape presence, it is suggested that fire frequency and temporal occurrence shifted from summer to a fall-dominated period (Shaw and Martin 1995).

This altering of fire shaped the tallgrass ecoregional plant community for several thousands of years (Moore 1972). The advent of early Euro-American explorations, beginning with the Spanish, first penetrated the tallgrass region with members of Coronado’s expedition in 1541 (Haines 1970, Roe 1970). Subsequent Native American ownership of the Spanish horse heralded great changes in their social behavior, biological success, and geographical coverage, initiating vast ecological change within the tallgrass region. An important component of this ecological change was fire, ignited for a variety of reasons, by an increasingly complex, more numerous, and more mobile Native American population. Over time, this increased use of fire is believed to have substantially accelerated an eastward expansion of the tallgrass region (Kozlowski and Ahlgren 1974, Howe 1993).

While historical fire records are scant; they do indicate that the period between 1535 and 1890 supported a dominance of fall fires. Almost all fire records of this period are along major river systems due to the need for huntable game, fuel, and accessible water, all of which made the major rivers within the region the principal travel lanes for both Euro-American and Native American travelers of this time period (Moore 1972).

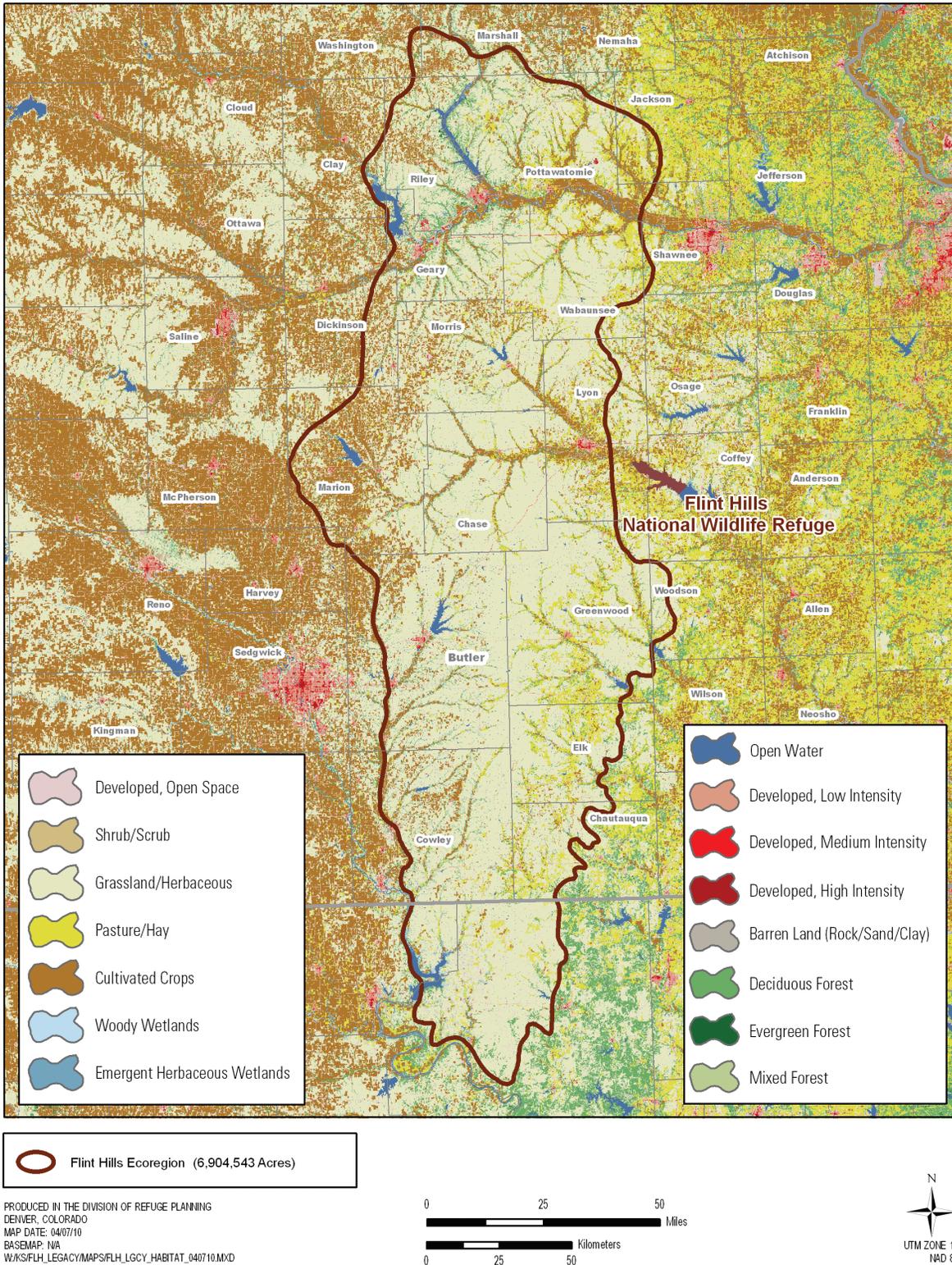
Pre-1840 fire re-occurrence rates in tallgrass prairie vary from a possible annual regime (Pyne 1982) of 2–5 times per decade (Hulbert 1976), to every 5–10 years (Wright and Bailey 1982). Cutter and Guyette (1994) suggest a 2.8 year fire interval for a Missouri savanna while Bragg (1986) and Hulbert (1976) suggest a 3–5 year pre-settlement fire interval for Nebraska and Kansas tallgrass prairie. Kelly Kindscher and Craig Freeman (Kansas Biological Survey, University of Kansas, Lawrence,



U.S. Fish & Wildlife Service

**Flint Hills Legacy Conservation Area**  
Eastern Kansas

*NLCD Habitat Map*



**Figure 3. Land cover and habitat types in the Flint Hills Legacy Conservation Area.**

Kansas, and Kansas Natural Heritage Inventory, respectively; personal communication) suggest a 3–5 year return interval for the Flint Hills ecoregion.

Historical fire-return interval loses some of its relevancy unless discussed within the context of spatial scale and temporal events across the landscape. Historical fire-grazing interaction on the Great Plains was a shifting mosaic of disturbance, including areas that were burned and grazed, along with regions that were not disturbed. As an area burned and consequently greened up over time, herbivores of all kinds would concentrate on it. This burned area, if heavily used could leave other areas with very little grazing pressure. This fire-grazing interaction would repeat itself across the landscape creating a moving mosaic across both space and time. This random disturbance pattern allowed for a diverse assemblage of species to exist simultaneously (Weir et al. 2007).

Modern era settlement and livestock usage of the Kansas Flint Hills began in the mid-1800s. During initial settlement most cattle came from Texas and were driven across open range to Kansas. Around the 1880s Kansas enacted a fence law, and within a decade the majority of the region was fenced and drive routes were blocked off, much as it exists today (Jim Hoy, historian, Emporia State University, Emporia, Kansas; personal communication). As early as 1863, cattlemen recognized that burning prairies benefited both cattle weight gains and the condition of their pastures.

In recent years, prescribed fires have largely been conducted by ranchers in the spring on an annual basis. Some ranchers have begun to use patch fires that is more representative of historical fire regimes in the region.

### Prairie Uplands

The Flint Hills landscape is most often associated with bluestem grasses and about ninety native grass species are found here, with big bluestem, little bluestem, Indiangrass, switchgrass, eastern gamagrass and sideoats grama being some of the more important species from an ecological and livestock production perspective. The 500-plus native broadleaf prairie plant species (herbaceous forbs) documented as occurring in the Flint Hills are also important, not only for maintaining the ecological health of the prairie but also for providing added forage value.

As the seasons progress, new species will flower each week from March through September. This floral diversity provides benefits such as pollen and nectar foods for a diverse assemblage of pollinators, and a seed source variable in size, shape, and amino acid complex, all spatially and temporally available across the landscape. This rich array of food choices provides a quality foraging opportunity to numerous migratory and resident trust species.

Late-season rains often give rise to luxuriant fall grasses, which in turn provide important winter thermal protection for grassland birds and offer unique water quality and quantity benefits to the region.

As a result of interactions among climate, topography, fire, and bison herbivory, the vegetative structure and composition of the prairie varied both temporally and spatially across the landscape. Thus, grassland birds evolved in an ever-changing mosaic of habitats, and as a result, bird communities were likely to have varied both temporally and spatially across the landscape.

### Oak Savanna and Woodlands

Although they represent a small percentage of the total acreage of the tallgrass prairie, native oak woodlands can be found throughout the project area. Species that are most commonly associated with these areas include white oak, post oak, and black oak, with a grass component including little bluestem. Post oak occurs as a dominant tree in savannas and in forests adjacent to grasslands, and will expand into adjacent prairies in the absence of fire.

Oak trees provide cover and habitat for birds and mammals. Cavities provide nest and den sites, and leaves are used for nest construction. Oak acorns provide food for numerous wildlife species including squirrels, mice, voles, white-tailed deer, and wild turkey. Bell's vireo, Bewick's wren, loggerhead shrike, and red-headed woodpecker use this woody habitat.

### Riparian Areas

The Flint Hills ecoregion, as defined by Chapman et al. (2001), contains the largest concentration of freshwater springs in Kansas (Kansas Geological Survey 2008) and is the source of the Caney, Cottonwood, Elk, Fall, Marais des Cygnes (Osage), Neosho, Verdigris, and Walnut rivers. This grassland region is drained by roughly 3,300 miles of perennially flowing streams and 14,000 miles of intermittent and ephemeral streams (USGS 2008). It boasts many of the state's most pristine surface waters (for example Dodds and Oakes 2004) and supports a rich variety of native fish and shellfish species, including the world's largest remaining populations of the federally protected Topeka shiner and Neosho madtom (Haslouer et al. 2005, Angelo et al. 2002a, 2009). Many streams in the Flint Hills currently serve as ecological "reference" systems in environmental monitoring programs administered by state and federal natural resource agencies (for example KDHE 2007). These streams approach the historical (pre-settlement) ecological condition and provide the physiochemical and biological data needed to assess changes in the state's more heavily

impacted surface waters (Angelo et al. 2002b, KDHE 2008).

## Wildlife

The Flint Hills prairie supports a wide variety of animal life. There are assemblages of amphibians and reptiles, fish, birds, mammals, and species of special concern in the project area. Appendix B contains the species list for the Flint Hills area.

### Amphibians and Reptiles

The tallgrass prairie and stream corridors that run throughout the project area provide food and shelter for a number of terrestrial or semi-aquatic animals including salamanders, toads, frogs, skinks, lizards, snakes, and turtles.

### Fish and Aquatic Species

The project area contains many of the state's most pristine surface waters (for example Dodds and Oakes 2004) and supports a rich variety of native fish (over eighty species), and shellfish, including the world's largest remaining populations of the federally protected Topeka shiner and Neosho madtom (Haslouer et al. 2005, Angelo et al. 2002a, 2009).

Protection of this tallgrass landscape is essential to sustaining these aquatic species. A number of watersheds situated in the tallgrass prairie of eastern Kansas are the last remaining strongholds for the federally endangered Topeka shiner, a small minnow that inhabits headwater prairie streams. While the number of known occurrences of Topeka shiner populations throughout its historical range in Iowa, Kansas, Minnesota, Missouri, Nebraska, and South Dakota has been reduced by more than 80 percent, stable populations remain in many of the unfragmented prairie streams in the Flint Hills (Haslouer et al. 2005, Angelo et al. 2002a, 2009). Because the Topeka shiner is not negatively impacted by normal ranching practices, maintenance of native prairie watersheds through continued ranching, which Service conservation easements will allow, may be the best hope for long-term survival of the species.

Another federally listed species endemic to the tallgrass prairie region is the Neosho madtom, a threatened catfish found primarily in about a 200-mile stretch of the Neosho and Cottonwood rivers in eastern Kansas. Like the Topeka shiner, the Neosho madtom is dependent on healthy prairie watersheds.

Many of eastern Kansas' prairie streams also harbor diverse assemblages of freshwater mussels. Freshwater mussels are the most imperiled animal group in North America, with thirty-six species believed to have become extinct during the past century. Unfortunately, mussels in Kansas have

undergone a similar trend of decline. Of the forty-eight species known to have occurred in Kansas, at least five of these are now believed to be extirpated from the state, and twenty-one species are state-listed as either endangered, threatened, or as a species in need of conservation (Brian Obermeyer, Flint Hills project coordinator, The Nature Conservancy, Topeka, Kansas; face to face meeting, 2009). While there are no federally listed mussels in Kansas, five species are classified by the Service as species of concern, and federal protection could soon be proposed for two of these—the Neosho mucket and the western fanshell—if their conservation status is further threatened. Protection of native prairie watersheds through the use of conservation easements may be one of the best defenses to preclude further listings and extirpations of aquatic mollusks in the Flint Hills.

### Birds

The remaining portion of a once vast grassland provides essential habitat for numerous grassland bird species, including greater prairie-chicken, Henslow's sparrow, short-eared owl, Bell's vireo, American golden-plover, grasshopper sparrow, dickcissel, eastern meadowlark, upland sandpiper, buff-breasted sandpiper, scissor-tailed flycatcher, loggerhead shrike, Smith's longspur, Harris' sparrow, Swainson's hawk and northern harrier. Among bird species, grassland birds have shown the fastest rate of decline. Of forty-six grassland-breeding bird species, 48% are species of conservation concern nationwide, including four populations that are federally endangered. Of the forty-two grassland species with sufficient monitoring, twenty-three are declining significantly (North American Bird Conservation Initiative 2009).

Within the Flint Hills, birds require a mosaic of vegetation structure within the tallgrass prairie. The



*Greater prairie-chicken.*

intent of the FHLCA is to maintain the contiguity of the tallgrass prairie, thus protecting it from fragmentation caused by woody encroachment or development. In large parcels of grassland habitat, bird diversity increases when grazing and fire create a mosaic of vegetation structure (Fuhlendorf et al. 2006). When fire or grazing reduce the height and density of grasses, habitat becomes more suitable for grasshopper sparrow (Vickery 1996). Conversely, a 3-year absence of fire promotes habitat for Henslow's sparrow (Zimmerman 1988). Grassland birds evolved under the combined influence of fire and grazing (Fuhlendorf et al. 2006). Those two disturbances are inseparable, interacting through positive and negative feedbacks to create a shifting mosaic of vegetation structure across the landscape (Fuhlendorf and Engle 2004). This diversity of vegetation height, structure, and location creates the heterogeneity necessary to support an entire guild of grassland birds: migrants, nesters, and wintering species. Homogenous grassland habitat, with similar vegetation height and litter depth, cannot support the entire community of grassland birds (Fuhlendorf and Engle 2004).

Several species within the Flint Hills are identified as grassland obligate birds: northern harrier, upland sandpiper, greater prairie-chicken, horned lark, Savanna sparrow, grasshopper sparrow, Henslow's sparrow, dickcissel, eastern meadowlark (Ribic et al. 2009). Researchers at Konza Prairie found low-intensity cattle grazing to positively affect upland sandpipers, grasshopper sparrows, and eastern meadowlarks (Powell 2008). Grasshopper sparrows avoid areas with extensive shrub cover, selecting areas burned within the past 1–2 years (Powell 2008, Vickery 1996). Eastern meadowlarks use habitats with taller grasses of greater density, mixed with forbs (Powell 2008).

Continuing along the spectrum of denser vegetation and greater time since disturbance, Henslow's sparrows prefer significantly greater cover of standing dead vegetation created by a 2–3 year absence of fire (Zimmerman 1988). Dickcissels select areas of tall (10–59 inches) and dense (90–100%) cover (Powell 2008). Finally, Bell's vireo nests in low-shrub vegetation within draws (Brown 1993). Although each species has different habitat needs, they share a common element—intact tallgrass prairie with a diversity of vegetation structure.

These grassland birds all require relatively large blocks of healthy tallgrass prairie at various ecological stages of succession. Project size becomes important within the context of providing adequate numbers of suitable habitat units dispersed within the proper spatial scale, all of which are necessary to provide resilient, quality migrational and breeding habitat within the context of seasonal weather variations and the resultant plant community responses. Additionally, avian predator concerns and temporal shifts in migration further substantiate the



*Hikers in the Konza prairie.*

need for large, well-dispersed areas of a mosaic of tallgrass habitat types along the entire migrational corridor for these species. The requirements of these tallgrass-dependent migrant birds make them a priority species guild for conservation management.

Important year-round avian species such as the greater prairie-chicken (a Flint Hills umbrella species) require a similar mosaic of habitat types. Specific successional stages of the tallgrass plant community are necessary for many different stages of the greater prairie-chicken's life cycle. The greater prairie-chicken requires visually open areas with short vegetation for lek displays, dense almost shrubby habitat for nesting, moderate densities for brood rearing, and dense herbaceous cover for winter thermal protection. All of these habitat stages needed by greater prairie-chickens are representative of the various size and distribution requirements for avian migrants, making the prairie-chicken a useful umbrella species for habitat conservation management decisions. Home ranges of prairie-chicken flocks may be greater than 9,900 acres during certain times of a year (Robel et al. 1970). The number of acres necessary for a genetically viable population of greater prairie-chickens varies depending on large part on the quality and juxtaposition of habitats within a given area. Suggested size for a Minnesota population located in fragmented habitat was a minimum of 1 million acres (Johnson et al. 2004).

Unlike migrant species, the greater prairie-chicken must obtain all of its requirements within the context of tallgrass prairie. This affinity for open tallgrass makes it imperative to have habitat dispersed over as large a geographical area as possible.

## Mammals

Uplands and stream corridors provide habitat for many small mammals including shrews, mice, voles, pocket gophers, ground squirrels, weasels, mink, and bats. These mammals provide critical food sources for prairie raptors such as bald eagles, ferruginous hawks, northern harriers, prairie falcons, and short eared owls. In addition, big game animals such as white-tailed deer, pronghorn, and the occasional mule deer use the upland prairie habitat. Mountain lion, badger, bobcat, coyote, and red fox are examples of carnivores that occur throughout the project area.

## Species of Special Concern

At the federal level, eleven Flint Hills species are listed as threatened and endangered, or are candidates for listing; these include the American burying beetle, piping plover, Topeka shiner, least tern, whooping crane, Neosho madtom, western prairie-fringed orchid, Arkansas River shiner, and the Arkansas darter, Neosho mucket, rabbitsfoot (candidates for listing). Refer to appendix B, which includes the federally listed animals documented as occurring in the project area.

## CULTURAL RESOURCES

Current archaeological evidence indicates that the earliest humans, called the Paleoindians, migrated to the region at the close of the last Ice Age approximately 12,000 years ago. These people had a highly mobile lifestyle that depended on big game hunting, including mammoths and the huge now-extinct ancient bison. The hallmark of most Paleoindian sites are the beautiful but deadly spear points that are generally recovered from animal kill and butchering sites, and small temporary camps. Evidence of the Paleoindian occupation of the Flint Hills area is sparse and most often consists of isolated spear points.

There was a gradual but definite shift in the pattern of human use of the region beginning about 9,000 years ago. The changes are due to a combination of regional climatic fluctuations and an increasing population, coupled with tremendous social change and technological innovation. Although this stage, referred to as the Archaic and lasting until about 2,000 years ago, is better represented in the archaeological record than the preceding Paleo-Indian stage, the interpretation of the remains is difficult. Evidence of a greater diversity of tools and increased use of native plants is found on many sites but the remains also suggest a more localized and less mobile population.

By approximately 2,000 years ago the populations of the Flint Hills region exhibited a combination of distinctive local traits and the effects of contact with neighboring groups. This period is referred to as

the Plains Woodland or Ceramic Period and lasted up to approximately 350 years ago. Along with an increasing population and regional variation came great changes and innovation, including the advent of pottery, the bow and arrow, and semi permanent dwellings. Small villages began to be established and evidence of early agriculture is found along some of the waterways.

When the Coronado expedition reached what would become central Kansas in 1541, the area was occupied by several of Native American groups. Over the next 300 years, various tribes lived in the Flint Hills region including the Pawnee, Wichita, Plains Apache, Kansa, Kiowa, and the Osage. Although many tribes moved, or were moved, in and out of the region, by the mid-1800s the influx of emigrants of European ancestry was prevalent. By the late 1870s many of the tribes had been relocated to Oklahoma.

The Service has a trust responsibility to American Indian tribes that includes protection of the tribal sovereignty and preservation of tribal culture and other trust resources. Currently, the Service does not propose any project, activity, or program that would result in changes in the character of, or adversely affect, any historical cultural resource or archaeological site. When such undertakings are considered, the Service takes all necessary steps to comply with section 106 of the National Historic Preservation Act of 1966, as amended. The Service pursues compliance with section 110 of the act to survey, inventory, and evaluate cultural resources.

## SOCIOECONOMIC ENVIRONMENT

The project area includes portions of twenty-one counties; Butler, Chase, Chautauqua, Clay, Cowley, Dickinson, Elk, Geary, Greenwood, Harvey, Jackson, Lyon, Marion, Marshall, Morris, Pottawatomie, Riley, Shawnee, Washington, Woodson, and Waubanssee. A number of small communities are within the project area, mostly located adjacent to Highway I-35 and the eastern portion of I-70. Some of the largest communities in the state are immediately adjacent to the project area. Wichita has a population of over 366,000, Kansas City 142,562, and Topeka 123,446. Over 2.8 million persons live in the state of Kansas (U.S. Census Bureau 2009). Although there are several large communities adjacent to the FHLCA, the economy of the project area is tied to ranching and agriculture.

The strong agricultural tradition in Kansas has been contributing to the economies of small towns and the state's overall well-being since before statehood. Known as "cow towns," many towns in Kansas were dependent on the large cattle drives of the mid- and late-eighteenth century. As the drives changed and eventually disappeared, these cow towns had to change their economic base to survive—towns such as Abilene and Dodge City had to reinvent

themselves. Though not totally dependent on the cattle industry now, many towns still rely on the economics of the industry. The grasslands of the Flint Hills provide summer grazing grounds that provide cattle to the numerous feed lots in other portions of Kansas.

The importance of the Flint Hills to the cattle industry cannot be overstated. The Flint Hills grasslands provide cattle to the feedlots that supply the processing facilities, thus supporting a state-wide cattle industry. With Kansas ranking second in cattle and calves, the Flint Hills plays a major role in the \$6.24 billion cattle industry in Kansas, processing over 22% of all beef in the United States (Kansas Department of Agriculture 2010). The Flint Hills ranchers' livelihood depends on natural resources (grass, water, and open space) and these ranchers have a deep-rooted attachment to the land.

Unlike many other areas in the country, the key to protecting the tallgrass prairie lies primarily in sustaining the current land use pattern of livestock ranching and the use of prescribed fire.

Reasonably foreseeable actions are actions and activities that are independent of the conservation area proposed action but could result in the cumulative or additive effects when combined with the proposed alternatives. They are anticipated to occur regardless of which alternative is selected. The cumulative effects of these activities are described in the "Cumulative Impacts" sections in chapter 3. Energy development (oil and gas, and wind) and residential development, and future prairie conservation efforts by a variety of organizations are the primary, reasonably foreseeable actions occurring in the Flint Hills region and are also discussed in chapter 3.

### ***Landownership***

More than 98 percent of the property within the project boundary is in private ownership. Many Flint Hills properties are in the possession of absentee landowners, with ranch managers controlling the day-to-day operations.

### ***Property Tax***

Currently, landowners pay property taxes on their private lands to the counties. Since the proposed project is a conservation easement program, the land does not change hands and, therefore, the property taxes paid by the landowner to the county are not affected. Kansas property taxes are based on agricultural value, and as easements will not affect the agricultural value of the property, no changes to the tax base are anticipated.

### ***Public Use and Wildlife-dependent Recreational Activities***

Visitors to the Flint Hills are attracted by opportunities for bird and other wildlife viewing, nature photography, canoeing, fishing, hunting, wildflower touring, hiking, and horseback riding.

The 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation found that \$5.58 million were spent in Kansas on equipment and various trip-related expenditures for hunting and fishing. An additional \$1.56 million was spent on food, lodging, and various equipment used for wildlife watching. In 2008, the sale of hunting and fishing licenses alone in Kansas generated approximately \$10.8 million in revenue (Kansas Department of Revenue 2008).

There is increasing interest in developing agri-tourism opportunities in the Flint Hills. Many tourists travel on the Native Stone Scenic Byways and Flint Hills Scenic Byway located within the project area.



# 3 Threats to and Status of Resources



*Black Sampson prairie vista.*

This chapter discusses the analysis conducted during the EA process, and why establishment of the FHLCA through conservation easements was the chosen alternative.

Wildlife species dependent on tallgrass habitat are dependent on an increasingly shrinking ecosystem, a factor contributing to the rapid decrease of grassland birds dependent on the tallgrass prairie. Intact, open landscapes are essential habitat components for the greater prairie-chicken and other grassland birds that are the priority species for conservation management in the tallgrass prairie habitat guild.

Grasslands once dominated central North America. The eastern third of this vast grassland ecosystem, from southern Manitoba to Illinois and south to Texas, is known as the tallgrass prairie region. The tallgrass prairie, like the Great Plains as a whole, was shaped under disturbances such as fire, grazing, and drought. During these cycles of change and disturbance, deep-rooted prairie plants assimilated nutrients and returned them to the surface, creating rich, dark soils considered to be some of the most fertile in the world.

The rich soils, combined with gently rolling topography, made the region important for agricultural development. Much of the tallgrass prairie was converted to cropland in a single decade, 1870–80, as railroads and land acts provided economic incentives. The tallgrass prairie ecosystem has been

plowed, fragmented, and in some cases severely degraded, making this once expansive, complex ecosystem one of North America's most altered and endangered ecosystems (Noss et al. 1995). Still relatively unspoiled by the pressures of modern development is the greater Flint Hills landscape of eastern Kansas.

Today, less than 4 percent of this once vast grassland region remains (Steinauer and Collins 1996). Cultivation, agriculture, tree encroachment, and development activities have pushed grassland-dependent wildlife species into ever-shrinking areas of tallgrass prairie. Approximately three-quarters of the remaining tallgrass prairie lie within the Flint Hills ecoregion of eastern Kansas and northeastern Oklahoma, with about 3.5 million acres present in the Kansas portion of the Flint Hills. The outer edge of this region is presently suffering a rapid conversion to forest due partly to a declining fire culture within the agricultural communities of the region. The inner core of this region is relatively intact to date, offering potential for a sustainable rural economy, and ecosystem function and value. The remaining, highest quality, ecologically functioning stretch of tallgrass prairie runs between the southern and northern borders of the state, and is as narrow as 20 miles wide, constrained on the east and west by tillage agriculture. The narrow north-south corridor reflects the shape of the remaining intact Flint Hills tallgrass.

The tallgrass prairie that remains today is due in large part to the ranching culture of the Flint Hills region. The Service believes that the FHLCA easement program is a positive effort toward perpetual conservation of wildlife values by protecting large tracts of private lands from development and conversion of prairie grasslands that will undermine these values and fragment habitats.

In addition to fragmentation, residential and commercial development can present a substantial threat to aquatic ecosystems. Housing developments can bring run-off or septic-derived nutrient additions to streams and lakes, wetland drainage, water diversion, invasive or noxious weeds, and introduction of nonnative fish into aquatic ecosystems.

## EFFECTS ON THE BIOLOGICAL ENVIRONMENT

The analysis of the chosen alternative considered the estimated effects on wildlife habitat and water and soil resources

### *Wildlife Habitat*

Fragmentation of the landscape can result in areas that are too small or disconnected to meet the habitat needs of many area-sensitive or grassland-dependent wildlife species.

### **Habitat Fragmentation**

Establishing the FHLCA will provide for the conservation of up to 1,100,000 acres of the only remaining landscape-scale expression of tallgrass prairie. This program will provide protection and prevent the fragmentation of essential tallgrass habitat, and prairie-dependent resident and migratory wildlife species.

Areas with FHLCA conservation easements will not permit commercial and industrial-scale development of wind energy, new residential developments, oil and gas developments, or commercial aggregate extraction projects on easement lands due to the serious fragmentation that occurs with these types of activities and their associated infrastructure (wind towers, roads, and transmission lines). Perpetual conservation easements will restrict new development in order to prevent the resultant habitat fragmentation, and thereby protect key biological linkages, facilitate wildlife movement, and provide for wildlife habitat requirements. Additionally, the use of conservation easements will support management activities such as prescribed fire, grazing, and efforts to control the spread of woody vegetation and invasive weeds. Retaining

large, unfragmented areas will also greatly reduce the potential for human-wildlife conflicts.

Because the conservation area currently benefits from minimal habitat fragmentation, the project seeks to retain the intact status of the habitat. The habitat loss and fragmentation from roads, power lines, turbines, and other associated infrastructure that is probably the most pressing issue for wind projects sited in relatively intact, natural landscapes (Kuvlesky et al. 2007, McDonald et al. 2009) will be greatly reduced in the project area.

The Service supports the development of renewable energy (see Secretarial Order 3285) in areas that have minimal impacts to the trust wildlife resources on public lands. However, available research shows the grassland interior species of the Flint Hills to be especially vulnerable to infrastructure from various forms of development. Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines (USFWS 2003) recommends avoiding “placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds).” While wind turbines may be compatible with some wildlife species in other areas of Kansas, the Flint Hills tallgrass prairie dependent species have demonstrated sensitivity to vertical structures and habitat fragmentation.

Agricultural practices such as livestock grazing, prescribed burning, and haying will continue, while sod busting (breaking of native grassland) will be prohibited. Easements will maximize the connectivity with other protected grasslands and decrease the negative impacts of habitat fragmentation on grassland birds.

For easements that have been put in place on land where the owner has not sold or leased the mineral or subsurface estates (oil and gas deposits), the U.S. Fish and Wildlife Service easements will be senior to any subsurface interests later acquired by a developer. Since development of the mineral estate could significantly impact the resources to be protected, the Service will require a developer to access minerals from off-site. Surface occupancy of the easement for mineral development will be prohibited.

In many places where the subsurface estate has been severed, including along the Flint Hills ecosystem, the landowner does not own the subsurface rights; and this means that the easement that the Service acquires from the landowner is subject to those outstanding mineral rights. In those cases, the Service will work on a voluntary basis with the developer to minimize surface degradation and will seek restoration of disturbed sites.

Conserving the unfragmented nature of North America's interior grassland habitats, which have steadily become more fragmented by a variety of human-induced influences (Samson and Knopf 1994, Knopf and Samson 1997), is essential for the long-term conservation of grassland-dependent wildlife.

The Flint Hills region provides habitat integral to larger national conservation efforts. The region is a north-south migration linkage for many migratory birds. Wildlife species dependent on tallgrass habitat are being increasingly compressed into a shrinking ecosystem, a factor contributing to the rapid decrease of grassland birds; the fastest declining group of all of North American bird guilds. Intact, open landscapes are essential habitat components for the greater prairie-chicken and other grassland birds that are the priority species for this project. These open landscapes are also essential for the viability of ranching communities in the Flint Hills, and in turn provide habitat at the scale necessary for grassland interior specialists.

Establishing the Flint Hills Legacy Conservation Area will provide for the conservation of up to 1,100,000 acres of important tallgrass habitat on private land. This program will help maintain the intactness of the Flint Hills tallgrass prairie region and complement conservation efforts of RTK, TLA, KLT, TNC, KDWP, and other federal and state agencies.

### Other Fragmentation Issues

Conservation easements within the Flint Hills Legacy Conservation Area will help reduce habitat fragmentation resulting from a lack of fire and encroachment by woody species. Key biological linkages that facilitate wildlife movement and provide for wildlife habitat requirements will be maintained. The conservation of large, unfragmented blocks of tallgrass prairie will allow the continued use of prescribed fire to maintain healthy habitat. In particular, patch or rotation burning of prairie provides the mosaic of habitat conditions required by grassland birds.

One of the greatest threats to the tallgrass region is forestation due to fire suppression. Fire also maintains overall prairie health and in turn promotes heterogeneity, a precursor to biodiversity. Maintaining fire in the Flint Hills will be maintained through objective, voluntary management.

### Priority, Threatened, and Endangered Species

Grassland birds all require relatively large blocks of healthy tallgrass prairie at various ecological stages of succession for resilient, quality migrational and breeding habitat within the context of seasonal weather variations and the resultant plant community responses. Additionally, avian predator concerns and temporal shifts in migration further



*Red cedar invasion of prairie.*

© Kansas State University

substantiate the need for large, well-dispersed areas of a mosaic of tallgrass habitat types along the entire migrational corridor for these species. The requirements of these tallgrass-dependent migrant birds make them a priority species guild for conservation management.

Protection of this tallgrass landscape is essential to sustaining two federally listed aquatic species. A number of watersheds situated in the tallgrass prairie of eastern Kansas are the last remaining strongholds for the federally endangered Topeka shiner, a small minnow that inhabits headwater prairie streams. While the number of known occurrences of Topeka shiner populations throughout its historical range in Iowa, Kansas, Minnesota, Missouri, Nebraska and South Dakota has been reduced by more than 80 percent, stable populations remain in many of the unfragmented prairie streams in the Flint Hills ecoregion (Haslouer et al. 2005, Angelo et al. 2002a, 2009). Because the Topeka shiner is not negatively impacted by normal ranching practices, maintenance of native prairie watersheds through continued ranching, which Service conservation easements will allow, may be the best hope for long-term survival of the species.

Another federally listed species endemic to the tallgrass prairie region is the Neosho madtom, a threatened catfish found primarily in an approximately 200-mile stretch of the Neosho and Cottonwood rivers in eastern Kansas. Like the Topeka shiner, the Neosho madtom is dependent on healthy prairie watersheds.

Many of eastern Kansas' prairie streams also harbor diverse assemblages of freshwater mussels. Freshwater mussels are the most imperiled animal group in North America, with thirty-six species believed to have become extinct during the past century. Unfortunately, mussels in Kansas have undergone a similar trend of decline. Of the forty-eight species known to have occurred in Kansas, at

least five of these are now believed to be extirpated from the state, and twenty-one species are state-listed as either endangered, threatened, or as a species in need of conservation (Brian Obermeyer, Flint Hills project coordinator, The Nature Conservancy, Topeka, Kansas; face to face meeting, 2009).

While there are no federally listed mussels in Kansas, five species are classified by the Service as species of concern, and federal protection could soon be proposed for two of these—the Neosho mucket and the western fanshell—if their conservation status is further threatened. Protection of native prairie watersheds through the use of conservation easements may be one of the best defenses to preclude further listings and extirpations of aquatic mollusks in the Flint Hills.

At the federal level, eleven Flint Hills species are listed as threatened and endangered, or are candidates for listing; these include the American burying beetle, piping plover, Topeka shiner, least tern, whooping crane, Neosho madtom, western prairie-fringed orchid, Arkansas River shiner, and the Arkansas darter, Neosho mucket, rabbitsfoot (candidates for listing). Refer to appendix B, which includes the federally listed animals documented as occurring in the project area.

## ***Water and Soil Resources***

Water resources on 1,100,000 acres will be protected from increased nonpoint source pollution from residential subdivision, commercial development, increased erosion, and draining of wetlands, all of which are prohibited under the easement program. Compatible agricultural practices such as livestock grazing or haying will continue, while sod busting will be prohibited. The landowner will continue to own and control water rights.

## ***Carbon Sequestration Effects***

Carbon sequestration is cited as a goal of the USFWS Action Plan for Climate Change (2009). Tallgrass prairie is well known for its ability to store carbon within soils. In addition, research at Konza Prairie identifies tallgrass prairie as a carbon sink under elevated CO<sub>2</sub> concentrations (Williams et al. 2004). Therefore, conservation of the Flint Hills grasslands will not only ensure the storage of existing soil CO<sub>2</sub>, but also provide a place for future sequestration if atmospheric CO<sub>2</sub> concentrations increase. Some studies have indicated under conditions of elevated levels of CO<sub>2</sub>, carbon is stored in greater proportions below the ground and productivity increases in plant systems like the tallgrass prairie found in the Flint Hills (Canadell et al. 1996, Williams et al. 2004). Grasslands store the majority of carbon within the soil, whereas forests hold the greatest abundance of carbon in

aboveground biomass. While projects that sequester carbon through reforestation receive much attention, equal attention should be focused on retaining carbon that is currently stored in soils.

## **EFFECTS ON THE SOCIOECONOMIC ENVIRONMENT**

The analysis of the chosen alternative considered landownership and land use, the value of intact ecosystems, oil and gas explorations and development, wind energy, and public use effects on the socioeconomic environment.

### ***Landownership and Land Use***

The easement program will maintain the aesthetics of the tallgrass prairie while providing protection of trust resources through conservation of wildlife habitat and protection of land from surface disturbance or development, and fragmentation.

In 2006, the Outdoor Industry Foundation reported that wildlife and bird watching contributed \$730 billion annually to the United States economy, with an estimated sixty-six million Americans participating in wildlife viewing (Southwick Associates, Inc. 2007).

Easements will affect lands on which the Service has acquired a conservation easement. The location, distribution, and sale of development rights by landowners on adjacent lands without Service easements will not be affected. Ongoing, traditional agricultural uses such as livestock grazing will allow ranching to continue on easements. This alternative will maintain open space on a large landscape scale, thereby preserving the rural lifestyle and associated tourism and economic activities of the area.

The purchase of an easement will not result in a transfer of land title, and private landowners will continue to pay property taxes. Preventing subdivision and development could decrease future tax revenues in a defined market area. However, open space could actually provide a net savings to local governments when compared to the revenues generated and costs of services associated with residential development (Haggerty 1996).

Positive effects may occur from increased public wildlife viewing, tourism, fishing, and hunting opportunities. Open space also may enhance property values on adjoining lands as people begin to seek out undeveloped lands in the future.

In addition, maintaining intact tallgrass prairie habitat will provide “ecosystem services” that are often unrecognized, or considered “free” (for example pollination, water purification, nutrient cycling, carbon sequestration, soil conservation, and control of pest insect populations by birds) that will not be

provided in areas that have undergone residential or commercial development.

The easement program will have no effect on tribal jurisdiction or tribal rights because it is outside of reservation lands and deals only with private landowners willing to sell an easement.

### **Public Use**

Conservation easements purchased on private tracts will not change the landowner's right to manage public access to their property.

Under the easement program private landowners will retain full control over their property rights, including allowing or restricting hunting and fishing on their lands.

### **Development**

The easement program will protect up to 1.1 million acres of tallgrass prairie from the combined effects of various future development activities by precluding surface occupancy, and the resultant infrastructure from fragmenting tallgrass habitat. The FHLCA is the only presently known action of similar scope and scale that is seeking landscape-scale conservation of the tallgrass prairie in the Flint Hills.

Ongoing, traditional agricultural uses such as livestock grazing will allow ranching to continue. Open space will be maintained on a large landscape scale, thereby preserving the rural lifestyle of the area.

### **Oil and Gas Exploration and Development**

The program will preclude oil and gas exploration or development requiring surface occupancy on easement land. Typically, conservation easements do not affect subsurface estates (oil and gas deposits) because the Service only acquires rights associated with surface ownership. In many places where the subsurface estate has been severed from surface ownership, including along the Flint Hills, the landowner does not own the subsurface rights; and this means that the easement that the Service acquires from the landowner is junior to the subsurface rights.

For easements that have been put in place on land where the owner has not sold or leased the mineral or subsurface estates (oil and gas deposits), the U.S. Fish and Wildlife Service easement will be senior to any subsurface interests later acquired by a developer. Since development of the mineral estate could significantly impact the resources the Service is attempting to protect, the Service will require a developer to access minerals from off-site. Surface occupancy of the easement for mineral development will be prohibited.

### **Wind Energy Development**

The easement program will enhance the protection of tallgrass prairie-dependent wildlife species through conservation of wildlife habitat and protection from surface disturbance or development of wind energy infrastructure, while providing some financial compensation to landowners through the sale of easements, to offset some of the potential revenue loss from the sale of wind energy development leases.

The project will only affect lands on which the Service has acquired a conservation easement. Location and distribution on adjacent lands without Service conservation easements will not be affected. Over 89% of Kansas has the potential for the development of wind energy (National Renewable Energy Lab 2010) most of which (over 45 million acres) will still be available for development.

### **Residential Development**

Preventing subdivision and development could decrease future tax revenues in a defined market area. However, open space could actually provide a net savings to local governments when compared to the revenues generated and costs of services associated with residential development (Haggerty 1996).

## **VALUE OF INTACT ECOSYSTEMS**

Under the program, the Flint Hills grasslands will remain intact, continuing to provide ecosystem goods and services to landowners and local communities. Ecosystem services include: soil erosion control, water supply, hay production, biodiversity, and carbon sequestration. Researchers have attached dollar values to the ecosystem services provided by the grasslands of the Great Plains (Dodds et al. 2008). Overall, the native grasslands of the Great Plains produce \$1,189 billion per year of ecosystem goods and services. Compared to other habitat types in the United States (eastern forests, deserts, wetlands), Great Plains grasslands have substantial value because of their significant acreage and their high quality (Dodds et al. 2008).

Great Plains grasslands stand out in other ways as well. Compared to other terrestrial ecosystems, grasslands provide the highest commodity value because of hay production. In addition, they show high economic value for biodiversity, due to the abundance of insect pollinators (Dodds et al. 2008). Beneficial insects from grasslands can provide pollination services to surrounding agricultural crops.

More locally, Kansas State Research and Extension conducted a watershed protection strategy for the Neosho River headwaters, most of which originates in the Flint Hills. The models for erosion control make comparisons between urban, cropland, and grassland cover types. Intact grassland provides a

95% reduction in soil erosion when compared to other cover types (Kansas State University Research and Extension 2009). This ecosystem service retains soil productivity and improves water quality for surrounding communities.

The program will help protect valuable ecosystem services as shown in figure 4. Furthermore, it will prevent the prohibitively high cost of restoration.

### UNAVOIDABLE ADVERSE IMPACTS

No direct or indirect unavoidable adverse impacts to the environment will result from the easement program, and it will not result in unavoidable adverse impacts on the physical or biological environment. The selection of an approved boundary will not, by itself, affect any aspect of landownership or values.

### IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

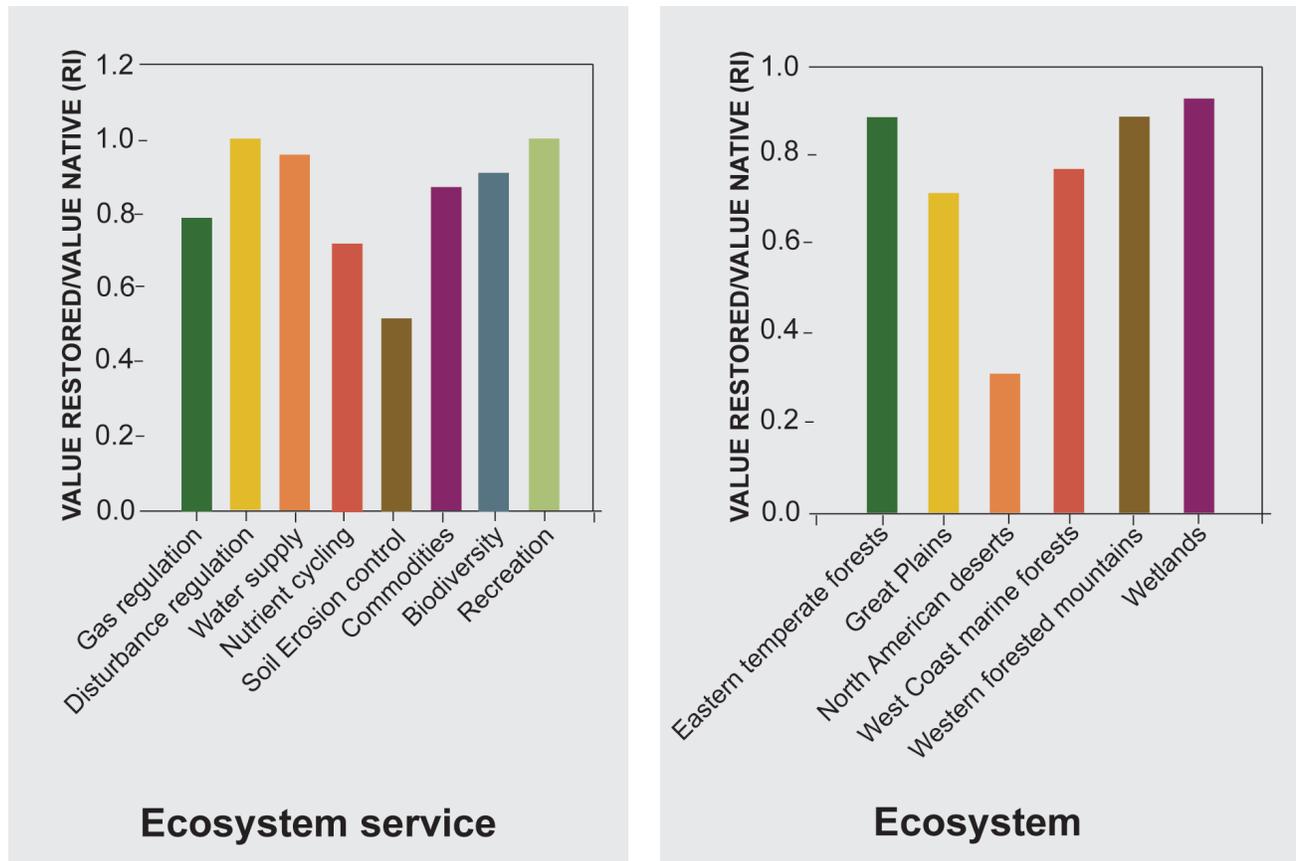
There will not be any irreversible or irretrievable commitments of resources associated with the

conservation easement program. Once easements are acquired, irreversible and irretrievable commitments of funds to protect these lands (such as expenditure for fuel and staff for monitoring) will exist.

The introduction of new residential and commercial infrastructure to the Flint Hills tallgrass prairie will be greatly restricted on conservation easement lands, reducing the likelihood of an irretrievable loss of habitat associated with development. The irretrievable loss of habitat caused by the development of new residential and commercial infrastructure in the Flint Hills that will eventually lead to an irreversible loss of both species, and habitat could be minimized under the proposed action.

With the restrictions on residential and commercial infrastructure development on conservation easement lands, prescribed fire could be more easily utilized to maintain tallgrass prairie. Prescribed fire is necessary to limit tree encroachment and to maintain tallgrass prairie habitat for the greater prairie-chicken and other grassland bird species, and to prevent an irreversible loss of habitat.

Figure 4. Relative native and restored benefits of ecosystem goods and services.



Note: The relative value, RI, is determined as the ratio of estimated benefits derived from native and restored acreages per year. (Source: Dodds et al. 2008)

## SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY

The conservation easement program will maintain the long term biological productivity of the Flint Hills prairie grassland and riparian ecosystems, increased protection of endangered and threatened species, and maintenance of biological diversity.

The nation will gain the protection of tallgrass prairie species for future generations of Americans. The public will gain long-term opportunities for wildlife dependent recreational activities.

## CUMULATIVE IMPACTS

Cumulative impacts are defined by National Environmental Policy Act (NEPA) policy as the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7)

This section describes the cumulative impacts on the environment that may result from the combination of reasonably foreseeable actions in the easement program, together with other biological and socioeconomic conditions, events, and developments.

### *Past Actions*

Past land protection efforts within the Flint Hills ecoregion have included the establishment of the Tallgrass Prairie National Preserve in 1996 by the National Park Service; the U.S. Department of Agriculture GRP, which currently holds approximately 17,000 acres of easements; an informal moratorium on wind development by a past governor; and the acquisition of approximately 35,000 acres of conservation easements by nonprofit organizations. The PFW program has worked with private landowners to restore or enhance 349,342 acres of tallgrass prairie to date.

### *Present Actions*

The Service's action to establish an approximately (but not to exceed) 1.1 million acre conservation easement program is the only known present action of similar scope and scale for land protection in the Kansas portion of the Flint Hills ecoregion. Once approved, it will take a number of years for the program to begin to have a noticeable effect. Securing initial funding and completing real estate transactions will take time.

## *Reasonably Foreseeable Future Actions*

Reasonably foreseeable actions are actions and activities that are independent of the conservation area program but could result in cumulative or additive effects when combined with the easement program. Energy (oil and gas, and wind) and residential development, and future prairie conservation efforts by a variety of organizations are the primary, reasonably foreseeable actions occurring in the Flint Hills region.

### **Oil and Gas Development**

Kansas ranks among the top 10 crude oil producing states with production occurring throughout the state. In addition, Kansas also produces a substantial quantity of natural gas, and its infrastructure is a transportation hub for supplies moving throughout the country. (U.S. Energy Information Administration 2010)

### **Wind Energy Development**

Over 89% of Kansas has been determined by National Renewable Energy Lab (NREL) to show potential for development of wind energy (NREL 2010). Second only to Nebraska, Kansas has extremely high wind energy potential with 47.1 million acres available with the installed capacity of 952,371 megawatts and an annual generation of 3.7 million gigawatt-hours. The FHLCA proposed the creation of a program to acquire conservation easements on up to 1.1 million acres, which represents 0.21% of the national or 2.34% of Kansas' total wind potential.

Current estimates of windy land area and wind energy potential developed by the NREL state that approximately 517 million acres of land within the 48 contiguous states of the United States have an installed capacity of 10.5 million megawatts and an annual generation of 36.9 million gigawatt-hours.

### **Residential Development**

Total land in farms in Kansas from 1969 to 2007 declined from about 49.4 million acres to about 46.3 million acres, a decrease of more than 6 percent, while the urban population in the state increased from 1.29 million people to 1.8 million people between 1980–2009 (USDA 2010). As urban areas spread into the surrounding prairie areas, the tallgrass habitat becomes increasingly fragmented by trees and buildings and roads.

### **Other Conservation Efforts**

Ongoing efforts by a variety of organizations and agencies including TNC, RTK, TLA, Natural Resources Conservation Service (NRCS), and PFW have led to the successful conservation of

approximately 35,000 acres of tallgrass prairie, and the enhancement and restoration of another 349,342 acres. Based on potential success of the proposed action in achieving land protection, it is anticipated that the Service will also consider protecting lands in Oklahoma within the Flint Hills (Osage Plains) ecoregion. The Kansas Legislature may continue to consider a large-scale moratorium on wind development within the Flint Hills. Currently there is not a solid base for analysis, and it will therefore be speculative to try to determine any effects in relation to the proposed action. The Service does not plan additional land protection in eastern Kansas beyond existing programs at the Marias des Cynes National Wildlife Refuge and a smaller set of options being explored to preserve some lands along the Missouri River. Lastly, we expect nonprofit organizations to continue to be active in the Flint Hills ecoregion, but based on past experience, it is anticipated that their role will shift in part from easement acquisition to a partnership in achieving the Service's goal of protecting up to 1.1 million acres.

## **DEVELOPMENT**

The program will protect up to 1.1 million acres of tallgrass prairie from the combined effects of various future development activities by precluding surface occupancy, and the resultant infrastructure from fragmenting tallgrass habitat. The Service's proposed FHLCA is the only presently known action of similar scope and scale that is seeking landscape-scale conservation of the tallgrass prairie in the Flint Hills.

## **CONSERVATION EFFORTS**

Through the proposed easement program, up to 1,100,000 acres of privately owned native tallgrass prairie habitats will be added to the 31,000 acres within the project area that already have some level of protection. This will have long term positive impacts on wildlife habitat and result in the long term conservation of migratory birds, threatened and endangered species, native plants, and the overall biological diversity of the Flint Hills tallgrass prairie.

# 4 Project Implementation



© Jim Richardson

*Riders and prescribed fire.*

Today, less than 4 percent of this once vast grassland region remains (Steinauer and Collins 1996). Cultivation, agriculture, tree encroachment, and development activities have pushed grassland-dependent wildlife species into ever-shrinking areas of tallgrass prairie. Approximately three-fourths of the remaining tallgrass prairie lies within the Flint Hills ecoregion of eastern Kansas and northeastern Oklahoma, with about 3.5 million acres present in the Kansas portion of the Flint Hills area.

## LAND PROTECTION OPTIONS

Various alternatives considered in the EA for protecting this area included no action, voluntary landowner zoning, county zoning, fee-title acquisition, a smaller project area, a larger project area, expansion of the project into Oklahoma, or conservation easement acquisition by the Service which was the chosen action.

### **No Action**

These consequences were considered unacceptable and led to the selection of the preferred alternative to establish a conservation area in the Flint Hills tallgrass prairie region. The Service's effort to conserve up to 1.1 million acres will augment the efforts of other conservation groups.

## **Acquisition or Management by Others**

The ranching practices (grazing and prescribed fire) that have continued in the Flint Hills are essential to maintaining tallgrass prairie, which is a fire climax ecosystem. The ranching heritage and efforts by a variety of agencies, and organizations have been essential to maintaining the tallgrass prairie to date. However, development pressures and encroachment by trees are increasingly fragmenting the Flint Hills tallgrass habitat, making the long-term future of the tallgrass prairie uncertain without an overall, landscape-scale conservation project such as the FHLCA.

## **ACTION AND OBJECTIVES**

After completion of the EA and after conducting a public comment period, the proposed alternative of acquiring conservation easements was chosen as the land protection plan. The project was found to have no significant impacts on the quality of the environment, thus a finding of no significant impact (FONSI) has been completed and signed (see appendix C). The FONSI document is basically the EA modified to reflect all applicable comments and responses. Appendix D is the compliance certificate, appendix E is the section 7 biological evaluation, and appendix F is the environmental action statement.

The Service intends to purchase or receive donated perpetual conservation easements on up to 1.1 million acres from willing landowners within the approved boundary. No fee-title acquisition will be considered as part of this project. The Service has standard conservation easement agreements that have been used successfully in other easement conservation areas of the United States. With appropriate modifications, the Service will use similar language and terms, and develop a standard document for the FHLCA conservation easements to minimize confusion, facilitate enforcement, and provide the necessary level of protection for the resources.

The easement program will rely on voluntary involvement by landowners. The project will not involve fee-title acquisitions. Land owner management practices such as grazing and prescribed fire will continue on the land included in the easement contract. All land within an easement will remain in private ownership and, therefore, property tax and grassland management activities such as invasive plant and tree control, grazing, and burning will remain the responsibility of the landowner. Public access, including hunting, will also remain under the control of the landowner.

The easement program will be managed by staff located at the Flint Hills National Wildlife Refuge near Hartford, Kansas. The Service staff will be responsible for monitoring and administration of all easements on private land. Monitoring will consist of periodically reviewing land status in meetings with the landowners or land managers to ensure that the stipulations of the conservation easement are being met. The Service's role is to monitor the purchased easements to ensure that landowners comply with the easement agreement so that the property does not undergo subdivision, commercial or industrial development, or conversion of native prairie grassland to cropland. Photo documentation will be used at the time the easements are established as part of a documentation of baseline conditions.

Conservation easements are the most cost-effective, politically acceptable means to ensure protection of critical habitats that occur within the project area. Although habitat protection through fee-title acquisition is preferable in some locations, it is not required and is not preferable to conservation easements in the Flint Hills region. Fee-title acquisition would triple or quadruple the cost of land acquisition in addition to adding significant increases in long-term management and operational costs for the Service. The Service views a strong and vibrant rural lifestyle, of which ranching is the dominant land use, as one of the key components to ensure habitat integrity and wildlife resource protection. The Service views conservation easements as the most viable means to protect wildlife values on the landscape-scale necessary to conserve the tallgrass prairie ecosystem.

## PRIORITY AREAS

The Service and its partners recognize the tremendous opportunity that exists to expand existing blocks of conservation lands within the FHCLA, including state or federal fee-title ownership, and conservation-oriented nongovernmental organization ownership which currently includes the TLA, RTK, KLT, U.S. Department of Agriculture, Kansas Department of Agriculture, KDWP, and TNC. Within these ownership areas, the Service has identified certain existing "core" protected lands within the project area that provide protection for grassland dependent-wildlife and habitat. These areas provide good anchors from which to build the easement program and increase habitat connectivity.

Service biologists identified and mapped the core area containing the highest quality, least fragmented tallgrass habitat within the Flint Hills of Kansas (figure 5). The Kansas portion of the Flint Hills ecoregion encompasses approximately 6.3 million acres. Within this ecoregion the identification of priority grasslands for inclusion in the FHLCA project area was based on a conceptual model representing greater prairie-chicken response to landscape-level habitat conditions. Prairie-chickens were used as an umbrella species for grassland communities because of this species' requirement for native grasslands and large home ranges (Svedarsky 1988, Poiana et al. 2001). Using a geographic information system (GIS) existing land cover data from the National Land Cover Database (NLCD) (Homer 2007) for grasslands was evaluated. All areas consisting of >95% grassland were selected as potential priority areas. The selection of a 95% grassland threshold is similar to that used for development of a Grassland Bird Conservation Area conceptual model which was found to be very effective at identifying priority areas for grassland birds in the Prairie Pothole Region. Applying the greater prairie-chicken conceptual model to NLCD 2001 land cover data resulted in a spatially explicit decision support tool identifying approximately 3.3 million acres of priority grassland within the Flint Hills ecoregion.

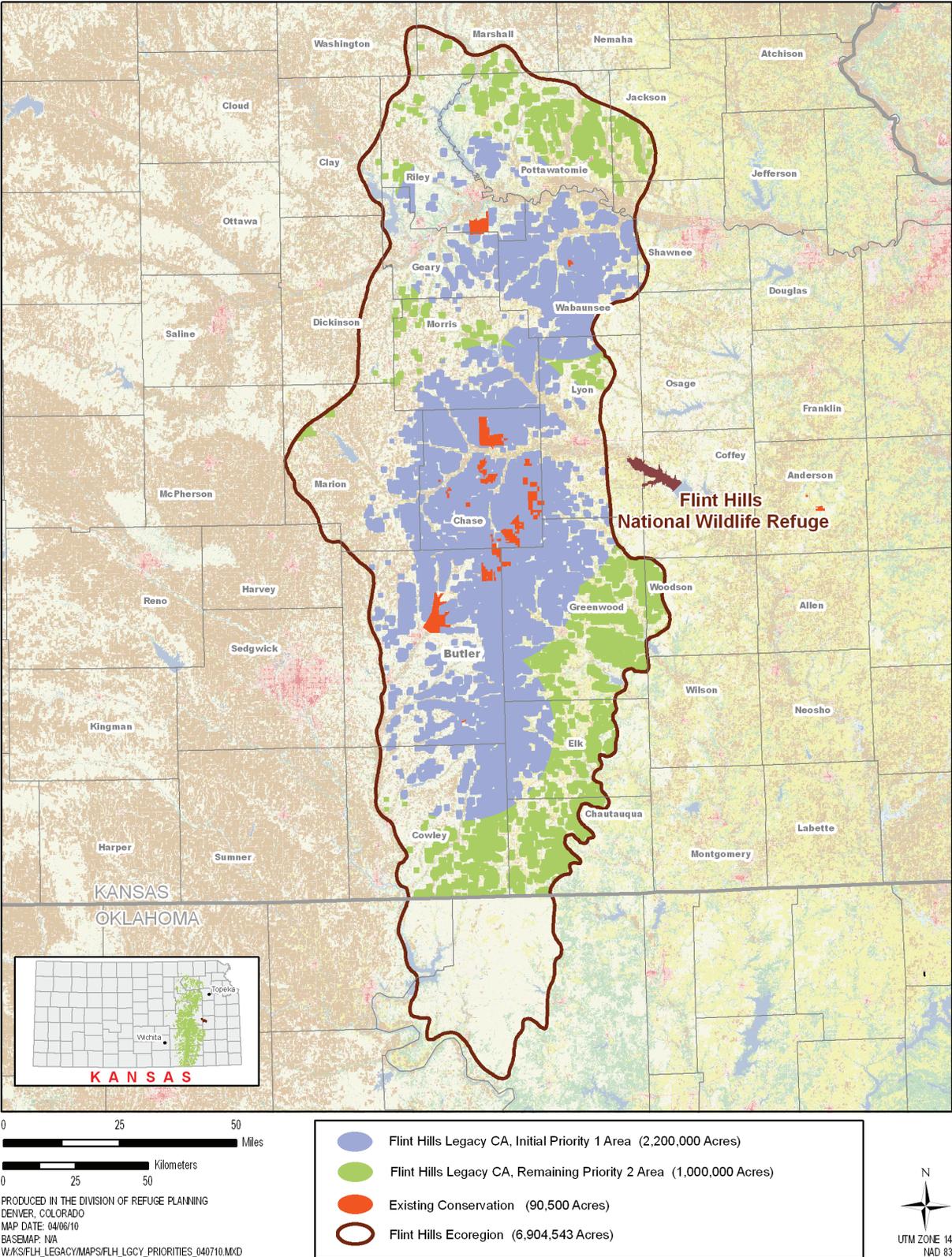
The following assumptions are associated with the conceptual model used to identify priority grasslands for the FHLCA project area:

- The greater prairie-chicken is an appropriate focal species for other Service priority trust species in the Flint Hills ecoregion.
- The greater prairie-chicken serves as an umbrella species and adequately represents habitat requirements for priority federal trust species, which are below desired population levels or declining (as measured by some population response metric such as probability of occurrence, density, survival, recruitment, population persistence).



U.S. Fish & Wildlife Service  
**Flint Hills Legacy Conservation Area**  
Eastern Kansas

*Initial Priorities Map*



**Figure 5. Priorities areas for the Flint Hills Legacy Conservation Area.**

- Potential declining priority federal trust species include dickcissel, grasshopper sparrow, Henslow's sparrow, upland sandpiper, and other species that may be deemed appropriate when data are obtained.
- The greater prairie-chicken responds to landscapes as quantified with an 800-meter (2,625-foot) radius.
- The greater prairie-chicken show the strongest response to landscapes with >95% grassland habitat.
- NLCD 2001 land cover data adequately represents Flint Hills landscape conditions.
- New decision support tools will be developed through refinements of the greater prairie-chicken model, additions of new priority species, development of additional priority species models, setting of population objectives, and evaluations of conservation delivery through the elements of biological planning, conservation delivery, and monitoring and research. These new tools may result in challenges to currently held paradigms about the best conservation approach for target species (Reynolds et al. 2001).

There are over 3.3 million acres of unencumbered private land within the project area that may be eligible for the Service's easement program. Because the Service's 1.1 million acre target is about one third of the potential private land within the project area, the Service has created two priority zones which will be used to focus the acquisition of conservation easements on private lands to provide the greatest benefit to grassland dependent wildlife (see figure 5).

Within the potential priority areas of >95% grassland threshold, a 20 mile radius was projected out from some existing properties already protected with conservation easements. The 2.2 million acre area that is >95% grasslands within a 20-mile radius anchored by existing conservation lands will be the Service's initial Priority 1 habitat acquisition zone.

The remaining 1.1 million acres tallgrass habitat with a >95% grassland threshold that is greater than 20 miles away from existing conservation areas will be included in the Priority 2 habitat protection zone

Within the Priority 1 and 2 areas, selection of parcels for acquisition will be based on providing a mosaic of protected habitat of 10,000-acre parcels, separated by a maximum distance of 20 miles to prevent genetic isolation. The Hamerstrom plan (Hamerstrom et al. 1957) of using an "ecological scatter pattern" to provide a mosaic of grassland preserves throughout private land ownerships, is still followed today.

As new data and science become available, the information will be incorporated into the initial prioritization model and will be used to adjust the ranking criteria for potential acquisition parcels.

## ACQUISITION ALTERNATIVES

The Service proposes to acquire conservation easements principally by using funds appropriated under the Land and Water Conservation Act, which derives funds from royalties paid for offshore oil and gas leasing. Such funds are intended for land and water conservation projects. These funds are not derived from general taxes. Funding is subject to annual appropriations by Congress for specific acquisition projects.

Money from other sources may also be used within the project area. Management activities associated with easements may be funded through other sources, such as TNC, PFW, and other private and public partners. Most of the Flint Hills Legacy Conservation Area is not eligible for Migratory Bird Conservation Fund dollars, which limits the use of this tool within the project area. The Service will also consider accepting voluntary donations for easements.

## COORDINATION

The Flint Hills Legacy Conservation Area has been discussed with landowners, conservation organizations, federal, state and county governments, and other interested groups and individuals. The proposal and associated EA addressed the protection of native habitats, primarily through acquisition of conservation easements, to be managed as part of the National Wildlife Refuge System.

### *Conservation Cooperatives*

Strategic habitat conservation (SHC) is a means of applying adaptive management across large landscapes. Landscape conservation cooperatives (LCCs) will facilitate strategic habitat conservation.

### **Strategic Habitat Conservation**

The FHLCA process will use the strategic habitat conservation framework as outlined in the National Ecological Assessment Team report. SHC involves an ongoing cycle of biological planning, conservation design, conservation delivery, outcome-based monitoring, and assumption-based research. It is also the process by which the Service continues to develop and apply science which is focused on improving the ability to apply conservation actions which result in landscapes capable of supporting populations of the priority species at desired levels. Additionally, SHC provides the framework by which the Service develops and applies science to inform and continually improve conservation delivery by addressing landscape-level population-limiting factors in an adaptive manner (USFWS 2008).

The U.S. Fish and Wildlife Service Region 6 Refuges program has Habitat and Population Evaluation Team Office of Conservation Science (HAPET) staff and equipment located at Flint Hills National Wildlife Refuge to provide support for the biological planning, conservation design, conservation delivery, monitoring, and research elements of SHC necessary to implement the FHLCA project. The FHLCA EA addressed the four key elements of strategic habitat conservation; planning, design, delivery, monitoring, and research.

Resources held in trust for the American people have been described in earlier chapters of this document. Biological planning requires the identification of priority species, development of population objectives, and identification of landscape-level limiting factors which keep priority trust species populations below desired levels. Initial biological planning will be conducted using the greater prairie-chicken as an umbrella species. This approach is based on the assumption that delivery of grassland conservation easements targeted at minimizing and reducing population limiting factors of greater prairie-chickens will also adequately address the limiting factors of priority grassland-dependent federal trust species (for example dickcissel, grasshopper sparrow, Henslow's sparrow, upland sandpiper) throughout the Flint Hills ecoregion. To aid in initial conservation design and delivery efforts, conceptual and quantitative models will be developed to predict greater prairie-chicken population response to landscape-level habitat conditions. Priority species, along with associated population goals, will continually be defined and updated throughout the implementation of this project, and additional landscape models will be developed for priority trust species.

### Conservation Delivery

PFW biologists have worked for years developing partnerships that provide the foundation for a successful easement program. The ongoing involvement of the PFW program and other partner organizations and agencies will be essential for the effective delivery of a sustainable conservation program. Application of the SHC framework will build on existing partnerships and support the development of new partnerships for delivering conservation throughout the Flint Hills ecoregion. Results from the biological planning and conservation design elements will be used to target conservation delivery, while the monitoring and research element will evaluate effectiveness and improve conservation actions over time. The biological planning element will engage partners in the identification of priority species, population objectives, and the development of biological models which will be directly linked to conservation actions. The conservation design element will involve the development of spatially

explicit decision support tools for targeting conservation delivery actions. These spatially explicit decision support tools, which can be tailored to specific treatments or locations based on the priorities and needs of different partners, will allow for greater flexibility, increased responsiveness, and improved efficiency in meeting Service and partner conservation delivery needs.

### Monitoring and Research

Monitoring and research efforts for the FHLCA will use model-based approaches to measure conservation effectiveness and will focus three key areas:

- Developing, improving, and assessing landscape models for priority trust species. Emphasis will be placed on the highest priority species with the greatest degree of uncertainty regarding limiting factors and the effectiveness of management actions at minimizing and reducing limiting factors. Data from existing surveys such as the Breeding Bird Survey will be evaluated and incorporated into spatial models. When necessary, additional data will be collected to evaluate assumptions used in the modeling process and assessments will be adjusted accordingly. These methods will provide an estimate of population response of trust species on easement lands and on non-easement properties. Similar modeling approaches may be developed or incorporated for priority nontrust species (for example, the greater prairie-chicken) in cooperation with partners such as nongovernmental organizations and universities.
- Evaluating assumptions and addressing uncertainties identified through the biological planning, conservation design and conservation delivery elements. When warranted, assumptions such as increased nesting success in larger blocks of grass will be evaluated in cooperation with partners such as nongovernmental organizations and universities.
- Assessing the contribution of grassland conservation easements and other management actions toward meeting population goals for priority trust species. Spatially explicit models will allow estimation of population size on conservation easements and other land parcels of interest. This will allow the Service and conservation partners to evaluate the contribution of the program to meeting population goals and refine conservation delivery to ensure maximum efficiency. Spatially explicit models will also enable the Service to demonstrate the contribution of the FHLCA to national and continental population goals for priority species similar to how the

HAPET office and cooperators have assessed the contribution of landscape-level conservation in the Prairie Pothole Region (Reynolds et al. 2001, Reynolds et al. 2006, Niemuth et al. 2009).

### Landscape Conservation Cooperatives

The Service will use landscape conservation cooperatives as a means of implementing strategic habitat conservation. LCCs will be formal, science and management partnerships between the Service, U.S. Geological Survey, other federal agencies, states, tribes, non-governmental organizations, universities, and others to increase applied conservation science capacity in support of fish and wildlife management within specific landscapes. The tools developed by the LCCs will allow Service offices, and our many partners, to implement on-the-ground actions in the most effective locations to meet their goals.

The FHLCA is part of the Tallgrass Prairie and Big Rivers LCC, which is in the process of being developed. This project meets criteria of the LCC initiative—cooperation among private landowners and other agencies (federal, state, local, and nongovernmental organizations).

In addition to fostering partnerships, these cooperatives provide science support to managers. The FHLCA will benefit from much of the science generated by the Konza Prairie Long-Term Ecological Research site. This land is owned by TNC, but operated under an agreement with Kansas State University. The FHLCA will receive further science support from the GIS capacity at the Service's Ecological Services Office in Manhattan, Kansas. As a final support for the strategic habitat conservation approach to conservation, it is notable that the Flint Hills represents the largest intact tallgrass prairie within the Geographic Framework of Bird Conservation Region #22, classified as a treasured landscape.

The Secretary of the Interior recently outlined the importance of landscape conservation cooperatives as a response to climate change (USFWS 2009). Landscape conservation cooperatives reach across broad landscapes, involve many partners, and function at a scale necessary to address wildlife adaptation in response to climate change. The FHLCA will link existing Flint Hills conservation easement areas held by TNC and the U.S. Department of Agriculture. The Council Grove Wildlife Area (managed by KDWP) also manages land within the easement boundary.

These cooperatives will continue to grow as a means of delivering strategic habitat conservation. The Service and the U.S. Geological Survey signed a memorandum of understanding to strengthen the science–management relationship in landscape-level conservation. This further commitment to strategic

habitat conservation improves the stature for the type of landscape conservation which will be used for the Flint Hills Legacy Conservation Area.

### Agency Coordination

The Service has discussed the proposal to establish the Flint Hills Legacy Conservation Area with landowners; conservation organizations; other federal agencies; tribal, state, and county governments; and other interested groups and individuals.

Information on the FHLCA project has been made available to county commissioners in each of the twenty-one counties included in the project area. At the federal level, the Service staff have briefed Senators Brownback and Roberts, as well as the Congressional delegation, and coordinated with representatives from other federal agencies such as the U.S. Department of Agriculture (Natural Resources Conservation Service), Department of Defense (Fort Riley Army Installation), National Park Service, and Environmental Protection Agency. At the state level, Governor Parkinson's staff, Kansas' state Congressional delegation, along with KDWP was briefed on the project. In addition, the Service provided information to eleven tribes on this project.

Nongovernmental conservation groups are vital to the success of the project. Service staff has coordinated with partner organizations such as TNC, TLA, RTK, and KLT.

The Service held six public meetings to provide information and discuss the proposal with landowners and other interested citizens. Open houses for public comments and scoping were held in Alma, Cottonwood Falls, and Wichita, Kansas on November 30 and December 1, and 2, 2009. Public comments were taken to identify issues to be analyzed for the proposed project. Approximately 148 landowners, citizens, and elected representatives attended the meetings and most expressed positive support for the project. Additionally, ninety letters providing comments and identifying issues and concerns were also submitted by mail or through the Service websites. In addition, Service field staff has contacted local government officials, other public agencies, sportsmen and conservation groups. Additional public meetings were held on April 21–23, 2010 in El Dorado, Cottonwood Falls and Alma, Kansas following publication of the “Environmental Assessment and Draft Land Protection Plan for the Flint Hills Legacy Conservation Area.”

After issuance of the draft EA and LPP, three public meetings were held April 21–23, 2010.

Detailed comments and their responses are included in appendix G.

## Contaminants and Hazardous Materials

Fieldwork for pre acquisition contaminant surveys will be conducted, on a tract-by-tract basis, prior to the purchase of any land interest. Any suspected problems or contaminants requiring additional surveys will be referred to a contaminants specialist located in the Service's ecological services office in Manhattan, Kansas.

## National Environmental Policy Act

As a federal agency, the Service must comply with provisions of the National Environmental Policy Act. An EA is required under the act to evaluate reasonable alternatives that will meet stated objectives, and to assess the possible impacts to the human environment. The draft EA, published in April 2010, served as the basis for determining whether implementation of the project would constitute a major federal action significantly affecting the quality of the human environment. A final EA was prepared and was approved July 2010.

## SOCIAL AND CULTURAL CONSIDERATIONS

The Service will acquire conservation easements principally by using funds appropriated under the Land and Water Conservation Act, which derives funds from royalties paid for offshore oil and gas leasing. Such funds are intended for land and water conservation projects. These funds are not derived from general taxes. Funding is subject to annual appropriations by Congress for specific acquisition projects.

Money from other sources may also be used within the project area. Management activities associated with easements may be funded through other sources, such as TNC, PFW, and other private and public partners. Most of the Flint Hills Legacy Conservation Area is not eligible for Migratory Bird Conservation Fund dollars which limits the use of this tool within this project area. The Service will also consider accepting voluntary donations of easements.

## TABLE—SUMMARY OF ACTION

The Service will purchase or receive donated conservation easements on approximately 1,100,000 acres from willing landowners within the approved boundary. The only method of protection that will be used within the project boundary is a conservation easement. Easements will be acquired principally using funds appropriated from the Land and Water Conservation Fund. Table 1 explains the protection priority zones.

**Table 1. Protection priorities for the Flint Hills Legacy Conservation Area.**

<i>Description</i>	<i>Total Area (acres)</i>	<i>Total Protected "Core" Lands</i>	<i>Priorities for Easements Private: Non-Pro- tected</i>
Priority 1 Zone	2,200,000	90,500	880,000
Priority 2 Zone	1,100,000	0	220,000
Total (acres)	3,300,000	90,500	1,100,000

## DISTRIBUTION AND AVAILABILITY

Copies of the land protection plan were sent to federal and state legislative delegations, tribes, agencies, landowners, private groups, and other interested individuals.

Additional copies of the document are available from the following offices and websites.

U.S. Fish and Wildlife Service  
Flint Hills National Wildlife Refuge  
530 West Maple Avenue  
Hartford, Kansas 66854  
620/392 5553  
<http://flinthills.fws.gov>

U.S. Fish and Wildlife Service  
Region 6, Division of Refuge Planning  
Branch of Land Protection Planning  
P.O. Box 25486–DFC  
Denver, Colorado 80225  
303/236 4345  
303/236 4792 fax  
<http://mountain-prairie.fws.gov/planning/lpp.htm>



# Appendix A

## *List of Preparers and Reviewers*

<i>Author's Name</i>	<i>Position</i>	<i>Work Unit</i>
Vic Elam	Legacy project coordinator	USFWS, Flint Hills National Wildlife Refuge, Hartford, KS
Mark Ely	Geographic information systems (GIS) specialist	USFWS, Region 6, Planning Division, Lakewood, CO
Mike Estey	Habitat and Population Evaluation Team biologist	USFWS, Flint Hills National Wildlife Refuge, Hartford, KS
Kelly Kindscher	Associate scientist	Kansas Biological Survey
David Lucas	Chief of planning	USFWS, Region 6, Planning Division, Lakewood, CO
Tim Menard	Wildlife biologist	USFWS, Flint Hills National Wildlife Refuge, Hartford, KS; Marais de Cygnes National Wildlife Refuge, Pleasanton, KS
Jim Minnerath	Wildlife biologist	USFWS, PFW, Flint Hills National Wildlife Refuge, Hartford, KS
Brian Obermeyer	Flint Hills project director	The Nature Conservancy
Sue Oliveira	Chief of realty	USFWS, Region 6, Realty Division, Lakewood, CO
Mike Rich	Project leader	USFWS, Flint Hills National Wildlife Refuge, Hartford, KS
Mike Spratt	<i>Former</i> chief of planning	USFWS, Region 6, Planning Division, Lakewood, CO
Amy Thornburg	Wildlife refuge specialist	USFWS, Region 6, Branch of Land Protection Planning, Lakewood, CO
Meg VanNess	Regional historic preservation officer	USFWS, Region 6, Refuges, Lakewood, CO

<i>Reviewer's Name</i>	<i>Position</i>	<i>Work Unit</i>
Laurel Bowen	Writer/editor	TBC Solutions, Clinton, TN
Noreen Walsh	Deputy regional director	USFWS, Region 6, Lakewood, CO



# Appendix B

## *List of Plants and Animals*

### PLANTS

SCIENTIFIC NAME	COMMON NAME
<b>Acanthaceae</b>	<b>Acanthus Family</b>
<i>Dicliptera brachiata</i>	dicliptera
<i>Justicia americana</i>	water willow
<i>Ruellia humilis</i>	fringeleaf ruellia
<i>Ruellia strepens</i>	limestone ruellia
<b>Aceraceae</b>	<b>Maple Family</b>
<i>Acer negundo</i>	boxelder
<i>Acer saccharinum</i>	silver maple
<i>Acorus calamus</i>	calamus sweetflag
<b>Adiantaceae</b>	<b>Fern Family</b>
<i>Argyrosma dealbata</i>	powdery cloak fern
<i>Cheilanthes lanosa</i>	hairy lip fern
<i>Pellaea atropurpurea</i>	purple cliff-brake
<i>Pellaea glabella ssp. glabella</i>	smooth cliffbrake
<b>Agavaceae</b>	<b>Agave Family</b>
<i>Yucca arkansana</i>	Arkansas soapweed
<i>Yucca filamentosa</i>	limp soapweed
<i>Yucca glauca</i>	small soapweed
<b>Alismataceae</b>	<b>Water Plantain Family</b>
<i>Alisma subcordatum</i>	smallflower water plantain
<i>Alisma triviale</i>	northern water-plantain
<i>Echinodorus berteroi</i>	erect burhead
<i>Echinodorus cordifolius</i>	creeping burhead
<i>Sagittaria brevirostra</i>	short-beak arrowhead
<i>Sagittaria graminea var. graminea</i>	grassy arrowhead
<i>Sagittaria latifolia</i>	common arrowhead
<i>Sagittaria montevidensis ssp. calycina</i>	giant arrowhead
<b>Amaranthaceae</b>	<b>Pigweed Family</b>
<i>Amaranthus albus</i>	tumbleweed amaranth
<i>Amaranthus arenicola</i>	sandhill pigweed
<i>Amaranthus blitoides</i>	prostrate pigweed
<i>Amaranthus hybridus</i>	slender pigweed
<i>Amaranthus palmeri</i>	Palmer's pigweed
<i>Amaranthus retroflexus</i>	rough pigweed

SCIENTIFIC NAME	COMMON NAME
<i>Amaranthus rudis</i>	water hemp
<i>Amaranthus tuberculatus</i>	tall water-hemp
<i>Froelichia gracilis</i>	slender snakecotton
<i>Iresine rhizomatosa</i>	bloodleaf
<b>Anacardiaceae</b>	<b>Sumac Family</b>
<i>Rhus aromatica</i>	fragrant sumac
<i>Rhus copallinum</i>	dwarf sumac
<i>Rhus glabra</i>	smooth sumac
<i>Toxicodendron radicans</i> ssp. <i>negundo</i>	poison-ivy
<b>Annonaceae</b>	<b>Custard-apple Family</b>
<i>Asimina triloba</i>	Pawpaw
<b>Apiaceae</b>	<b>Parsley Family</b>
<i>Ammoselinum popei</i>	plains sand parsley
<i>Berula erecta</i> var. <i>incisa</i>	cut-leaf water-parsnip
<i>Bupleurum rotundifolium</i>	thoroughwax
<i>Chaerophyllum procumbens</i>	spreading chervil
<i>Chaerophyllum tainturieri</i>	erect chervil
<i>Cicuta maculata</i>	common water hemlock
<i>Conium maculatum</i>	poison-hemlock
<i>Cryptotaenia canadensis</i>	honewort
<i>Daucus carota</i>	Queen Anne's lace
<i>Eryngium leavenworthii</i>	Leavenworth's eryngo
<i>Eryngium yuccifolium</i>	button snakeroot
<i>Lomatium foeniculaceum</i>	fennel-leaf desert-parsley
<i>Osmorhiza longistylis</i>	long-style sweet-cicley
<i>Pastinaca sativa</i>	garden parsnip
<i>Polytaenia nuttallii</i>	prairie parsley
<i>Sanicula canadensis</i> var. <i>canadensis</i>	Canadian sanicle
<i>Sanicula odorata</i>	cluster sanicle
<i>Spermolepis inermis</i>	spreading spermolepis
<i>Torilis arvensis</i>	hedge parsley
<i>Zizia aurea</i>	golden zizia
<b>Apocynaceae</b>	<b>Dogbane Family</b>
<i>Apocynum cannabinum</i>	hemp dogbane
<i>Vinca major</i>	periwinkle
<i>Vinca minor</i>	common periwinkle
<b>Araceae</b>	<b>Arum Family</b>
<i>Arisaema dracontium</i>	green dragon
<i>Arisaema triphyllum</i> ssp. <i>triphyllum</i>	Indian Jack-in-the-pulpit
<i>Peltandra virginica</i>	Virginia arum
<i>Pistia stratiotes</i>	water lettuce
<b>Asclepiadaceae</b>	<b>Milkweed Family</b>
<i>Asclepias amplexicaulis</i>	bluntleaf milkweed

SCIENTIFIC NAME	COMMON NAME
<i>Asclepias asperula</i> ssp. <i>capricornu</i>	milkweed
<i>Asclepias incarnata</i> ssp. <i>incarnata</i>	swamp milkweed
<i>Asclepias pumila</i>	plains milkweed
<i>Asclepias speciosa</i>	showy milkweed
<i>Asclepias stenophylla</i>	narrow-leaf milkweed
<i>Asclepias sullivantii</i>	Sullivant's milkweed
<i>Asclepias syriaca</i>	common milkweed
<i>Asclepias tuberosa</i> ssp. <i>interior</i>	buttefly milkweed
<i>Asclepias verticillata</i>	whorled milkweed
<i>Asclepias viridiflora</i>	green milkweed
<i>Asclepias viridis</i>	green milkweed
<i>Cynanchum laeve</i>	climbing milkweed
<i>Vincetoxicum nigrum</i>	Louise's swallow-wort
<b>Aspleniaceae</b>	<b>Fern Family</b>
<i>Asplenium platyneuron</i>	ebony spleenwort
<i>Asplenium resiliens</i>	black-stemmed spleenwort
<i>Asplenium rhizophyllum</i>	walking fern
<i>Asplenium trichomanes</i> ssp. <i>trichomanes</i>	maidenhair spleenwort
<b>Asteraceae</b>	<b>Aster Family</b>
<i>Achillea millefolium</i>	western yarrow
<i>Acroptilon repens</i>	Russian knapweed
<i>Ageratina altissima</i>	white snakeroot
<i>Ambrosia artemisiifolia</i>	common ragweed
<i>Ambrosia bidentata</i>	lanceleaf ragweed
<i>Ambrosia psilostachya</i>	western ragweed
<i>Ambrosia trifida</i>	giant ragweed
<i>Amphiachyris dracunculoides</i>	annual broomweed
<i>Antennaria neglecta</i>	field pussytoes
<i>Antennaria parlinii</i> ssp. <i>fallax</i>	Parlin's pussytoes
<i>Anthemis cotula</i>	camomile
<i>Arctium minus</i>	common burdock
<i>Arnoglossum atriplicifolium</i>	pale Indian-plantain
<i>Arnoglossum plantagineum</i>	tuberous Indian-plantain
<i>Artemisia ludoviciana</i>	Louisiana sagewort
<i>Bidens aristosa</i> var. <i>retrorsa</i>	bearded beggarticks
<i>Bidens bipinnata</i>	Spanish needles
<i>Bidens cernua</i>	nodding beggartick
<i>Bidens comosa</i>	leafybract beggartick
<i>Bidens frondosa</i>	devil's beggartick
<i>Bidens vulgata</i>	tall beggartick
<i>Boltonia asteroides</i>	white doll's daisy
<i>Brickellia eupatorioides</i> var. <i>corymbulosa</i>	false boneset
<i>Carduus nutans</i>	musk-thistle

SCIENTIFIC NAME	COMMON NAME
<i>Centaurea cyanus</i>	bachelor's-button
<i>Chrysanthemum leucanthemum</i>	ox-eye daisy
<i>Chrysopsis pilosa</i>	soft goldenaster
<i>Cichorium intybus</i>	common chicory
<i>Cirsium altissimum</i>	tall thistle
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium undulatum</i>	wavyleaf thistle
<i>Cirsium vulgare</i>	bull thistle
<i>Conyza canadensis</i>	Canada horseweed
<i>Conyza ramosissima</i>	lawn horseweed
<i>Coreopsis grandiflora</i>	bigflower coreopsis
<i>Coreopsis palmata</i>	finger coreopsis
<i>Cyclachaena xanthifolia</i>	bur-weed marshelder
<i>Diaperia prolifera</i> var. <i>prolifera</i>	bighead pygmy cudweed
<i>Dyssodia papposa</i>	foetid dogweed
<i>Echinacea angustifolia</i>	narrow-leaf purple-coneflower
<i>Echinacea atrorubens</i>	Topeka purple coneflower
<i>Echinacea pallida</i>	pale purple coneflower
<i>Echinacea purpurea</i>	purple coneflower
<i>Eclipta prostrata</i>	yerba de tajo
<i>Engelmannia peristenia</i>	Engelmann's daisy
<i>Erechtites hieraciifolia</i>	American burnweed
<i>Erigeron annuus</i>	annual fleabane
<i>Erigeron philadelphicus</i>	Philadelphia fleabane
<i>Erigeron strigosus</i>	daisy fleabane
<i>Eupatorium altissimum</i>	tall joe-pye-weed
<i>Eupatorium perfoliatum</i>	boneset
<i>Eupatorium serotinum</i>	late eupatorium
<i>Euthamia gymnospermoides</i>	viscid euthamia
<i>Gaillardia pulchella</i>	rose ring gaillardia
<i>Grindelia ciliata</i>	—
<i>Grindelia lanceolata</i>	spinytooth gumweed
<i>Grindelia squarrosa</i>	curly-cup gumweed
<i>Helenium amarum</i>	bitter sneezeweed
<i>Helenium autumnale</i>	common sneezeweed
<i>Helianthus annuus</i>	common sunflower
<i>Helianthus ciliaris</i>	texas blueweed
<i>Helianthus grosseserratus</i>	sawtooth sunflower
<i>Helianthus hirsutus</i>	hairy sunflower
<i>Helianthus maximiliani</i>	Maximilian's sunflower
<i>Helianthus mollis</i>	ashy sunflower
<i>Helianthus pauciflorus</i> var. <i>pauciflorus</i>	stiff sunflower
<i>Helianthus petiolaris</i>	prairie sunflower

SCIENTIFIC NAME	COMMON NAME
<i>Helianthus salicifolius</i>	willowleaf sunflower
<i>Helianthus tuberosus</i>	Jerusalem artichoke
<i>Helianthus X kellermanii</i>	—
<i>Helianthus X laetiflorus</i>	—
<i>Heliopsis helianthoides var. occidentalis</i>	smooth oxeye
<i>Heliopsis helianthoides var. scabra</i>	smooth oxeye
<i>Heterotheca canescens</i>	goldenaster
<i>Heterotheca latifolia</i>	broad-leaf golden-aster
<i>Heterotheca stenophylla var. angustifolia</i>	narrow-leaf golden-aster
<i>Heterotheca subaxillaris ssp. latifolia</i>	camphorweed
<i>Hieracium gronovii</i>	Gronovius' hawkweed
<i>Hieracium longipilum</i>	longbeard hawkweed
<i>Hymenopappus scabiosaeus var. corymbosus</i>	flat-top woolly-white
<i>Iva annua</i>	annual sumpweed
<i>Krigia cespitosa</i>	common dwarf dandelion
<i>Lactuca canadensis</i>	Canada lettuce
<i>Lactuca floridana</i>	Florida lettuce
<i>Lactuca ludoviciana</i>	Louisiana lettuce
<i>Lactuca saligna</i>	willowleaf lettuce
<i>Lactuca serriola</i>	prickly lettuce
<i>Leucanthemum vulgare</i>	common ox-eye daisy
<i>Liatris aspera</i>	rough gayfeather
<i>Liatris mucronata</i>	pointed gayfeather
<i>Liatris punctata</i>	dotted gayfeather
<i>Liatris pycnostachya</i>	thickspike gayfeather
<i>Liatris squarrosa var. hirsuta</i>	—
<i>Matricaria discoidea</i>	disc mayweed
<i>Microseris cuspidata</i>	prairie false dandelion
<i>Packera plattensis</i>	plains groundsel
<i>Packera pseudaurea var. semicordata</i>	false golden ragwort
<i>Parthenium integrifolium var. hispidum</i>	wild quinine
<i>Pluchea odorata</i>	purple marsh-fleabane
<i>Prenanthes aspera</i>	rough rattlesnakeroot
<i>Pseudognaphalium obtusifolium</i>	fragrant false-cudweed
<i>Pyrrhopappus carolinianus</i>	Carolina false dandelion
<i>Pyrrhopappus grandiflorus</i>	tuberous false dandelion
<i>Ratibida columnifera</i>	yellow prairie coneflower
<i>Ratibida pinnata</i>	grayhead prairie coneflower
<i>Rudbeckia amplexicaulis</i>	clasping coneflower
<i>Rudbeckia hirta var. pulcherrima</i>	black-eyed Susan
<i>Rudbeckia laciniata</i>	cutleaf coneflower
<i>Rudbeckia triloba</i>	brown-eyed Susan
<i>Senecio plattensis</i>	plains groundsel

SCIENTIFIC NAME	COMMON NAME
<i>Silphium integrifolium</i>	whole-leaf rosinweed
<i>Silphium laciniatum</i>	compass plant
<i>Silphium perfoliatum</i>	cup plant
<i>Silphium speciosum</i>	whole-leaf rosinweed
<i>Solidago altissima</i>	—
<i>Solidago altissima</i> var. <i>altissima</i>	—
<i>Solidago canadensis</i> var. <i>hargerii</i>	Canadian goldenrod
<i>Solidago delicatula</i>	—
<i>Solidago gigantea</i>	Late goldenrod
<i>Solidago missouriensis</i>	Missouri goldenrod
<i>Solidago nemoralis</i>	gray goldenrod
<i>Solidago petiolaris</i>	downy goldenrod
<i>Solidago rigida</i> ssp. <i>rigida</i>	stiff goldenrod
<i>Solidago speciosa</i>	—
<i>Solidago ulmifolia</i>	—
<i>Sonchus arvensis</i> ssp. <i>uliginosus</i>	—
<i>Sonchus asper</i>	prickly sowthistle
<i>Symphyotrichum divaricatum</i>	southern annual saltmarsh aster
<i>Symphyotrichum drummondii</i>	Drummond's aster
<i>Symphyotrichum ericoides</i> var. <i>ericoides</i>	white heath aster
<i>Symphyotrichum hesperium</i>	lance-leaf aster
<i>Symphyotrichum laeve</i> var. <i>laeve</i>	smooth aster
<i>Symphyotrichum lanceolatum</i> var. <i>lanceolatum</i>	lance-leaf aster
<i>Symphyotrichum novae-angliae</i>	New England aster
<i>Symphyotrichum oblongifolium</i>	aromatic aster
<i>Symphyotrichum oolentangiense</i>	azure aster
<i>Symphyotrichum parviceps</i>	Smallhead aster
<i>Symphyotrichum patens</i> var. <i>gracile</i>	spreading aster
<i>Symphyotrichum pilosum</i>	frost-weed aster
<i>Symphyotrichum praealtum</i> var. <i>praealtum</i>	willowleaf aster
<i>Symphyotrichum sericeum</i>	silky aster
<i>Taraxacum laevigatum</i>	red-seeded dandelion
<i>Taraxacum officinale</i>	common dandelion
<i>Thelesperma filifolium</i> var. <i>filifolium</i>	—
<i>Thelesperma megapotamicum</i>	Rio Grande greenthread
<i>Tragopogon dubius</i>	western salsify
<i>Tragopogon porrifolius</i>	oyster salsify
<i>Verbesina alternifolia</i>	wingstem crownbeard
<i>Verbesina encelioides</i> ssp. <i>exauriculata</i>	—
<i>Verbesina virginica</i>	white crownbeard
<i>Vernonia arkansana</i>	Arkansas ironweed
<i>Vernonia baldwinii</i> ssp. <i>baldwinii</i>	western ironweed
<i>Vernonia fasciculata</i>	—

SCIENTIFIC NAME	COMMON NAME
<i>Xanthium strumarium</i>	common cocklebur
<b>Azollaceae</b>	<b>Water Fern Family</b>
<i>Azolla mexicana</i>	Mexican mosquito fern
<b>Balsaminaceae</b>	<b>Touch-me-not Family</b>
<i>Impatiens capensis</i>	spotted touch-me-not
<b>Berberidaceae</b>	<b>Barberry Family</b>
<i>Berberis thunbergii</i>	Japanese barberry
<i>Podophyllum peltatum</i>	may-apple
<b>Betulaceae</b>	<b>Birch Family</b>
<i>Corylus americana</i>	American hazelnut
<i>Ostrya virginiana</i>	hop-hornbeam
<b>Bignoniaceae</b>	<b>Trumpet-creeper Family</b>
<i>Campsis radicans</i>	trumpet creeper
<i>Catalpa bignonioides</i>	common catalpa
<i>Catalpa speciosa</i>	catalpa
<b>Boraginaceae</b>	<b>Borage Family</b>
<i>Cynoglossum officinale</i>	common hounds'-tongue
<i>Hackelia virginiana</i>	Virginia stickseed
<i>Heliotropium tenellum</i>	pasture heliotrope
<i>Lappula redowskii</i>	flatspine stickseed
<i>Lappula squarrosa</i>	European stickseed
<i>Lithospermum arvense</i>	corn gromwell
<i>Lithospermum canescens</i>	hoary gromwell
<i>Lithospermum incisum</i>	plains gromwell
<i>Myosotis verna</i>	Virginia forget-me-not
<i>Onosmodium bejariense</i> var. <i>occidentale</i>	western marbelseed
<b>Brassicaceae</b>	<b>Mustard Family</b>
<i>Alliaria petiolata</i>	garlic mustard
<i>Barbarea vulgaris</i>	bitter wintercress
<i>Boechera canadensis</i>	sicklepod
<i>Brassica juncea</i>	Indian mustard
<i>Brassica nigra</i>	black mustard
<i>Camelina microcarpa</i>	small-seeded false flax
<i>Capsella bursa-pastoris</i>	shepherd's purse
<i>Cardamine concatenata</i>	toothwort
<i>Cardamine parviflora</i> var. <i>arenicola</i>	—
<i>Chorispora tenella</i>	blue mustard
<i>Conringia orientalis</i>	hare's-ear mustard
<i>Descurainia intermedia</i>	pinnate tansy-mustard
<i>Descurainia pinnata</i>	pinnate tansy-mustard
<i>Descurainia sophia</i>	flixweed
<i>Diplotaxis muralis</i>	sand rocket
<i>Draba brachycarpa</i>	shortpod draba

SCIENTIFIC NAME	COMMON NAME
<i>Draba cuneifolia</i>	wedgeleaf draba
<i>Draba reptans</i>	white whitlow-wort
<i>Erysimum asperum</i>	plains wallflower
<i>Erysimum repandum</i>	bushy wallflower
<i>Hesperis matronalis</i>	dame's rocket
<i>Iodanthus pinnatifidus</i>	purple rocket
<i>Lepidium campestre</i>	field peppergrass
<i>Lepidium densiflorum</i>	peppergrass
<i>Lepidium draba</i>	—
<i>Lepidium oblongum</i>	oblong pepper-grass
<i>Lepidium virginicum</i>	Virginia peppergrass
<i>Microthlaspi perfoliatum</i>	—
<i>Nasturtium officinale</i>	common watercress
<i>Physaria gordonii</i> ssp. <i>gordonii</i>	—
<i>Physaria gracilis</i> ssp. <i>nuttallii</i>	—
<i>Rorippa fernaldiana</i>	—
<i>Rorippa palustris</i> ssp. <i>fernalidiana</i>	—
<i>Rorippa sessiliflora</i>	stalkless yellowcress
<i>Rorippa sinuata</i>	spreading yellowcress
<i>Sibara virginica</i>	Virginia rockcress
<i>Sinapis arvensis</i>	wild mustard
<i>Sisymbrium altissimum</i>	tumble-mustard
<i>Thlaspi arvense</i>	field pennycress
<i>Thlaspi perfoliatum</i>	thorowort pennycress
<b>Cactaceae</b>	<b>Cactus Family</b>
<i>Coryphantha missouriensis</i>	Missouri foxtail cactus
<i>Opuntia macrorhiza</i>	bigroot prickly pear
<b>Callitrichaceae</b>	<b>Water-starwort Family</b>
<i>Callitriche heterophylla</i>	—
<i>Callitriche terrestris</i>	—
<b>Campanulaceae</b>	<b>Bellflower Family</b>
<i>Campanula americana</i>	American bellflower
<i>Lobelia cardinalis</i>	cardinal flower
<i>Lobelia siphilitica</i>	great lobelia
<i>Lobelia spicata</i>	palespike lobelia
<i>Triodanis biflora</i>	—
<i>Triodanis holzingeri</i>	—
<i>Triodanis leptocarpa</i>	slender-fruit Venus'-looking-glass
<i>Triodanis perfoliata</i>	clasping-leaf Venus'-looking-glass
<b>Cannabaceae</b>	<b>Hemp Family</b>
<i>Cannabis sativa</i>	domestic hemp
<i>Humulus japonicus</i>	Japanese hops
<i>Humulus lupulus</i> var. <i>pubescens</i>	—

SCIENTIFIC NAME	COMMON NAME
<b>Capparaceae</b>	<b>Caper Family</b>
<i>Polanisia dodecandra</i> ssp. <i>trachysperma</i>	—
<b>Caprifoliaceae</b>	<b>Honeysuckle Family</b>
<i>Lonicera flava</i>	yellow honeysuckle
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Lonicera maackii</i>	Maack's honeysuckle
<i>Lonicera morrowii</i>	—
<i>Lonicera sempervirens</i>	trumpet honeysuckle
<i>Lonicera tatarica</i>	tatarian honeysuckle
<i>Sambucus canadensis</i>	common elderberry
<i>Symphoricarpos orbiculatus</i>	buckbrush
<i>Triosteum perfoliatum</i>	clasping horse-gentian
<i>Viburnum prunifolium</i>	blackhaw
<i>Viburnum rufidulum</i>	rusty blackhaw
<b>Caryophyllaceae</b>	<b>Pink Family</b>
<i>Arenaria serpyllifolia</i>	thyme-leaved sandwort
<i>Arenaria serpyllifolia</i> var. <i>serpyllifolia</i>	thyme-leaved sandwort
<i>Cerastium brachypodum</i>	shortstalk cerastium
<i>Cerastium fontanum</i> ssp. <i>vulgare</i>	—
<i>Cerastium pumilum</i>	—
<i>Dianthus armeria</i>	Deptford pink
<i>Holosteum umbellatum</i>	jagged chickweed
<i>Minuartia patula</i>	—
<i>Paronychia fastigiata</i> var. <i>fastigiata</i>	forked nailwort
<i>Saponaria officinalis</i>	bouncingbet
<i>Silene antirrhina</i>	sleep catchfly
<i>Silene latifolia</i>	—
<i>Silene stellata</i>	starry campion
<i>Stellaria media</i>	chickweed
<i>Stellaria pallida</i>	pale chickweed
<b>Celastraceae</b>	<b>Bittersweet Family</b>
<i>Celastrus scandens</i>	American bittersweet
<i>Euonymus atropurpurea</i>	wahoo
<i>Euonymus fortunei</i>	Chinese wintercreeper
<b>Ceratophyllaceae</b>	<b>Hornwort Family</b>
<i>Ceratophyllum demersum</i>	common hornwort
<i>Ceratophyllum echinatum</i>	prickly hornwort
<b>Chenopodiaceae</b>	<b>Goosefoot Family</b>
<i>Chenopodium album</i>	lamb's-quarters
<i>Chenopodium berlandieri</i> var. <i>zschackii</i>	pit-seed goosefoot
<i>Chenopodium glaucum</i>	oak-leaved goosefoot
<i>Chenopodium missouriense</i>	Missouri goosefoot
<i>Chenopodium pallescens</i>	pale goosefoot

SCIENTIFIC NAME	COMMON NAME
<i>Chenopodium pratericola</i>	field goosefoot
<i>Chenopodium simplex</i>	maple-leaf goosefoot
<i>Chenopodium standleyanum</i>	Standley's goosefoot
<i>Cycloloma atriplicifolium</i>	winged pigweed
<i>Dysphania ambrosioides</i>	worm-seed goosefoot
<i>Dysphania anthelmintica</i>	wormseed
<i>Kochia scoparia</i>	broom kochia
<i>Monolepis nuttalliana</i>	Nuttall's poverty-weed
<i>Salsola collina</i>	Russian thistle
<i>Salsola iberica</i>	—
<b>Cistaceae</b>	<b>Rock-rose Family</b>
<i>Helianthemum bicknellii</i>	Bicknell's frostweed
<i>Lechea tenuifolia</i>	narrowleaf pinweed
<b>Clusiaceae</b>	<b>Mangosteen Family</b>
<i>Hypericum drummondii</i>	nits-and-lice
<i>Hypericum perforatum</i>	common St. John's-wort
<i>Hypericum punctatum</i>	spotted St. John's-wort
<i>Hypericum sphaerocarpum</i>	round-fruit St. John's-wort
<b>Commelinaceae</b>	<b>Spiderwort Family</b>
<i>Commelina erecta</i>	erect dayflower
<i>Tradescantia bracteata</i>	bracted spiderwort
<i>Tradescantia occidentalis</i>	prairie spiderwort
<i>Tradescantia ohioensis</i>	Ohio spiderwort
<i>Tradescantia tharpii</i>	Tharp's spiderwort
<b>Convolvulaceae</b>	<b>Morning-glory Family</b>
<i>Calystegia macounii</i>	Macoun's bindweed
<i>Calystegia sepium</i>	—
<i>Calystegia silvatica ssp. fraterniflora</i>	—
<i>Convolvulus arvensis</i>	field bindweed
<i>Evolvulus nuttallianus</i>	Nuttall's <i>evolvulus</i>
<i>Ipomoea coccinea</i>	red morning-glory
<i>Ipomoea hederacea</i>	ivy-leaf morning-glory
<i>Ipomoea lacunosa</i>	white morning-glory
<i>Ipomoea leptophylla</i>	bush morning-glory
<i>Ipomoea pandurata</i>	bigroot morning-glory
<i>Ipomoea purpurea</i>	common morning-glory
<i>Ipomoea shumardiana</i>	Shumard's morning-glory
<b>Cornaceae</b>	<b>Dogwood Family</b>
<i>Cornus amomum ssp. obliqua</i>	pale dogwood
<i>Cornus drummondii</i>	roughleaf dogwood
<b>Crassulaceae</b>	<b>Stonecrop Family</b>
<i>Crassula drummondii</i>	—
<i>Penthorum sedoides</i>	ditch stonecrop

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<b>Cucurbitaceae</b>	<b>Cucumber Family</b>
<i>Citrullus lanatus</i> var. <i>lanatus</i>	watermelon
<i>Cucurbita foetidissima</i>	buffalo gourd
<i>Echinocystis lobata</i>	wild mock-cucumber
<i>Melothria pendula</i>	creeping cucumber
<i>Sicyos angulatus</i>	bur cucumber
<b>Cupressaceae</b>	<b>Cypress Family</b>
<i>Chamaecyparis lawsoniana</i>	—
<i>Juniperus virginiana</i> var. <i>virginiana</i>	eastern red-cedar
<b>Cuscutaceae</b>	<b>Dodder Family</b>
<i>Cuscuta coryli</i>	hazel dodder
<i>Cuscuta glomerata</i>	cluster dodder
<i>Cuscuta indecora</i> var. <i>indecora</i>	—
<i>Cuscuta pentagona</i>	—
<b>Cyperaceae</b>	<b>Sedge Family</b>
<i>Bolboschoenus fluviatilis</i>	river tuberous-bulrush
<i>Bolboschoenus maritimus</i> ssp. <i>paludosus</i>	saltmarsh tuberous-bulrush
<i>Bulbostylis capillaris</i>	hairsedge bulbstyle
<i>Carex aggregata</i>	cluster sedge
<i>Carex albicans</i> var. <i>albicans</i>	white-tinge sedge
<i>Carex annectens</i>	yellow-fruit sedge
<i>Carex austrina</i>	southern sedge
<i>Carex bicknellii</i>	Bicknell's sedge
<i>Carex blanda</i>	woodland sedge
<i>Carex brevior</i>	short-beak sedge
<i>Carex bushii</i>	Bush's sedge
<i>Carex crus-corvi</i>	raven-foot sedge
<i>Carex davisii</i>	Davis' sedge
<i>Carex emoryi</i>	emory sedge
<i>Carex festucacea</i>	fescue sedge
<i>Carex fissa</i>	—
<i>Carex frankii</i>	Frank's sedge
<i>Carex gravida</i>	heavy sedge
<i>Carex grisea</i>	narrow-leaf sedge
<i>Carex hirsutella</i>	—
<i>Carex hyalinolepis</i>	thinscale sedge
<i>Carex hystericina</i>	bottle-brush sedge
<i>Carex inops</i> ssp. <i>heliophila</i>	sun sedge
<i>Carex laeviconica</i>	smoothcone sedge
<i>Carex leavenworthii</i>	Leavenworth's sedge
<i>Carex lupulina</i>	hop sedge
<i>Carex meadii</i>	Mead's sedge
<i>Carex microdonta</i>	littletooth sedge

SCIENTIFIC NAME	COMMON NAME
<i>Carex molesta</i>	pest sedge
<i>Carex muehlenbergii</i> var. <i>enervis</i>	—
<i>Carex oligocarpa</i>	straight-fruit sedge
<i>Carex pellita</i>	woolly sedge
<i>Carex shinneryi</i>	—
<i>Carex umbellata</i>	umbellate sedge
<i>Carex vulpinoidea</i>	fox sedge
<i>Cyperus acuminatus</i>	tapeleaf sedge
<i>Cyperus bipartitus</i>	brook flatsedge
<i>Cyperus echinatus</i>	globe flatsedge
<i>Cyperus erythrorhizos</i>	redroot flatsedge
<i>Cyperus esculentus</i>	yellow nutsedge
<i>Cyperus lupulinus</i>	slender-stem flat-rush
<i>Cyperus odoratus</i>	slender flatsedge
<i>Cyperus pseudovegetus</i>	falsegreen flatsedge
<i>Cyperus schweinitzii</i>	Schweinitz's flat-sedge
<i>Cyperus setigerus</i>	—
<i>Cyperus squarrosus</i>	awned flatsedge
<i>Cyperus strigosus</i>	false nutsedge
<i>Cyperus X mesochoreus</i>	intermediate flat-sedge
<i>Eleocharis acicularis</i>	needle spike-rush
<i>Eleocharis compressa</i>	flat-stem spike-rush
<i>Eleocharis engelmannii</i>	Engelmann's spike-rush
<i>Eleocharis erythropoda</i>	bald spike-rush
<i>Eleocharis macrostachya</i>	longstem spikesedge
<i>Eleocharis montevidensis</i>	—
<i>Eleocharis obtusa</i>	blunt spike-rush
<i>Eleocharis palustris</i>	marsh spike-rush
<i>Fimbristylis annua</i>	annual fimbristylis
<i>Fimbristylis autumnalis</i>	slender fimbristylis
<i>Fimbristylis puberula</i> var. <i>puberula</i>	—
<i>Fimbristylis vahlii</i>	Vahl's fimbristylis
<i>Fuirena simplex</i> var. <i>aristulata</i>	—
<i>Lipocarpa aristulata</i>	pointed lipocarpa
<i>Lipocarpa drummondii</i>	Drummond's lipocarpa
<i>Schoenoplectus acutus</i> var. <i>acutus</i>	hard-stem twine-bulrush
<i>Schoenoplectus heterochaetus</i>	slender bulrush
<i>Schoenoplectus pungens</i>	common threesquare twine-bulrush
<i>Schoenoplectus tabernaemontani</i>	soft-stem twine-bulrush
<i>Scirpus atrovirens</i>	green bulrush
<i>Scirpus georgianus</i>	Georgia bulrush
<i>Scirpus pallidus</i>	pale bulrush
<i>Scirpus pendulus</i>	rusty bulrush

SCIENTIFIC NAME	COMMON NAME
<b>Dipsacaceae</b>	<b>Teasel Family</b>
<i>Dipsacus laciniatus</i>	cutleaf teasel
<b>Dryopteridaceae</b>	<b>Wood Fern Family</b>
<i>Cystopteris protrusa</i>	southern bladder fern
<i>Cystopteris tennesseensis</i>	Tennessee bladder fern
<i>Dryopteris marginalis</i>	marginal wood fern
<i>Onoclea sensibilis</i>	sensitive fern
<i>Polystichum acrostichoides</i>	Christmas fern
<i>Woodsia obtusa</i>	—
<b>Ebenaceae</b>	<b>Ebony Family</b>
<i>Diospyros virginiana</i>	persimmon
<b>Elatinaceae</b>	<b>Waterwort Family</b>
<i>Bergia texana</i>	Texas bergia
<b>Equisetaceae</b>	<b>Horsetail Family</b>
<i>Equisetum arvense</i>	field horsetail
<i>Equisetum hyemale</i> ssp. <i>affine</i>	common scouring-rush
<i>Equisetum laevigatum</i>	smooth scouring rush
<i>Equisetum X ferrissii</i>	Ferriss' scouring rush
<b>Euphorbiaceae</b>	<b>Spurge Family</b>
<i>Acalypha deamii</i>	Deam's copperleaf
<i>Acalypha monococca</i>	slender copperleaf
<i>Acalypha ostryifolia</i>	rough-pod copperleaf
<i>Acalypha rhomboidea</i>	rhombic copperleaf
<i>Acalypha virginica</i>	Virginia copperleaf
<i>Argythamnia mercurialina</i>	Mercury's argythamnia
<i>Chamaesyce glyptosperma</i>	ridge-seed mat-spurge
<i>Chamaesyce humistrata</i>	spreading spurge
<i>Chamaesyce maculata</i>	spotted spurge
<i>Chamaesyce missurica</i>	Missouri spurge
<i>Chamaesyce nutans</i>	eyebane
<i>Chamaesyce prostrata</i>	prostrate spurge
<i>Chamaesyce serpens</i>	round-leaf mat-spurge
<i>Chamaesyce stictospora</i>	slim-seed mat-spurge
<i>Croton capitatus</i> var. <i>capitatus</i>	woolly croton
<i>Croton glandulosus</i> var. <i>septentrionalis</i>	tropic croton
<i>Croton monanthogynus</i>	one-seeded croton
<i>Croton texensis</i>	Texas croton
<i>Croton willdenowii</i>	rush-foil
<i>Euphorbia corollata</i>	flowering spurge
<i>Euphorbia cyathophora</i>	painted spurge
<i>Euphorbia davidii</i>	western toothed spurge
<i>Euphorbia dentata</i>	eastern toothed spurge
<i>Euphorbia hexagona</i>	six-angled spurge

SCIENTIFIC NAME	COMMON NAME
<i>Euphorbia marginata</i>	snow-on-the-mountain
<i>Euphorbia spathulata</i>	warty spurge
<i>Euphorbia virgata</i>	—
<i>Ricinus communis</i>	castor bean
<i>Tragia betonicifolia</i>	nettleleaf noseburn
<i>Tragia ramosa</i>	stalked noseburn
<b>Fabaceae</b>	<b>Pea Family</b>
<i>Acacia angustissima</i> var. <i>hirta</i>	—
<i>Albizia julibrissin</i>	silktree
<i>Amorpha canescens</i>	lead plant
<i>Amorpha fruticosa</i>	false indigo
<i>Amorpha nana</i>	dwarf wild indigo
<i>Amphicarpaea bracteata</i>	hog peanut
<i>Apios americana</i>	American potato bean
<i>Astragalus crassicaarpus</i>	ground-plum milk-vetch
<i>Astragalus lotiflorus</i>	lotus milk-vetch
<i>Astragalus plattensis</i>	Platte River milk-vetch
<i>Baptisia alba</i> var. <i>macrophylla</i>	—
<i>Baptisia australis</i> var. <i>minor</i>	blue wild-indigo
<i>Baptisia bracteata</i> var. <i>leucophaea</i>	plains wild-indigo
<i>Baptisia leucophaea</i>	plains wild-indigo
<i>Baptisia X bicolor</i>	—
<i>Cercis canadensis</i>	redbud
<i>Chamaecrista fasciculata</i>	showy partridge pea
<i>Chamaecrista nictitans</i> ssp. <i>nictitans</i> var. <i>nictitans</i>	—
<i>Colutea arborescens</i>	bladder senna
<i>Crotalaria sagittalis</i>	rattlebox
<i>Dalea aurea</i>	golden prairie-clover
<i>Dalea candida</i> var. <i>candida</i>	white prairie-clover
<i>Dalea enneandra</i>	nine-anther prairie-clover
<i>Dalea lanata</i> var. <i>lanata</i>	—
<i>Dalea leporina</i>	hare's-foot prairie-clover
<i>Dalea multiflora</i>	roundhead prairie-clover
<i>Dalea purpurea</i>	purple prairie-clover
<i>Dalea villosa</i> var. <i>villosa</i>	—
<i>Desmanthus illinoensis</i>	Illinois bundleflower
<i>Desmanthus leptolobus</i>	slenderlobe bundleflower
<i>Desmodium canadense</i>	Canada tickclover
<i>Desmodium canescens</i>	hoary tickclover
<i>Desmodium ciliare</i>	slender tickclover
<i>Desmodium cuspidatum</i>	long-leaf tickclover
<i>Desmodium glabellum</i>	—
<i>Desmodium glutinosum</i>	large-flowered tickclover

SCIENTIFIC NAME	COMMON NAME
<i>Desmodium illinoense</i>	Illinois tickclover
<i>Desmodium paniculatum</i>	—
<i>Desmodium perplexum</i>	Dillen's tick-clover
<i>Desmodium sessilifolium</i>	sessile-leaf tickclover
<i>Gleditsia triacanthos</i>	honey locust
<i>Glycyrrhiza lepidota</i>	wild licorice
<i>Gymnocladus dioicus</i>	Kentucky coffee-tree
<i>Kummerowia stipulacea</i>	Korean clover
<i>Lespedeza capitata</i>	round-head lespedeza
<i>Lespedeza cuneata</i>	sericea lespedeza
<i>Lespedeza formosa</i>	—
<i>Lespedeza procumbens</i>	trailing lespedeza
<i>Lespedeza repens</i>	creeping lespedeza
<i>Lespedeza stuevei</i>	tall bush lespedeza
<i>Lespedeza violacea</i>	prairie lespedeza
<i>Lespedeza virginica</i>	slender bush lespedeza
<i>Lespedeza X simulata</i>	—
<i>Lotus corniculatus</i>	bird's-foot trefoil
<i>Lotus unifoliolatus var. unifoliolatus</i>	—
<i>Medicago lupulina</i>	black medick
<i>Medicago minima</i>	prickly medick
<i>Medicago sativa ssp. sativa</i>	alfalfa
<i>Melilotus albus</i>	white sweet clover
<i>Melilotus officinalis</i>	yellow sweet clover
<i>Mimosa quadrivalvis var. nuttallii</i>	cat-claw mimosa
<i>Oxytropis lambertii</i>	Lambert's crazyweed
<i>Pedimelum argophyllum</i>	silver-leaf scurfpea
<i>Pedimelum esculentum</i>	prairie-turnip
<i>Psoralidium argophyllum</i>	—
<i>Psoralidium lanceolatum</i>	lemon scurfpea
<i>Psoralidium tenuiflorum</i>	many-flowered scurf-pea
<i>Robinia pseudoacacia</i>	black locust
<i>Securigera varia</i>	—
<i>Senna marilandica</i>	Maryland senna
<i>Strophostyles helvula</i>	wild bean
<i>Strophostyles leiosperma</i>	slick-seed bean
<i>Tephrosia virginiana</i>	goat's rue
<i>Trifolium campestre</i>	low hop clover
<i>Trifolium hybridum</i>	alsike clover
<i>Trifolium hybridum ssp. elegans</i>	—
<i>Trifolium pratense</i>	red clover
<i>Trifolium repens</i>	white clover
<i>Vicia americana</i>	American vetch

SCIENTIFIC NAME	COMMON NAME
<i>Vicia villosa</i> ssp. <i>villosa</i>	hairy vetch
<b>Fagaceae</b>	<b>Beech Family</b>
<i>Quercus imbricaria</i>	shingle oak
<i>Quercus macrocarpa</i>	bur oak
<i>Quercus marilandica</i>	blackjack oak
<i>Quercus muehlenbergii</i>	chinquapin oak
<i>Quercus prinoides</i>	dwarf chinquapin oak
<i>Quercus rubra</i>	—
<i>Quercus shumardii</i>	Shumard's oak
<i>Quercus stellata</i>	post oak
<i>Quercus velutina</i>	black oak
<i>Quercus X bushii</i>	—
<b>Fumariaceae</b>	<b>Fumitory Family</b>
<i>Corydalis crystallina</i>	mealy corydalis
<i>Corydalis micrantha</i> ssp. <i>micrantha</i>	—
<i>Dicentra cucullaria</i>	Dutchman's breeches
<b>Gentianaceae</b>	<b>Gentian Family</b>
<i>Gentiana puberulenta</i>	downy gentian
<i>Sabatia campestris</i>	prairie rose gentian
<b>Geraniaceae</b>	<b>Geranium Family</b>
<i>Erodium cicutarium</i>	filaree
<i>Geranium carolinianum</i>	Carolina cranesbill
<i>Geranium pusillum</i>	small cranesbill
<b>Grossulariaceae</b>	<b>Currant Family</b>
<i>Ribes aureum</i> var. <i>villosum</i>	—
<i>Ribes missouriense</i>	Missouri gooseberry
<b>Haloragaceae</b>	<b>Watermilfoil Family</b>
<i>Myriophyllum heterophyllum</i>	water milfoil
<i>Myriophyllum pinnatum</i>	green parrot's feather
<b>Hippocastanaceae</b>	<b>Horse Chestnut Family</b>
<i>Aesculus glabra</i> var. <i>arguta</i>	Ohio buckeye
<b>Hydrocharitaceae</b>	<b>Waterleaf Family</b>
<i>Najas guadalupensis</i>	common naiad
<i>Najas guadalupensis</i> ssp. <i>guadalupensis</i>	common naiad
<b>Hydrophyllaceae</b>	<b>Waterleaf Family</b>
<i>Ellisia nyctelea</i>	waterpod
<i>Hydrophyllum virginianum</i>	Virginia waterleaf
<b>Iridaceae</b>	<b>Iris Family</b>
<i>Iris flavescens</i>	—
<i>Iris germanica</i>	bearded iris
<i>Iris pseudacorus</i>	yellow-flag iris
<i>Iris pumila</i>	—
<i>Nemastylis geminiflora</i>	nemastylis

SCIENTIFIC NAME	COMMON NAME
<i>Sisyrinchium angustifolium</i>	common blue-eyed grass
<i>Sisyrinchium campestre</i>	prairie blue-eyed grass
<b>Isoetaceae</b>	<b>Quillwort Family</b>
<i>Isoetes butleri</i>	Butler's quillwort
<b>Juglandaceae</b>	<b>Walnut Family</b>
<i>Carya cordiformis</i>	bitternut hickory
<i>Carya illinoensis</i>	pecan
<i>Carya ovata</i>	shagbark hickory
<i>Juglans nigra</i>	black walnut
<b>Juncaceae</b>	<b>Rush Family</b>
<i>Juncus acuminatus</i>	tapertip rush
<i>Juncus diffusissimus</i>	slimpod rush
<i>Juncus dudleyi</i>	Dudley's rush
<i>Juncus interior</i>	inland rush
<i>Juncus marginatus</i>	shore rush
<i>Juncus nodatus</i>	stout rush
<i>Juncus tenuis</i>	path rush
<i>Juncus torreyi</i>	Torrey's rush
<i>Luzula bulbosa</i>	wood rush
<b>Lamiaceae</b>	<b>Mint Family</b>
<i>Agastache nepetoides</i>	catnip giant hyssop
<i>Glechoma hederacea</i>	ground ivy
<i>Hedeoma hispida</i>	rough false pennyroyal
<i>Lamium amplexicaule</i>	henbit
<i>Lamium purpureum</i>	deadnettle
<i>Leonurus cardiaca</i>	common motherwort
<i>Lycopus americanus</i>	American bugleweed
<i>Marrubium vulgare</i>	common horehound
<i>Mentha arvensis</i>	field mint
<i>Monarda bradburiana</i>	Bradbury bee-balm
<i>Monarda citriodora</i>	lemon bee-balm
<i>Monarda fistulosa</i>	wild bergamot bee-balm
<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>	small skullcap
<i>Stachys tenuifolia</i>	slenderleaf betony
<i>Teucrium canadense</i>	American germander
<i>Trichostema brachiatum</i>	false pennyroyal

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<b>Lemnaceae</b>	<b>Duckweed Family</b>
<i>Lemna aequinoctialis</i>	equinox duckweed
<i>Lemna minor</i>	lesser duckweed
<i>Lemna obscura</i>	obscure duckweed
<i>Lemna perpusilla</i>	minute duckweed
<i>Lemna turionifera</i>	turion duckweed
<i>Spirodela polyrrhiza</i>	greater duckmeat
<i>Wolffia columbiana</i>	Columbia watermeal
<b>Lentibulariaceae</b>	<b>Bladderwort Family</b>
<i>Utricularia macrorhiza</i>	common bladderwort
<b>Liliaceae</b>	<b>Lily Family</b>
<i>Allium canadense</i>	Canadian onion
<i>Allium sativum</i>	wild onion
<i>Allium stellatum</i>	pink wild onion
<i>Allium vineale</i>	field garlic
<i>Androstephium coeruleum</i>	blue funnel lily
<i>Asparagus officinalis</i>	garden asparagus
<i>Camassia angusta</i>	wild hyacinth
<i>Camassia scilloides</i>	wild hyacinth
<i>Erythronium albidum</i>	white dogtooth violet
<i>Erythronium mesochoreum</i>	prairie dogtooth violet
<i>Hemerocallis fulva</i>	day lily
<i>Hypoxis hirsuta</i>	yellow star grass
<i>Maianthemum racemosum</i>	feathery false Solomon's seal
<i>Maianthemum stellatum</i>	starry spikenard
<i>Muscari neglectum</i>	—
<i>Nothoscordum bivalve</i>	false garlic
<i>Ornithogalum umbellatum</i>	star-of-Bethlehem
<i>Polygonatum biflorum</i>	Solomon's seal
<i>Toxicoscordion nuttallii</i>	—
<b>Linaceae</b>	<b>Flax Family</b>
<i>Linum pratense</i>	Norton's flax
<i>Linum sulcatum</i>	grooved flax
<b>Loasaceae</b>	<b>Loasa Family</b>
<i>Mentzelia oligosperma</i>	stick-leaf chickenthief
<b>Lythraceae</b>	<b>Loosestrife Family</b>
<i>Ammannia auriculata</i>	earleaf ammannia
<i>Ammannia coccinea</i>	red ammannia
<i>Ammannia robusta</i>	purple ammannia
<i>Didiplis diandra</i>	water purslane
<i>Lythrum alatum</i>	winged loosestrife
<i>Lythrum californicum</i>	California loosestrife
<i>Lythrum salicaria</i>	purple loosestrife

SCIENTIFIC NAME	COMMON NAME
<i>Rotala ramosior</i>	rotala
<b>Malvaceae</b>	<b>Mallow Family</b>
<i>Abutilon theophrasti</i>	velvet-leaf
<i>Callirhoe alcaeoides</i>	pale poppy mallow
<i>Callirhoe involucrata</i>	purple poppy mallow
<i>Callirhoe leiocarpa</i>	hairy-fruited poppy mallow
<i>Hibiscus laevis</i>	halberd-leaved rose mallow
<i>Hibiscus trionum</i>	flower-of-an-hour
<i>Malva neglecta</i>	common mallow
<i>Malva pusilla</i>	running mallow
<i>Malvastrum hispidum</i>	hairy false mallow
<i>Sida spinosa</i>	prickly sida
<b>Marsileaceae</b>	<b>Water Clover Family</b>
<i>Marsilea vestita</i>	western water-clover
<b>Menispermaceae</b>	<b>Moonseed Family</b>
<i>Cocculus carolinus</i>	Carolina snailseed
<i>Menispermum canadense</i>	moonseed
<b>Molluginaceae</b>	<b>Carpetweed Family</b>
<i>Mollugo verticillata</i>	carpetweed
<b>Moraceae</b>	<b>Mulberry Family</b>
<i>Maclura pomifera</i>	Osage orange
<i>Morus alba</i>	white mulberry
<i>Morus rubra</i>	red mulberry
<b>Nelumbonaceae</b>	<b>Lotus-lily Family</b>
<i>Nelumbo lutea</i>	American lotus
<b>Nyctaginaceae</b>	<b>Four-o'clock Family</b>
<i>Mirabilis albida</i>	white four-o'clock
<i>Mirabilis linearis</i>	narrowleaf four-o'clock
<i>Mirabilis nyctaginea</i>	wild four-o'clock
<b>Nymphaeaceae</b>	<b>Water-lily Family</b>
<i>Nymphaea odorata ssp. odorata</i>	fragrant water-lily
<b>Oleaceae</b>	<b>Olive Family</b>
<i>Fraxinus americana</i>	white ash
<i>Fraxinus pennsylvanica</i>	green ash
<i>Fraxinus quadrangulata</i>	blue ash
<i>Syringa vulgaris</i>	common lilac
<b>Onagraceae</b>	<b>Evening Primrose Family</b>
<i>Calylophus serrulatus</i>	plains yellow evening-primrose
<i>Circaea lutetiana ssp. canadensis</i>	broadleaf enchanter's nightshade
<i>Epilobium coloratum</i>	purple-leaved willow-herb
<i>Epilobium X wisconsinense</i>	Wisconsin willow-herb
<i>Gaura coccinea</i>	scarlet butterfly-weed
<i>Gaura longiflora</i>	biennial gaura

SCIENTIFIC NAME	COMMON NAME
<i>Gaura mollis</i>	velvet butterfly-weed
<i>Ludwigia alternifolia</i> var. <i>pubescens</i>	—
<i>Ludwigia palustris</i>	water purslane
<i>Ludwigia peploides</i>	floating seedbox
<i>Oenothera biennis</i>	common evening primrose
<i>Oenothera laciniata</i>	cutleaf evening primrose
<i>Oenothera linifolia</i>	narrow-leaved evening primrose
<i>Oenothera macrocarpa</i> ssp. <i>macrocarpa</i>	Missouri evening-primrose
<i>Oenothera pilosella</i>	meadow evening primrose
<i>Oenothera rhombipetala</i>	fourpoint evening primrose
<i>Oenothera speciosa</i>	white evening primrose
<i>Oenothera triloba</i>	stemless evening primrose
<i>Oenothera villosa</i>	hairy evening-primrose
<i>Stenosiphon linifolius</i>	stenosiphon
<b>Ophioglossaceae</b>	<b>Fern Family</b>
<i>Botrychium virginianum</i>	rattlesnake fern
<i>Ophioglossum engelmannii</i>	limestone adder's-tongue
<b>Orchidaceae</b>	<b>Orchid Family</b>
<i>Platanthera praeclara</i> — <i>Threatened</i>	western prairie fringed orchid
<i>Spiranthes cernua</i>	nodding ladies'-tresses
<i>Spiranthes lacera</i>	slender ladies'-tresses
<i>Spiranthes magnicamporum</i>	Great Plains ladies'-tresses
<i>Spiranthes tuberosa</i>	little ladies'-tresses
<i>Spiranthes vernalis</i>	upland ladies'-tresses
<i>Spiranthes vernalis</i>	upland ladies'-tresses
<b>Osmundaceae</b>	<b>Royal Fern Family</b>
<i>Osmunda regalis</i> var. <i>spectabilis</i>	—
<b>Oxalidaceae</b>	<b>Wood-sorrel Family</b>
<i>Oxalis dillenii</i>	green wood sorrel
<i>Oxalis stricta</i>	yellow wood-sorrel
<i>Oxalis violacea</i>	violet wood sorrel
<b>Papaveraceae</b>	<b>Poppy Family</b>
<i>Argemone polyanthemos</i>	prickly poppy
<i>Papaver rhoeas</i>	field poppy
<b>Phytolaccaceae</b>	<b>Pokeweed Family</b>
<i>Phytolacca americana</i> var. <i>americana</i>	American pokeweed
<b>Pinaceae</b>	<b>Pine Family</b>
<i>Pinus nigra</i>	—
<i>Pinus ponderosa</i>	—
<i>Pinus sylvestris</i>	—
<b>Plantaginaceae</b>	<b>Plantain Family</b>
<i>Plantago aristata</i>	bottlebrush plantain
<i>Plantago elongata</i> ssp. <i>elongata</i>	slender plantain

SCIENTIFIC NAME	COMMON NAME
<i>Plantago lanceolata</i>	English plantain
<i>Plantago patagonica</i> var. <i>patagonica</i>	woolly plantain
<i>Plantago pusilla</i>	tiny plantain
<i>Plantago rhodosperma</i>	red-seeded plantain
<i>Plantago rugelii</i>	Rugel's plantain
<i>Plantago virginica</i>	pale-seeded plantain
<b>Platanaceae</b>	<b>Sycamore Family</b>
<i>Platanus occidentalis</i>	sycamore
<b>Poaceae</b>	<b>Grass Family</b>
<i>Aegilops cylindrica</i>	jointed goatgrass
<i>Aegilotriticum sancti-andreae</i>	—
<i>Agrostis elliottiana</i>	awned bentgrass
<i>Agrostis gigantea</i>	redtop
<i>Agrostis hyemalis</i>	winter bent grass
<i>Agrostis stolonifera</i>	creeping bent grass
<i>Alopecurus carolinianus</i>	Carolina foxtail
<i>Andropogon gerardii</i>	big bluestem
<i>Andropogon hallii</i>	sandhill bluestem
<i>Andropogon scoparius</i>	little bluestem
<i>Andropogon virginicus</i>	broomsedge bluestem
<i>Aristida basiramea</i>	forktip threeawn
<i>Aristida dichotoma</i> var. <i>curtissii</i>	—
<i>Aristida longespica</i> var. <i>geniculata</i>	—
<i>Aristida oligantha</i>	old-field threeawn
<i>Aristida purpurascens</i>	arrow feather threeawn
<i>Avena fatua</i> var. <i>sativa</i>	—
<i>Bothriochloa bladhii</i>	Caucasian bluestem
<i>Bothriochloa ischaemum</i> var. <i>songarica</i>	Turkestan bluestem
<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	silver bluestem
<i>Bouteloua curtipendula</i>	side-oats grama
<i>Bouteloua gracilis</i>	blue grama
<i>Bouteloua hirsuta</i>	hairy grama
<i>Bromus catharticus</i>	rescuegrass
<i>Bromus commutatus</i>	hairy chess
<i>Bromus inermis</i>	smooth brome
<i>Bromus japonicus</i>	Japanese brome
<i>Bromus pubescens</i>	Canada brome
<i>Bromus secalinus</i>	rye brome
<i>Bromus tectorum</i>	downy brome
<i>Buchloe dactyloides</i>	buffalo grass
<i>Calamovilfa longifolia</i> var. <i>longifolia</i>	prairie sand-reed
<i>Cenchrus incertus</i>	coast sandbur
<i>Cenchrus longispinus</i>	field sandbur

SCIENTIFIC NAME	COMMON NAME
<i>Chasmanthium latifolium</i>	sea oats
<i>Chloris verticillata</i>	windmillgrass
<i>Chloris virgata</i>	showy chloris
<i>Cynodon dactylon</i>	bermudagrass
<i>Dactylis glomerata</i>	orchardgrass
<i>Danthonia spicata</i>	poverty oat grass
<i>Diarrhena obovata</i>	American beakgrass
<i>Dichanthelium acuminatum</i>	—
<i>Dichanthelium malacophyllum</i>	soft-leaf dichanthelium
<i>Dichanthelium oligosanthos ssp. scribnerianum</i>	Scribner's dichanthelium
<i>Dichanthelium ovale ssp. praecocius</i>	—
<i>Dichanthelium perlongum</i>	long-spike dichanthelium
<i>Dichanthelium sphaerocarpon</i>	roundseed dichanthelium
<i>Digitaria ciliaris</i>	southern crabgrass
<i>Digitaria cognata ssp. cognata</i>	fall witch grass
<i>Digitaria filiformis</i>	slender crabgrass
<i>Digitaria ischaemum</i>	smooth crabgrass
<i>Digitaria sanguinalis</i>	hairy crabgrass
<i>Echinochloa colona</i>	jungle-rice
<i>Echinochloa crus-galli</i>	barnyard grass
<i>Echinochloa esculenta</i>	—
<i>Echinochloa muricata</i>	rough barnyard grass
<i>Eleusine indica</i>	goosegrass
<i>Elymus canadensis</i>	Canada wildrye
<i>Elymus glabriflorus</i>	smooth wildrye
<i>Elymus macgregorii</i>	McGregor's wild rye
<i>Elymus repens</i>	quack grass
<i>Elymus submuticus</i>	Virginia wild-rye
<i>Elymus villosus</i>	hairy wildrye
<i>Elymus virginicus</i>	Virginia wild-rye
<i>Elymus X maltei</i>	—
<i>Eragrostis capillaris</i>	lacegrass
<i>Eragrostis cilianensis</i>	stink grass
<i>Eragrostis curtipedicellata</i>	gummy lovegrass
<i>Eragrostis frankii</i>	sandbar lovegrass
<i>Eragrostis hypnoides</i>	teal lovegrass
<i>Eragrostis intermedia</i>	plains lovegrass
<i>Eragrostis minor</i>	little lovegrass
<i>Eragrostis pectinacea</i>	Carolina love grass
<i>Eragrostis spectabilis</i>	purple lovegrass
<i>Eragrostis trichodes</i>	sand lovegrass
<i>Eriochloa contracta</i>	prairie cupgrass
<i>Festuca subverticillata</i>	nodding fescue

SCIENTIFIC NAME	COMMON NAME
<i>Glyceria striata</i>	fowl mannagrass
<i>Glyceria striata</i> var. <i>striata</i>	fowl mannagrass
<i>Gymnopogon ambiguus</i>	bearded skeletongrass
<i>Hesperostipa comata</i> ssp. <i>comata</i>	needle-and-thread
<i>Hesperostipa spartea</i>	porcupine grass
<i>Hordeum jubatum</i>	foxtail barley
<i>Hordeum pusillum</i>	little barley
<i>Koeleria macrantha</i>	prairie June grass
<i>Leersia oryzoides</i>	rice cut grass
<i>Leersia virginica</i>	whitegrass
<i>Leptochloa fascicularis</i>	bearded sprangletop
<i>Leptochloa fusca fascicularis</i>	bearded sprangletop
<i>Leptochloa mucronata</i>	red sprangletop
<i>Leptochloa panicea</i> ssp. <i>mucronata</i>	red sprangletop
<i>Lolium perenne</i> var. <i>perenne</i>	—
<i>Melica nitens</i>	threeflower melic
<i>Muhlenbergia bushii</i>	Bush's muhly
<i>Muhlenbergia capillaris</i>	hairgrass
<i>Muhlenbergia cuspidata</i>	plains muhly
<i>Muhlenbergia frondosa</i>	wirestem muhly
<i>Muhlenbergia mexicana</i>	Mexican muhly
<i>Muhlenbergia racemosa</i>	marsh muhly
<i>Muhlenbergia schreberi</i>	nimblewill
<i>Muhlenbergia sobolifera</i>	rock muhly
<i>Muhlenbergia sylvatica</i>	forest muhly
<i>Neeragrostis reptans</i>	—
<i>Panicum anceps</i>	beaked panicum
<i>Panicum capillare</i>	common witch grass
<i>Panicum dichotomiflorum</i>	fall panicum
<i>Panicum flexile</i>	wiry witchgrass
<i>Panicum obtusum</i>	vine-mesquite
<i>Panicum philadelphicum</i>	Philadelphia witchgrass
<i>Panicum rigidulum</i>	redtop panicum
<i>Panicum virgatum</i>	switchgrass
<i>Pascopyrum smithii</i>	western wheatgrass
<i>Paspalum floridanum</i> var. <i>glabratum</i>	—
<i>Paspalum laeve</i> var. <i>circularare</i>	—
<i>Paspalum pubiflorum</i> var. <i>glabrum</i>	hairy-seed paspalum
<i>Paspalum setaceum</i> var. <i>muhlenbergii</i>	thin paspalum
<i>Paspalum setaceum</i> var. <i>stramineum</i>	—
<i>Phalaris arundinacea</i>	reed canarygrass
<i>Phalaris caroliniana</i>	Carolina canarygrass
<i>Phleum pratense</i>	timothy

SCIENTIFIC NAME	COMMON NAME
<i>Phleum pratense ssp. pratense</i>	timothy
<i>Phragmites australis</i>	common reed
<i>Poa annua</i>	annual bluegrass
<i>Poa bulbosa</i>	bulbose bluegrass
<i>Poa compressa</i>	Canada bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Poa sylvestris</i>	woodland bluegrass
<i>Saccharum ravennae</i>	plumegrass
<i>Schedonardus paniculatus</i>	tumblegrass
<i>Schedonorus arundinaceus</i>	tall rye grass
<i>Schedonorus pratensis</i>	meadow rye grass
<i>Schizachyrium scoparium</i>	little bluestem
<i>Sclerochloa dura</i>	hardgrass
<i>Setaria faberi</i>	Chinese foxtail
<i>Setaria glauca</i>	—
<i>Setaria italica</i>	foxtail millet
<i>Setaria parviflora</i>	knotroot bristlegrass
<i>Setaria pumila</i>	yellow bristle grass
<i>Setaria viridis</i>	green foxtail
<i>Sorghastrum nutans</i>	Indiangrass
<i>Sorghum bicolor</i>	sorghum
<i>Sorghum halepense</i>	Johnsongrass
<i>Spartina pectinata</i>	prairie cordgrass
<i>Sphenopholis obtusata var. obtusata</i>	wedgescale
<i>Sporobolus airoides</i>	alkali sacaton
<i>Sporobolus asper var. drummondii</i>	rough dropseed
<i>Sporobolus clandestinus</i>	—
<i>Sporobolus compositus</i>	rough dropseed
<i>Sporobolus cryptandrus</i>	sand dropseed
<i>Sporobolus heterolepis</i>	prairie dropseed
<i>Sporobolus neglectus</i>	puffsheath dropseed
<i>Sporobolus ozarkanus</i>	Ozark dropseed
<i>Sporobolus pyramidatus</i>	whorled dropseed
<i>Sporobolus vaginiflorus</i>	povertygrass
<i>Thinopyrum ponticum</i>	tall sand-wheat
<i>Tridens flavus</i>	purpletop
<i>Tridens muticus var. elongatus</i>	—
<i>Tridens strictus</i>	longspike tridens
<i>Triplasis purpurea</i>	purple sandgrass
<i>Tripsacum dactyloides</i>	eastern gammagrass
<i>Triticum aestivum</i>	bread wheat
<i>Vulpia octoflora</i>	sixweeks fescue

SCIENTIFIC NAME	COMMON NAME
<b>Polemoniaceae</b>	<b>Phlox Family</b>
<i>Phlox divaricata</i>	wild blue phlox
<i>Phlox oklahomensis</i>	Oklahoma phlox
<i>Phlox pilosa</i> ssp. <i>pilosa</i>	downy phlox
<b>Polygalaceae</b>	<b>Milkwort Family</b>
<i>Polygala incarnata</i>	slender milkwort
<i>Polygala verticillata</i>	whorled milkwort
<b>Polygonaceae</b>	<b>Buckwheat Family</b>
<i>Eriogonum annuum</i>	annual eriogonum
<i>Fagopyrum esculentum</i>	buckwheat
<i>Fallopia convolvulus</i>	black bindweed
<i>Fallopia scandens</i>	climbing false-buckwheat
<i>Persicaria amphibia</i>	water smartweed
<i>Persicaria bicornis</i>	pink smartweed
<i>Persicaria hydropiperoides</i>	swamp smartweed
<i>Persicaria lapathifolia</i>	pale smartweed
<i>Persicaria maculosa</i>	spotted lady's-thumb, redshank
<i>Persicaria pensylvanica</i>	Pennsylvania smartweed
<i>Persicaria punctata</i>	dotted smartweed
<i>Persicaria virginiana</i>	jumpseed
<i>Polygonum aviculare</i>	prostrate knotweed
<i>Polygonum erectum</i>	erect knotweed
<i>Polygonum ramosissimum</i>	bush knotweed
<i>Polygonum tenue</i>	slender knotweed
<i>Rumex acetosella</i>	sheep sorrel
<i>Rumex acetosella</i> ssp. <i>pyrenaicus</i>	sheep sorrel
<i>Rumex altissimus</i>	pale dock
<i>Rumex crispus</i>	curly dock
<i>Rumex maritimus</i>	golden dock
<i>Rumex patientia</i>	patience dock
<i>Rumex stenophyllus</i>	narrow-leaf dock
<b>Pontederiaceae</b>	<b>Pickereel-weed Family</b>
<i>Eichhornia crassipes</i>	—
<i>Heteranthera limosa</i>	blue mud plantain
<i>Heteranthera multiflora</i>	—
<i>Heteranthera rotundifolia</i>	—
<i>Pontederia cordata</i>	common pickereelweed
<b>Portulacaceae</b>	<b>Purslane Family</b>
<i>Claytonia virginica</i>	Virginia spring beauty
<i>Phemeranthus calycinus</i>	rock-pink fameflower
<i>Phemeranthus parviflorus</i>	prairie fameflower
<i>Portulaca oleracea</i>	common purslane
<i>Portulaca pilosa</i>	hairy purslane

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<b>Potamogetonaceae</b>	<b>Pondweed Family</b>
<i>Potamogeton diversifolius</i>	water-thread pondweed
<i>Potamogeton foliosus</i>	leafy pondweed
<i>Potamogeton nodosus</i>	long-leaf pondweed
<i>Potamogeton pusillus</i>	—
<i>Stuckenia pectinata</i>	sago pondweed
<b>Primulaceae</b>	<b>Primrose Family</b>
<i>Anagallis arvensis</i>	scarlet pimpernel
<i>Androsace occidentalis</i>	western rock-jasmine
<i>Dodecatheon meadia</i> var. <i>meadia</i>	—
<i>Lysimachia ciliata</i>	fringed loosestrife
<i>Lysimachia nummularia</i>	moneywort
<b>Ranunculaceae</b>	<b>Buttercup Family</b>
<i>Anemone canadensis</i>	meadow anemone
<i>Anemone caroliniana</i>	Carolina anemone
<i>Anemone cylindrica</i>	candle anemone
<i>Anemone virginiana</i>	tall anemone
<i>Aquilegia</i>	columbine
<i>Aquilegia canadensis</i>	American columbine
<i>Clematis pitcheri</i>	Pitcher's clematis
<i>Clematis terniflora</i>	virgin's bower
<i>Consolida ajacis</i>	rocket larkspur
<i>Delphinium carolinianum</i>	Carolina larkspur
<i>Delphinium tricorne</i>	dwarf larkspur
<i>Enemion biternatum</i>	false rue anemone
<i>Myosurus minimus</i>	mousetail
<i>Ranunculus abortivus</i>	early wood buttercup
<i>Ranunculus aquatilis</i> var. <i>diffusus</i>	white water crowfoot
<i>Ranunculus hispidus</i> var. <i>hispidus</i>	—
<i>Ranunculus sardous</i>	hairy buttercup
<i>Ranunculus sceleratus</i> var. <i>sceleratus</i>	cursed crowfoot
<i>Ranunculus testiculatus</i>	bur buttercup
<i>Thalictrum dasycarpum</i>	purple meadow-rue
<b>Rhamnaceae</b>	<b>Buckthorn Family</b>
<i>Ceanothus americanus</i>	New Jersey tea
<i>Ceanothus herbaceus</i>	inland ceanothus
<i>Ceanothus ovatus</i>	—
<i>Rhamnus lanceolata</i> var. <i>glabrata</i>	—
<b>Rosaceae</b>	<b>Rose Family</b>
<i>Agrimonia parviflora</i>	many-flowered agrimony
<i>Agrimonia pubescens</i>	downy agrimony
<i>Amelanchier arborea</i>	tall service berry
<i>Amelanchier sanguinea</i>	—

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Crataegus coccinioides</i>	Kansas hawthorn
<i>Crataegus crus-galli</i>	cockspur hawthorn
<i>Crataegus mollis</i>	summer hawthorn
<i>Crataegus pruinosa</i>	frosty hawthorn
<i>Fragaria virginiana</i>	wild strawberry
<i>Geum canadense</i>	white avens
<i>Malus ioensis</i>	—
<i>Potentilla arguta</i>	tall cinquefoil
<i>Potentilla recta</i>	sulphur cinquefoil
<i>Potentilla rivalis</i>	brook cinquefoil
<i>Potentilla simplex</i>	old-field cinquefoil
<i>Prunus americana</i>	wild plum
<i>Prunus angustifolia</i>	chickasaw plum
<i>Prunus cerasus</i>	sour cherry
<i>Prunus mahaleb</i>	mahaleb plum
<i>Prunus mexicana</i>	Mexican plum
<i>Prunus munsoniana</i>	wild-goose plum
<i>Prunus persica</i>	peach
<i>Prunus rivularis</i>	creek plum
<i>Prunus serotina</i>	black cherry
<i>Prunus virginiana</i>	choke cherry
<i>Pyrus communis</i>	pear
<i>Rosa arkansana</i>	prairie wild rose
<i>Rosa blanda</i>	smooth rose
<i>Rosa multiflora</i>	multiflora rose
<i>Rosa setigera</i>	climbing rose
<i>Rosa X rudiusscula</i>	—
<i>Rubus aboriginum</i>	one-flower dewberry
<i>Rubus curtipes</i>	—
<i>Rubus discolor</i>	Himalayan blackberry
<i>Rubus enslenii</i>	small dewberry
<i>Rubus flagellaris</i>	American dewberry
<i>Rubus frondosus</i>	leafy highbush blackberry
<i>Rubus hancinianus</i>	Hancin's dewberry
<i>Rubus laudatus</i>	praiseworthy blackberry
<i>Rubus meracus</i>	dryslope dewberry
<i>Rubus mollior</i>	soft blackberry
<i>Rubus occidentalis</i>	black raspberry
<i>Rubus ostryifolius</i>	highbush blackberry
<i>Rubus pensilvanicus</i>	highbush blackberry
<i>Rubus roribaccus</i>	Lucretia dewberry
<b>Rubiaceae</b>	<b>Madder Family</b>
<i>Cephalanthus occidentalis</i>	buttonbush

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Diodia teres</i>	rough buttonweed
<i>Galium aparine</i>	catchweed bedstraw
<i>Galium circaezans</i>	woods bedstraw
<i>Galium concinnum</i>	shining bedstraw
<i>Galium obtusum</i>	bluntleaf bedstraw
<i>Galium pedemontanum</i>	foothill bedstraw
<i>Galium pilosum</i>	hairy bedstraw
<i>Galium triflorum</i>	sweet-scent bedstraw
<i>Galium virgatum</i>	southwestern bedstraw
<i>Hedyotis nigricans</i>	narrow-leaf bluet
<i>Houstonia pusilla</i>	small bluets
<b>Rutaceae</b>	<b>Rue Family</b>
<i>Poncirus trifoliata</i>	—
<i>Ptelea trifoliata</i>	common hop tree
<i>Zanthoxylum americanum</i>	common prickly ash
<b>Salicaceae</b>	<b>Willow Family</b>
<i>Populus deltoides</i> ssp. <i>monilifera</i>	cottonwood
<i>Populus nigra</i>	black poplar
<i>Populus X canadensis</i>	Carolina poplar
<i>Salix amygdaloides</i>	peach-leaved willow
<i>Salix caroliniana</i>	Carolina willow
<i>Salix eriocephala</i> ssp. <i>eriocephala eriocephala</i>	diamond willow
<i>Salix exigua</i> ssp. <i>interior</i>	sandbar willow
<i>Salix humilis</i> var. <i>humilis</i>	—
<i>Salix nigra</i>	black willow
<b>Santalaceae</b>	<b>Sandalwood Family</b>
<i>Comandra umbellata</i>	umbellate bastard toad-flax
<b>Sapindaceae</b>	<b>Soapberry Family</b>
<i>Cardiospermum halicacabum</i>	common balloon vine
<i>Sapindus saponaria</i> var. <i>drummondii</i>	southern soapberry
<b>Sapotaceae</b>	<b>Sapodilla Family</b>
<i>Bumelia lanuginosa</i> var. <i>oblongifolia</i>	gum bully
<b>Saxifragaceae</b>	<b>Saxifrage Family</b>
<i>Heuchera richardsonii</i>	Richardson's alumroot
<b>Scrophulariaceae</b>	<b>Figwort Family</b>
<i>Agalinis aspera</i>	rough agalinis
<i>Agalinis fasciculata</i>	fascicled agalinis
<i>Agalinis gattingeri</i>	Gattinger's purple false foxglove
<i>Agalinis heterophylla</i>	stiff purple agalinis
<i>Agalinis tenuifolia</i>	slender agalinis
<i>Bacopa rotundifolia</i>	roundleaf water hyssop
<i>Buchnera americana</i>	blue hearts
<i>Castilleja sessiliflora</i>	downy paintbrush

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Chaenorrhinum minus</i>	lesser dwarf-snapdragon
<i>Collinsia violacea</i>	violet collinsia
<i>Cymbalaria muralis</i>	Kenilworth ivy
<i>Dasistoma macrophylla</i>	mullein foxglove
<i>Gratiola neglecta</i>	golden hedge hyssop
<i>Leucospora multifida</i>	paleseed
<i>Lindernia dubia</i>	yellow false pimpernel
<i>Mimulus alatus</i>	sharpwing monkeyflower
<i>Mimulus ringens</i>	Alleghany monkeyflower
<i>Nuttallanthus texanus</i>	Texas toad-flax
<i>Penstemon cobaea</i>	cobaea beardtongue
<i>Penstemon digitalis</i>	smooth beardtongue
<i>Penstemon grandiflorus</i>	shell-leaf beardtongue
<i>Penstemon tubiflorus</i>	tube beardtongue
<i>Scrophularia marilandica</i>	Maryland figwort
<i>Tomanthera densiflora</i>	fine-leaf hairy-foxglove
<i>Verbascum blattaria</i>	moth mullein
<i>Verbascum thapsus</i>	woolly mullein
<i>Veronica americana</i>	American speedwell
<i>Veronica anagallis-aquatica</i>	blue water speedwell
<i>Veronica arvensis</i>	corn speedwell
<i>Veronica catenata</i>	pink water speedwell
<i>Veronica peregrina</i>	purslane speedwell
<i>Veronica polita</i>	wayside speedwell
<b>Selaginellaceae</b>	<b>Spike-moss Family</b>
<i>Selaginella rupestris</i>	rock spike-moss
<b>Simaroubaceae</b>	<b>Quassia Family</b>
<i>Ailanthus altissima</i>	tree-of-heaven
<b>Smilacaceae</b>	<b>Catbrier Family</b>
<i>Smilax herbacea</i>	—
<i>Smilax hispida</i>	bristly greenbrier
<i>Smilax lasioneura</i>	—
<i>Smilax tamnoides</i>	—
<b>Solanaceae</b>	<b>Nightshade Family</b>
<i>Datura stramonium</i>	jimsonweed
<i>Lycium barbarum</i>	matrimony vine
<i>Physalis angulata var. pendula</i>	cut-leaf ground-cherry
<i>Physalis heterophylla</i>	clammy groundcherry
<i>Physalis hispida</i>	—
<i>Physalis longifolia</i>	common ground-cherry
<i>Physalis missouriensis</i>	Missouri groundcherry
<i>Physalis pumila</i>	prairie ground-cherry
<i>Physalis virginiana</i>	—

SCIENTIFIC NAME	COMMON NAME
<i>Physalis virginiana</i> var. <i>virginiana</i>	—
<i>Solanum carolinense</i>	Carolina horse nettle
<i>Solanum elaeagnifolium</i>	silverleaf nightshade
<i>Solanum interius</i>	plains black nightshade
<i>Solanum ptychanthum</i>	black nightshade
<i>Solanum rostratum</i>	buffalo bur
<i>Solanum sarrachoides</i>	viscid nightshade
<b>Sparganiaceae</b>	<b>Bur-reed Family</b>
<i>Sparganium eurycarpum</i>	giant bur-reed
<b>Staphyleaceae</b>	<b>Bladder-nut Family</b>
<i>Staphylea trifolia</i>	American bladdernut
<b>Tamaricaceae</b>	<b>Tamarix Family</b>
<i>Tamarix parviflora</i>	small-flowered tamarisk
<i>Tamarix ramosissima</i>	salt cedar
<b>Taxodiaceae</b>	<b>Taxodium Family</b>
<i>Taxodium distichum</i> var. <i>distichum</i>	bald cypress
<b>Thelypteridaceae</b>	<b>Marsh Fern Family</b>
<i>Thelypteris palustris</i> var. <i>pubescens</i>	—
<b>Tiliaceae</b>	<b>Linden Family</b>
<i>Tilia americana</i>	American basswood
<b>Typhaceae</b>	<b>Cattail Family</b>
<i>Typha angustifolia</i>	narrow-leaved cattail
<i>Typha domingensis</i>	southern cattail
<i>Typha latifolia</i>	common cattail
<b>Ulmaceae</b>	<b>Elm Family</b>
<i>Celtis laevigata</i>	sugarberry
<i>Celtis occidentalis</i>	common hackberry
<i>Celtis tenuifolia</i>	dwarf hackberry
<i>Ulmus americana</i>	American elm
<i>Ulmus pumila</i>	Siberian elm
<i>Ulmus rubra</i>	slippery elm
<b>Urticaceae</b>	<b>Nettle Family</b>
<i>Boehmeria cylindrica</i>	bog hemp
<i>Laportea canadensis</i>	wood nettle
<i>Parietaria pensylvanica</i>	Pennsylvania pellitory
<i>Pilea pumila</i>	clearweed
<i>Urtica dioica</i> ssp. <i>gracilis</i>	stinging nettle
<b>Valerianaceae</b>	<b>Valerian Family</b>
<i>Valerianella radiata</i>	corn salad
<b>Verbenaceae</b>	<b>Verbena Family</b>
<i>Glandularia bipinnatifida</i> var. <i>bipinnatifida</i>	—
<i>Glandularia canadensis</i>	rose vervain
<i>Phryma leptostachya</i>	lopseed

SCIENTIFIC NAME	COMMON NAME
<i>Phyla cuneifolia</i>	wedgeleaf frogfruit
<i>Phyla lanceolata</i>	lanceleaf frogfruit
<i>Verbena bipinnatifida</i>	—
<i>Verbena bracteata</i>	prostrate verbena
<i>Verbena canadensis</i>	Canada verbena
<i>Verbena hastata</i>	blue verbena
<i>Verbena simplex</i>	narrowleaf verbena
<i>Verbena stricta</i>	woolly verbena
<i>Verbena urticifolia</i>	white verbena
<i>Verbena X engelmannii</i>	Engelmann's verbena
<i>Verbena X moechnia</i>	pasture vervain
<i>Vitex agnus-castus</i>	—
<b>Violaceae</b>	<b>Violet Family</b>
<i>Hybanthus verticillatus</i>	North American calceolaria
<i>Viola bicolor</i>	Johnny-jump-up
<i>Viola pedata</i>	bird's-foot violet
<i>Viola pedatifida</i>	prairie violet
<i>Viola pratensis</i>	meadow violet
<i>Viola pubescens</i>	downy yellow violet
<i>Viola sororia</i>	downy blue violet
<i>Viola striata</i>	—
<b>Vitaceae</b>	<b>Grape Family</b>
<i>Ampelopsis cordata</i>	raccoon grape
<i>Parthenocissus inserta</i>	Virginia creeper
<i>Parthenocissus quinquefolia</i>	Virginia creeper
<i>Vitis cinerea</i>	graybark grape
<i>Vitis riparia</i>	riverbank grape
<i>Vitis vulpina</i>	winter grape
<b>Zannichelliaceae</b>	<b>Horned Pondweed Family</b>
<i>Zannichellia palustris</i>	horned pondweed
<b>Zygophyllaceae</b>	<b>Creosotebush Family</b>
<i>Tribulus terrestris</i>	puncture vine

## ANIMALS

SCIENTIFIC NAME	COMMON NAME
<b>Invertebrates</b>	
<i>Nicrophorus americanus</i> —Endangered	American burying beetle
<i>Probythinella emarginata</i>	Delta hydrobe
<b>Unionid Mussels</b>	
<i>Amblema plicata</i>	Threeridge
<i>Elliptio dilatata</i>	Spike
<i>Fusonaia flava</i>	Wabash pigtoe
<i>Lampsilis cardium</i>	Plain pocketbook

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Lampsilis rafinequena</i>	Neosho mucket
<i>Lampsilis siliquoidea</i>	Fat mucket
<i>Lampsilis teres</i>	Yellow sandshell
<i>Lasmigona complanata</i>	White heelsplitter
<i>Leptodea fragilis</i>	Fragile papershell
<i>Ligumia subrostrata</i>	Pondmussel
<i>Obliquaria reflexa</i>	Threehorn wartyback
<i>Pyganodon grandis</i>	Floater
<i>Quadrula cylindrica</i>	Rabbitsfoot
<i>Quadrula metanevra</i>	Monkeyface
<i>Quadrula nodulata</i>	Wartyback
<i>Quadrula pustulosa</i>	Pimpleback
<i>Quadrula quadrula</i>	Mapleleaf
<i>Strophitus undulatus</i>	Creeper
<i>Toxolasma parvum</i>	Lilliput
<i>Tritogonia verrucosa</i>	Pistolgrip
<i>Truncilla donaciformis</i>	Fawnsfoot
<i>Truncilla truncata</i>	Deertoe
<i>Uniomerus tetralasmus</i>	Pondhorn
<i>Utterbackia imbecilis</i>	Paper pondshell
<b>Amphibians and Reptiles</b>	
<i>Ambystoma texanum</i>	Smallmouth Salamander
<i>Necturus maculosus</i>	Mudpuppy
<i>Bufo americanus</i>	American Toad
<i>Bufo cognatus</i>	Great Plains Toad
<i>Bufo woodhousii</i>	Woodhouse's Toad
<i>Acris crepitans</i>	Northern Cricket Frog
<i>Hyla chrysoscelis</i>	Cope's Gray Treefrog
<i>Pseudacris clarkii</i>	Spotted Chorus Frog
<i>Pseudacris triseriata</i>	Western Chorus Frog
<i>Gastrophryne olivacea</i>	Great Plains Narrowmouth Toad
<i>Spea bombifrons</i>	Plains Spadefoot
<i>Rana blairi</i>	Plains Leopard Frog
<i>Rana catesbeiana</i>	Bullfrog
<i>Rana sphenoccephala</i>	Southern Leopard Frog
<i>Chelydra serpentina</i>	Snapping Turtle
<i>Macrochelys temminckii</i>	Alligator Snapping Turtle
<i>Chrysemys picta</i>	Painted Turtle
<i>Graptemys ouachitensis</i>	Ouachita Map Turtle
<i>Pseudemys concinna</i>	River Cooter
<i>Terrapene ornata</i>	Western Box Turtle
<i>Trachemys scripta</i>	Slider
<i>Kinosternon flavescens</i>	Yellow Mud Turtle

SCIENTIFIC NAME	COMMON NAME
<i>Sternotherus odoratus</i>	Common Musk Turtle
<i>Apalone mutica</i>	Smooth Softshell
<i>Apalone spinifera</i>	Spiny Softshell
<i>Ophisaurus attenuatus</i>	Slender Glass Lizard
<i>Crotaphytus collaris</i>	Collared Lizard
<i>Holbrookia maculata</i>	Lesser Earless Lizard
<i>Phrynosoma cornutum</i>	Texas Horned Lizard
<i>Sceloporus undulatus</i>	Fence/prairie/plateau Lizard
<i>Eumeces fasciatus</i>	Five-lined Skink
<i>Eumeces septentrionalis</i>	Prairie Skink
<i>Eumeces obsoletus</i>	Great Plains Skink
<i>Scincella lateralis</i>	Ground Skink
<i>Cnemidophorus sexlineatus</i>	Six-lined Racerunner
<i>Coluber constrictor</i>	Racer
<i>Diadophis punctatus</i>	Ringneck Snake
<i>Elaphe guttata</i>	Corn Snake
<i>Elaphe obsoleta</i>	Rat Snake
<i>Heterodon nasicus</i>	Western Hognose Snake
<i>Heterodon platirhinos</i>	Eastern Hognose Snake
<i>Lampropeltis calligaster</i>	Prairie Kingsnake
<i>Lampropeltis getula</i>	Common Kingsnake
<i>Lampropeltis triangulum</i>	Milk Snake
<i>Masticophis flagellum</i>	Coachwhip
<i>Nerodia erythrogaster</i>	Plainbelly Water Snake
<i>Nerodia rhombifer</i>	Diamondback Water Snake
<i>Nerodia sipedon</i>	Northern Water Snake
<i>Opheodrys aestivus</i>	Rough Green Snake
<i>Pituophis catenifer</i>	Pine or Gopher Snake
<i>Regina grahamii</i>	Graham's Crayfish Snake
<i>Sonora semiannulata</i>	Ground Snake
<i>Storeria dekayi</i>	Brown Snake
<i>Tantilla gracilis</i>	Flathead Snake
<i>Tantilla nigriceps</i>	Plains Blackhead Snake
<i>Thamnophis proximus</i>	Western Ribbon Snake
<i>Thamnophis radix</i>	Plains Garter Snake
<i>Thamnophis sirtalis</i>	Common Garter Snake
<i>Tropidoclonion lineatum</i>	Lined Snake
<i>Agkistrodon contortrix</i>	Copperhead
<i>Crotalus horridus</i>	Timber Rattlesnake
<i>Sistrurus catenatus</i>	Massasauga
<b>Fish</b>	
<i>Scaphirhynchus platorynchus</i>	Shovelnose Sturgeon
<i>Lepisosteus osseus</i>	Longnose Gar

SCIENTIFIC NAME	COMMON NAME
<i>Lepisosteus platostomus</i>	Shortnose Gar
<i>Anguilla rostrata</i>	American Eel
<i>Dorosoma cepedianum</i>	Gizzard Shad
<i>Hiodon alosoides</i>	Goldeye
<i>Esox lucius</i>	Northern Pike
<i>Campostoma anomalum</i>	Central Stoneroller
<i>Carassius auratus</i>	Goldfish
<i>Ctenopharyngodon idella</i>	Grass Carp
<i>Cyprinus carpio</i>	Common Carp
<i>Hybognathus argyritis</i>	Western Silvery Minnow
<i>Hybognathus placitus</i>	Plains Minnow
<i>Nocomis asper</i>	Redspot Chub
<i>Nocomis biguttatus</i>	Hornyhead Chub
<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Notropis atherinoides</i>	Emerald Shiner
<i>Notropis boops</i>	Bigeye Shiner
<i>Notropis buchanani</i>	Ghost Shiner
<i>Notropis girardi</i> —Threatened	Arkansas River Shiner
<i>Notropis stramineus</i>	Sand Shiner
<i>Notropis topeka</i> —Endangered	Topeka Shiner
<i>Notropis volucellus</i>	Mimic Shiner
<i>Notropis percobromus</i>	Rosyface Shiner
<i>Phenacobius mirabilis</i>	Suckermouth Minnow
<i>Phoxinus erythrogaster</i>	Southern Redbelly Dace
<i>Pimephales notatus</i>	Bluntnose Minnow
<i>Pimephales promelas</i>	Fathead Minnow
<i>Pimephales tenellus</i>	Slim Minnow
<i>Pimephales vigilax</i>	Bullhead Minnow
<i>Semotilus atromaculatus</i>	Creek Chub
<i>Cyprinella camura</i>	Bluntface Shiner
<i>Cyprinella lutrensis</i>	Red Shiner
<i>Erimystax x-punctatus</i>	Gravel Chub
<i>Luxilus cardinalis</i>	Cardinal Shiner
<i>Luxilus cornutus</i>	Common Shiner
<i>Lythrurus umbratilis</i>	Redfin Shiner
<i>Macrhybopsis gelida</i>	Sturgeon Chub
<i>Macrhybopsis storeriana</i>	Silver Chub
<i>Macrhybopsis hyostoma</i>	Speckled Chub
<i>Carpiodes carpio</i>	River Carpsucker
<i>Carpiodes cyprinus</i>	Quillback
<i>Catostomus commersoni</i>	White Sucker
<i>Cycleptus elongatus</i>	Blue Sucker
<i>Ictiobus bubalus</i>	Smallmouth Buffalo

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Ictiobus cyprinellus</i>	Bigmouth Buffalo
<i>Ictiobus niger</i>	Black Buffalo
<i>Minytrema melanops</i>	Spotted Sucker
<i>Moxostoma carinatum</i>	River Redhorse
<i>Moxostoma erythrurum</i>	Golden Redhorse
<i>Moxostoma macrolepidotum</i>	Shorthead Redhorse
<i>Ictalurus furcatus</i>	Blue Catfish
<i>Ictalurus punctatus</i>	Channel Catfish
<i>Noturus flavus</i>	Stonecat
<i>Noturus nocturnus</i>	Freckled Madtom
<i>Noturus placidus</i> — <i>Threatened</i>	Neosho Madtom
<i>Noturus exilis</i>	Slender Madtom
<i>Pylodictis olivaris</i>	Flathead Catfish
<i>Ameiurus melas</i>	Black Bullhead
<i>Ameiurus natalis</i>	Yellow Bullhead
<i>Fundulus notatus</i>	Blackstripe Topminnow
<i>Fundulus zebrinus</i>	Plains Killifish
<i>Gambusia affinis</i>	Western Mosquitofish
<i>Labidesthes sicculus</i>	Brook Silverside
<i>Morone chrysops</i>	White Bass
<i>Morone saxatilis</i>	Striped Bass
<i>Lepomis cyanellus</i>	Green Sunfish
<i>Lepomis humilis</i>	Orangespotted Sunfish
<i>Lepomis macrochirus</i>	Bluegill
<i>Micropterus dolomieu</i>	Smallmouth Bass
<i>Micropterus punctulatus</i>	Spotted Bass
<i>Micropterus salmoides</i>	Largemouth Bass
<i>Pomoxis annularis</i>	White Crappie
<i>Pomoxis nigromaculatus</i>	Black Crappie
<i>Etheostoma cragini</i>	Arkansas Darter
<i>Etheostoma flabellare</i> ( <i>Candidate</i> )	Fantail Darter
<i>Etheostoma nigrum</i>	Johnny Darter
<i>Etheostoma spectabile</i>	Orangethroat Darter
<i>Etheostoma whipplei</i>	Redfin Darter
<i>Perca flavescens</i>	Yellow Perch
<i>Percina caprodes</i>	Logperch
<i>Percina copelandi</i>	Channel Darter
<i>Percina maculata</i>	Blackside Darter
<i>Percina phoxocephala</i>	Slenderhead Darter
<i>Stizostedion vitreum</i>	Walleye
<i>Aplodinotus grunniens</i>	Freshwater Drum
<b>Birds</b>	
<b>Anseriformes • Anatidae • Anserinae</b>	<b>Geese</b>
<i>Anser albifrons</i>	Greater White-fronted Goose

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Chen caerulescens</i>	Snow Goose
<i>Chen rossii</i>	Ross's Goose
<i>Branta bernicla</i>	Brant
<i>Branta canadensis</i>	Canada Goose
<b>Anseriformes • Anatidae • Anatinae</b>	<b>Ducks</b>
<i>Aix sponsa</i>	Wood Duck
<i>Anas strepera</i>	Gadwall
<i>Anas americana</i>	American Wigeon
<i>Anas rubripes</i>	American Black Duck
<i>Anas platyrhynchos</i>	Mallard
<i>Anas discors</i>	Blue-winged Teal
<i>Anas clypeata</i>	Northern Shoveler
<i>Anas acuta</i>	Northern Pintail
<i>Anas crecca</i>	Green-winged Teal
<i>Aythya valisineria</i>	Canvasback
<i>Aythya americana</i>	Redhead
<i>Aythya collaris</i>	Ring-necked Duck
<i>Aythya marila</i>	Greater Scaup
<i>Aythya affinis</i>	Lesser Scaup
<i>Melanitta fusca</i>	White-winged Scoter
<i>Bucephala albeola</i>	Bufflehead
<i>Bucephala clangula</i>	Common Goldeneye
<i>Lophodytes cucullatus</i>	Hooded Merganser
<i>Mergus merganser</i>	Common Merganser
<i>Oxyura jamaicensis</i>	Ruddy Duck
<b>Galliformes • Odontophoridae</b>	<b>New World Quails</b>
<i>Colinus virginianus</i>	Northern Bobwhite Quail
<b>Galliformes • Phasianidae • Phasianinae</b>	<b>Pheasants</b>
<i>Phasianus colchicus</i>	Ring-necked Pheasant
<b>Galliformes • Phasianidae • Tetraoninae</b>	<b>Grouses</b>
<i>Tympanuchus cupido</i>	Greater Prairie-Chicken
<b>Galliformes • Phasianidae • Meleagridinae</b>	<b>Turkeys</b>
<i>Meleagris gallopavo</i>	Wild Turkey
<b>Gaviiformes • Gaviidae</b>	<b>Loons</b>
<i>Gavia immer</i>	Common Loon
<b>Podicipediformes - Podicipedidae</b>	<b>Grebes</b>
<i>Podilymbus podiceps</i>	Pied-billed Grebe
<i>Podiceps auritus</i>	Horned Grebe
<i>Podiceps nigricollis</i>	Eared Grebe
<b>Pelecaniformes • Pelecanidae</b>	<b>Pelicans</b>
<i>Pelecanus erythrorhynchos</i>	American White Pelican
<b>Pelecaniformes • Phalacrocoracidae</b>	<b>Cormorants</b>
<i>Phalacrocorax auritus</i>	Double-crested Cormorant

SCIENTIFIC NAME	COMMON NAME
<b>Ciconiiformes - Ardeidae</b>	<b>Bitterns, Herons, and Egrets</b>
<i>Botaurus lentiginosus</i>	American Bittern
<i>Ixobrychus exilis</i>	Least Bittern
<i>Ardea herodias</i>	Great Blue Heron
<i>Ardea alba</i>	Great Egret
<i>Egretta thula</i>	Snowy Egret
<i>Egretta caerulea</i>	Little Blue Heron
<i>Bubulcus ibis</i>	Cattle Egret Heron
<i>Butorides virescens</i>	Green Heron
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron
<i>Nyctanassa violacea</i>	Yellow-crowned Night-Heron
<b>Ciconiiformes • Threskiornithidae • Threskiornithinae</b>	<b>Ibises and Spoonbills</b>
<i>Plegadis chihi</i>	White-faced Ibis
<b>Falconiformes • Cathartidae</b>	<b>New World Vultures</b>
<i>Coragyps atratus</i>	Black Vulture
<i>Cathartes aura</i>	Turkey Vulture
<b>Falconiformes • Accipitridae • Pandioninae</b>	<b>Ospreys</b>
<i>Pandion haliaetus</i>	Osprey
<b>Falconiformes • Accipitridae • Accipitrinae</b>	<b>Hawks and Eagles</b>
<i>Elanoides forficatus</i>	Swallow-tailed Kite
<i>Ictinia mississippiensis</i>	Mississippi Kite
<i>Haliaeetus leucocephalus</i>	Bald Eagle
<i>Circus cyaneus</i>	Northern Harrier
<i>Accipiter striatus</i>	Sharp-shinned Hawk
<i>Accipiter cooperii</i>	Cooper's Hawk
<i>Buteo platypterus</i>	Broad-winged Hawk
<i>Buteo swainsoni</i>	Swainson's Hawk
<i>Buteo jamaicensis</i>	Red-tailed Hawk
<i>Buteo regalis</i>	Ferruginous Hawk
<i>Buteo lagopus</i>	Rough-legged Hawk
<b>Falconiformes • Falconidae • Falconinae</b>	<b>Falcons</b>
<i>Falco sparverius</i>	American Kestrel
<i>Falco columbarius</i>	Merlin
<i>Falco peregrinus</i>	Peregrine Falcon
<i>Falco mexicanus</i>	Prairie Falcon
<b>Gruiformes • Rallidae</b>	<b>Rails</b>
<i>Laterallus jamaicensis</i>	Black Rail
<i>Rallus elegans</i>	King Rail
<i>Rallus limicola</i>	Virginia Rail
<i>Porzana carolina</i>	Sora
<i>Fulica americana</i>	American Coot
<b>Gruiformes • Gruidae • Gruinae</b>	<b>Cranes</b>
<i>Grus americana—Endangered</i>	Whooping Crane

SCIENTIFIC NAME	COMMON NAME
<b>Charadriiformes • Charadriidae • Charadriinae</b>	<b>Plovers</b>
<i>Pluvialis squatarola</i>	Black-bellied Plover
<i>Pluvialis dominica</i>	American Golden-Plover
<i>Charadrius alexandrinus</i>	Snowy Plover
<i>Charadrius semipalmatus</i>	Semipalmated Plover
<i>Charadrius melodus</i>	Threatened Piping Plover
<i>Charadrius vociferous</i>	Killdeer
<b>Charadriiformes • Recurvirostridae</b>	<b>Stilts and Avocets</b>
<i>Himantopus mexicanus</i>	Black-necked Stilt
<i>Recurvirostra americana</i>	American Avocet
<b>Charadriiformes • Scolopacidae • Scolopacinae</b>	<b>Sandpipers</b>
<i>Actitis macularius</i>	Spotted Sandpiper
<i>Tringa solitaria</i>	Solitary Sandpiper
<i>Tringa melanoleuca</i>	Greater Yellowlegs
<i>Tringa semipalmata</i>	Willet
<i>Tringa flavipes</i> Lesser	Yellowlegs
<i>Bartramia longicauda</i>	Upland Sandpiper
<i>Numenius americanus</i>	Long-billed Curlew
<i>Limosa haemastica</i>	Hudsonian Godwit
<i>Limosa fedoa</i>	Marbled Godwit
<i>Calidris alba</i>	Sanderling
<i>Calidris pusilla</i>	Semipalmated Sandpiper
<i>Calidris mauri</i>	Western Sandpiper
<i>Calidris minutilla</i>	Least Sandpiper
<i>Calidris fuscicollis</i>	White-rumped Sandpiper
<i>Calidris bairdii</i>	Baird's Sandpiper
<i>Calidris melanotos</i>	Pectoral Sandpiper
<i>Calidris alpina</i>	Dunlin
<i>Calidris himantopus</i>	Stilt Sandpiper
<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper
<i>Limnodromus griseus</i>	Short-billed Dowitcher
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher
<i>Gallinago gallinago</i>	Common Snipe
<i>Scolopax minor</i>	American Woodcock
<b>Charadriiformes • Scolopacidae • Phalaropodinae</b>	<b>Phalaropes</b>
<i>Phalaropus tricolor</i>	Wilson's Phalarope
<i>Phalaropus lobatus</i>	Red-necked Phalarope
<b>Charadriiformes • Laridae • Larinae</b>	<b>Gulls</b>
<i>Xema sabini</i>	Sabine's Gull
<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull
<i>Leucophaeus atricilla</i>	Laughing Gull
<i>Leucophaeus pipixcan</i>	Franklin's Gull
<i>Larus delawarensis</i>	Ring-billed Gull

SCIENTIFIC NAME	COMMON NAME
<i>Larus argentatus</i>	Herring Gull
<i>Larus hyperboreus</i>	Glaucous Gull
<b>Charadriiformes • Laridae • Sterniae</b>	<b>Terns</b>
<i>Sternula antillarum anthalassos—Endangered</i>	Interior Least Tern
<i>Hydroprogne caspia</i>	Caspian Tern
<i>Chlidonias niger</i>	Black Tern
<i>Sterna forsteri</i>	Forster's Tern
<b>Columbiformes • Columbidae</b>	<b>Ducks</b>
<i>Zenaidura macroura</i>	Mourning Dove
<b>Cuculiformes • Cuculidae • Cuculinae</b>	<b>Cuckoos</b>
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo
<b>Strigiformes • Tytonidae</b>	<b>Barn Owls</b>
<i>Tyto alba</i>	Barn Owl
<b>Strigiformes • Strigidae</b>	<b>Typical Owls</b>
<i>Megascops asio</i>	Eastern Screech-Owl
<i>Bubo virginianus</i>	Great Horned Owl
<i>Bubo scandiacus</i>	Snowy Owl
<i>Athene cunicularia</i>	Burrowing Owl
<i>Strix varia</i>	Barred Owl
<i>Asio otus</i>	Long-eared Owl
<i>Asio flammeus</i>	Short-eared Owl
<b>Caprimulgiformes • Caprimulgidae • Chordeilinae</b>	<b>Nightjars</b>
<i>Chordeiles minor</i>	Common Nighthawk
<i>Phalaenoptilus nuttallii</i>	Common Poorwill
<b>Apodiformes • Apodidae • Chaeturinae</b>	<b>Spine-tailed Swifts</b>
<i>Chaetura pelagica</i>	Chimney Swift
<b>Apodiformes • Trochilidae • Trochilinae</b>	<b>Hummingbirds</b>
<i>Archilochus colubris</i>	Ruby-throated Hummingbird
<b>Coraciiformes • Alcedinidae • Cerylinae</b>	<b>Kingfishers</b>
<i>Megaceryle alcyon</i>	Belted Kingfisher
<b>Piciformes • Picidae • Picinae</b>	<b>Woodpeckers</b>
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker
<i>Picoides pubescens</i>	Downy Woodpecker
<b>Passeriformes • Tyrannidae • Fluvicolinae</b>	<b>Flyvicoline Flycatchers</b>
<i>Contopus cooperi</i>	Olive-sided Flycatcher
<i>Contopus sordidulus</i>	Western Wood-Pewee
<i>Contopus virens</i>	Eastern Wood-Pewee
<i>Empidonax virescens</i>	Acadian Flycatcher
<i>Empidonax traillii</i>	Willow Flycatcher
<i>Empidonax minimus</i>	Least Flycatcher

SCIENTIFIC NAME	COMMON NAME
<i>Sayornis phoebe</i>	Eastern Phoebe
<b>Passeriformes • Tyrannidae • Tyranninae</b>	<b>Tyrannine Flycatchers</b>
<i>Myiarchus crinitus</i>	Great Crested Flycatcher
<i>Tyrannus verticalis</i>	Western Kingbird
<i>Tyrannus tyrannus</i>	Eastern Kingbird
<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher
<b>Passeriformes • Laniidae</b>	<b>Shrikes</b>
<i>Lanius ludovicianus</i>	Loggerhead Shrike
<b>Passeriformes • Vireonidae</b>	<b>Vireos</b>
<i>Vireo griseus</i>	White-eyed Vireo
<i>Vireo bellii</i>	Bell's Vireo
<i>Vireo flavifrons</i>	Yellow-throated Vireo
<i>Vireo solitarius</i>	Blue-headed Vireo
<i>Vireo gilvus</i>	Warbling Vireo
<i>Vireo philadelphicus</i>	Philadelphia Vireo
<i>Vireo olivaceus</i>	Red-eyed Vireo
<b>Passeriformes - Corvidae</b>	<b>Crows, Jays, and Magpies</b>
<i>Cyanocitta cristata</i>	Blue Jay
<i>Gymnorhinus cyanocephalus</i>	Pinyon Jay
<i>Pica hudsonia</i>	Black-billed Magpie
<b>Passeriformes - Alaudidae</b>	<b>Larks</b>
<i>Eremophila alpestris</i>	Horned Lark
<b>Passeriformes • Hirundinidae • Hirundininae</b>	<b>Swallows</b>
<i>Progne subis</i>	Purple Martin
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow
<i>Riparia riparia</i>	Bank Swallow
<b>Passeriformes • Paridae</b>	<b>Chickadees and Titmice</b>
<i>Poecile carolinensis</i>	Carolina Chickadee
<i>Baeolophus bicolor</i>	Tufted Titmouse
<b>Passeriformes • Sittidae • Sittinae</b>	<b>Nuthatches</b>
<i>Sitta canadensis</i>	Red-breasted Nuthatch
<b>Passeriformes • Certhiidae • Certhiinae</b>	<b>Tree Creepers</b>
<i>Certhia Americana</i>	Brown Creeper
<b>Passeriformes • Troglodytidae</b>	<b>Wrens</b>
<i>Troglodytes aedon</i>	House Wren
<i>Troglodytes troglodytes</i>	Winter Wren
<b>Passeriformes • Cinclidae</b>	<b>Dippers</b>
<i>Cinclus mexicanus</i>	American Dipper
<b>Passeriformes • Regulidae</b>	<b>Kinglets</b>
<i>Regulus satrapa</i>	Golden-crowned Kinglet
<i>Regulus calendula</i>	Ruby-crowned Kinglet
<b>Passeriformes • Sylviidae • Polioptilinae</b>	<b>Gnatcatchers</b>
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher

SCIENTIFIC NAME	COMMON NAME
<b>Passeriformes • Turdidae</b>	<b>Thrushes</b>
<i>Sialia sialis</i>	Eastern Bluebird
<i>Sialia currucoides</i>	Mountain Bluebird
<i>Myadestes townsendi</i>	Townsend's Solitaire
<i>Catharus fuscescens</i>	Veery
<i>Catharus minimus</i>	Gray-cheeked Thrush
<i>Catharus ustulatus</i>	Swainson's Thrush
<i>Hylocichla mustelina</i>	Wood Thrush
<i>Turdus migratorius</i>	American Robin
<b>Passeriformes • Sturnidae</b>	<b>Starlings</b>
<i>Sturnus vulgaris</i>	European Starling
<b>Passeriformes • Motacillidae</b>	<b>Pipits</b>
<i>Anthus rubescens</i>	American Pipit
<i>Anthus spragueii</i>	Sprague's Pipit
<b>Passeriformes • Bombycillidae</b>	<b>Waxwings</b>
<i>Bombycilla garrulus</i>	Bohemian Waxwing
<i>Bombycilla cedrorum</i>	Cedar Waxwing
<b>Passeriformes • Parulidae</b>	<b>Wood Warblers</b>
<i>Vermivora pinus</i>	Blue-winged Warbler
<i>Vermivora chrysoptera</i>	Golden-winged Warbler
<i>Vermivora peregrina</i>	Tennessee Warbler
<i>Vermivora celata</i>	Orange-crowned Warbler
<i>Vermivora ruficapilla</i>	Nashville Warbler
<i>Parula americana</i>	Northern Parula
<i>Dendroica petechia</i>	Yellow Warbler
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler
<i>Dendroica magnolia</i>	Magnolia Warbler
<i>Dendroica coronata</i>	Yellow-rumped Warbler
<i>Dendroica virens</i>	Black-throated Green Warbler
<i>Dendroica fusca</i>	Blackburnian Warbler
<i>Dendroica dominica</i>	Yellow-throated Warbler
<i>Dendroica palmarum</i>	Palm Warbler
<i>Dendroica castanea</i>	Bay-breasted Warbler
<i>Dendroica striata</i>	Blackpoll Warbler
<i>Mniotilta varia</i>	Black-and-white Warbler
<i>Setophaga ruticilla</i>	American Redstart
<i>Protonotaria citrea</i>	Prothonotary Warbler
<i>Helmitheros vermivorum</i>	Worm-eating Warbler
<i>Seiurus aurocapilla</i>	Ovenbird
<i>Seiurus noveboracensis</i>	Northern Waterthrush
<i>Seiurus motacilla</i>	Louisiana Waterthrush
<i>Oporornis formosus</i>	Kentucky Warbler
<i>Oporornis philadelphia</i>	Mourning Warbler

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Geothlypis trichas</i>	Common Yellowthroat
<i>Wilsonia pusilla</i>	Wilson's Warbler
<i>Wilsonia canadensis</i>	Canada Warbler
<i>Icteria virens</i>	Yellow-breasted Chat
<b>Passeriformes • Emberizidae</b>	<b>Sparrows and Towhees</b>
<i>Pipilo erythrophthalmus</i>	Eastern Towhee
<i>Spizella arborea</i>	American Tree Sparrow
<i>Spizella passerina</i>	Chipping Sparrow
<i>Spizella pallida</i>	Clay-colored Sparrow
<i>Spizella pusilla</i>	Field Sparrow
<i>Pooecetes gramineus</i>	Vesper Sparrow
<i>Chondestes grammacus</i>	Lark Sparrow
<i>Passerculus sandwichensis</i>	Savannah Sparrow
<i>Ammodramus savannarum</i>	Grasshopper Sparrow
<i>Ammodramus bairdii</i>	Baird's Sparrow
<i>Ammodramus henslowii</i>	Henslow's Sparrow
<i>Ammodramus leconteii</i>	Le Conte's Sparrow
<i>Passerella iliaca</i>	Fox Sparrow
<i>Melospiza melodia</i>	Song Sparrow
<i>Melospiza lincolni</i>	Lincoln's Sparrow
<i>Melospiza georgiana</i>	Swamp Sparrow
<i>Zonotrichia albicollis</i>	White-throated Sparrow
<i>Zonotrichia querula</i>	Harris's Sparrow
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow
<i>Junco hyemalis</i>	Dark-eyed Junco
<i>Calcarius lapponicus</i>	Lapland Longspur
<i>Calcarius pictus</i>	Smith's Longspur
<i>Calcarius ornatus</i>	Chestnut-collared Longspur
<b>Passeriformes • Cardinalidae</b>	<b>Tanagers, Cardinals, Grosbeaks, and Allies</b>
<i>Piranga rubra</i>	Summer Tanager
<i>Piranga olivacea</i>	Scarlet Tanager
<i>Cardinalis cardinalis</i>	Northern Cardinal
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak
<i>Passerina caerulea</i>	Blue Grosbeak
<i>Passerina cyanea</i>	Indigo Bunting
<i>Passerina ciris</i>	Painted Bunting
<i>Spiza americana</i>	Dickcissel
<b>Passeriformes • Icteridae</b>	<b>Blackbirds and Orioles</b>
<i>Dolichonyx oryzivorus</i>	Bobolink
<i>Agelaius phoeniceus</i>	Red-winged Blackbird
<i>Sturnella magna</i>	Eastern Meadowlark
<i>Sturnella neglecta</i>	Western Meadowlark
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird

SCIENTIFIC NAME	COMMON NAME
<i>Euphagus carolinus</i>	Rusty Blackbird
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird
<i>Quiscalus quiscula</i>	Common Grackle
<i>Quiscalus mexicanus</i>	Great-tailed Grackle
<i>Molothrus ater</i>	Brown-headed Cowbird
<i>Icterus spurius</i>	Orchard Oriole
<i>Icterus galbula</i>	Baltimore Oriole
<b>Passeriformes • Fringillidae • Carduelinae</b>	<b>Finches</b>
<i>Carpodacus purpureus</i>	Purple Finch
<i>Loxia curvirostra</i>	Red Crossbill
<i>Acanthis flammea</i>	Common Redpoll
<i>Spinus pinus</i>	Pine Siskin
<i>Spinus tristis</i>	American Goldfinch
<b>Passeriformes • Passeridae</b>	<b>Old World Sparrows</b>
<i>Passer domesticus</i>	House Sparrow
<b>Mammals</b>	
<i>Didelphis virginiana</i>	Virginia Opossum
<i>Sorex haydeni</i>	Hayden's Shrew
<i>Cryptotis parva</i>	Least Shrew
<i>Scalopus aquaticus</i>	Eastern Mole
<i>Myotis lucifugus</i>	Little Brown Myotis
<i>Myotis septentrionalis</i>	Northern Myotis
<i>Pipistrellus subflavus</i>	Eastern Pipistrelle
<i>Eptesicus fuscus</i>	Big Brown Bat
<i>Lasiurus borealis</i>	Eastern Red Bat
<i>Lasiurus cinereus</i>	Hoary Bat
<i>Nycticeius humeralis</i>	Evening Bat
<i>Tadarida brasiliensis</i>	Brazilian Free-tailed Bat
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat
<i>Dasypus novemcinctus</i>	Nine-banded Armadillo
<i>Sylvilagus floridanus</i>	Eastern Cottontail
<i>Lepus californicus</i>	Black-tailed Jack Rabbit
<i>Marmota monax</i>	Woodchuck
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined Ground Squirrel
<i>Spermophilus franklinii</i>	Franklin's Ground Squirrel
<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel
<i>Sciurus niger</i>	Eastern Fox Squirrel
<i>Glaucomys volans</i>	Southern Flying Squirrel
<i>Geomys bursarius</i>	Plains Pocket Gopher
<i>Perognathus flavescens</i>	Plains Pocket Mouse
<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse
<i>Castor canadensis</i>	American Beaver

<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
<i>Reithrodontomys montanus</i>	Plains Harvest Mouse
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse
<i>Peromyscus maniculatus</i>	Deer Mouse
<i>Peromyscus leucopus</i>	White-footed Mouse
<i>Peromyscus attwateri</i>	Texas Mouse
<i>Onychomys leucogaster</i>	Northern Grasshopper Mouse
<i>Sigmodon hispidus</i>	Hispid Cotton Rat
<i>Neotoma floridana</i>	Eastern Woodrat
<i>Microtus ochrogaster</i>	Prairie Vole
<i>Microtus pinetorum</i>	Woodland Vole
<i>Synaptomys cooperi</i>	Southern Bog Lemming
<i>Zapus hudsonius</i>	Meadow Jumping Mouse
<i>Erethizon dorsatum</i>	Common Porcupine
<i>Canis latrans</i>	Coyote
<i>Vulpes vulpes</i>	Red Fox
<i>Urocyon cinereoargenteus</i>	Common Gray Fox
<i>Procyon lotor</i>	Common Raccoon
<i>Mustela nivalis</i>	Least Weasel
<i>Mustela frenata</i>	Long-tailed Weasel
<i>Mustela vison</i>	Mink
<i>Taxidea taxus</i>	American Badger
<i>Spilogale putorius</i>	Eastern Spotted Skunk
<i>Mephitis mephitis</i>	Striped Skunk
<i>Puma concolor</i>	Mountain Lion
<i>Odocoileus virginianus</i>	White-tailed Deer
<i>Antilocapra americana</i>	Pronghorn

# Appendix C

## *Finding of No Significant Impact*

U.S. Department of the Interior  
FISH AND WILDLIFE SERVICE  
Region 6, Denver, Colorado

### FINDING OF NO SIGNIFICANT IMPACT

#### **Flint Hills Legacy Conservation Area**

Butler, Chase, Chautauqua, Clay, Cowley, Dickinson, Elk, Geary, Greenwood, Harvey, Jackson, Lyon, Marion, Marshall, Morris, Pottawatomie, Riley, Shawnee, Washington, Woodson and Waubanssee Counties, Kansas

The U.S. Fish and Wildlife Service has completed the *Environmental Assessment and Land Protection Plan, Flint Hills Legacy Conservation Area*. The Environmental Assessment evaluates two alternatives, including a No Action Alternative, and the subsequent environmental consequences of establishing the Flint Hills Legacy Conservation Area.

Alternative B, the preferred alternative, was selected for implementation because it best meets the Service's objective to maintain tallgrass prairie habitat integrity for wildlife on a landscape-scale. The Flint Hills Legacy Conservation Area has been proposed to help protect the Flint Hills tallgrass prairie from being drastically changed by widespread, unplanned residential or commercial development, and the further encroachment of woody plants. This proposal also would benefit the American public by protecting wildlife, water quality and open space.

The following is a summary of anticipated environmental effects from implementation of the preferred alternative:

1. Establishing the Flint Hills Legacy Conservation Area would provide for the conservation of up to 1,100,000 acres of important habitat on private land. This project would help maintain the uniqueness of the Flint Hills region and complement other conservation efforts by Ranchland Trust of Kansas, Kansas Livestock Association, Kansas Land Trust, Tallgrass Legacy Alliance, The Nature Conservancy, the Kansas Department of Wildlife and Parks, and other state and federal agencies.
2. Conservation easements within the Flint Hills Legacy Conservation Area would help alleviate habitat fragmentation issues. Maintaining key biological linkages would facilitate wildlife movement and provide for wildlife habitat requirements, particularly wintering and migrational habitat for migratory birds such as the Henslow's sparrow, American golden-plover, grasshopper sparrow, dickcissel, upland sandpiper, buff-breasted sandpiper, scissor-tailed flycatcher, Smith's longspur, Harris' sparrow, Swainson's hawk, northern harrier, and indicator resident species such as the greater prairie-chicken. In addition, a number of aquatic species will benefit from the protection of the prairie and its associated riparian corridors. The project area contains many of the state's most pristine surface waters (e.g., Dodds and Oakes 2004) and supports a rich variety of native fish (over 80 species), and shellfish, including the world's largest remaining populations of the federally protected Topeka shiner and Neosho madtom (Haslouer et al. 2005, Angelo et al. 2002a, 2009).
3. Water resources on 1,100,000 acres would be protected from increased non-point source pollution from residential subdivision and commercial development which are prohibited under the proposed

easement program. This project will help reduce the demand for potable water associated with new subdivisions and the challenges to water rights that may follow.

4. The proposed action would affect location and distribution, but not rate or density, of human population growth. Positive effects may occur from increased public wildlife viewing, and hunting opportunities. Open space also may enhance property values on adjoining lands as people begin to seek out undeveloped lands in the future.

5. The Service, within the approved project boundary, would create no additional land-use regulations. The purchase of an easement would not result in a transfer of land title, and private landowners would continue to pay property taxes.

Preventing subdivision and development could decrease future tax revenues in certain market areas. However, open space could actually provide a net savings to local governments when compared to the revenues generated and costs of services associated with residential development (Haggerty 1996).

6. The proposed easement program would not preclude energy development on private land. When acquiring easements on properties where wind, oil and gas, or mineral rights have already been sold and severed from the estate, the Service will work with landowners and developers to minimize any negative impacts of development activities (50 CFR § 25.11). On land where the rights for wind, oil and gas, or mineral development have not been sold and where the estate is still intact, conservation easements would require nonsurface occupancy, or off-site development, for any future development activities.

The Service would consider energy development on the easement properties, if they can be implemented without disturbing the surface or creating vertical barriers which would fragment the grassland habitat for wildlife. Easements would contain reasonable surface stipulations for new development actions such as non-surface occupancy, revegetation of disturbed areas, access, and site reclamation.

7. Conservation easements purchased on private tracts would not change the landowner's right to manage public access to their property. Private landowners would retain full control over their property access rights, including allowing or restricting hunting and fishing on their lands, under the proposed easement program.

8. Through the proposed easement program, approximately 1,100,000 acres of privately owned native grassland habitats would be added to the 90,500 acres of federal, state and privately owned lands within the project area that already have some level of protection. This would have long-term positive impacts on wildlife habitat and result in the long-term conservation of migratory birds, threatened and endangered species, native plants, and the overall biological diversity in the Flint Hills tallgrass prairie region.

As part of the public scoping process associated with this action, comments were solicited from the public through news releases and public meetings. Open houses were held in Alma, Cottonwood Falls, El Dorado, and Wichita. Public comments were taken to identify issues to be analyzed for the proposed project. Approximately 199 landowners, citizens, and elected representatives attended the meetings, and most expressed positive support for the project.

In addition, the Service's field staff has contacted local government officials, other public agencies, and conservation groups, all of which have expressed an interest in and a desire to protect the Flint Hills from the pressures brought about by rural subdivisions.

Thus, this EA has taken a hard look at the environmental impacts to inform the public and ourselves about the consequences of the proposed action. Environmental consequences will be beneficial to grassland habitat, migratory birds, water quality, and native fish and mussels. While the proposal to establish the Flint Hills Legacy Conservation Area will largely preserve the current state of the natural environment and prevent degradation, there may be some reduction in energy development requiring surface occupancy, that would otherwise occur, but for the easements proposed by the Fish and Wildlife Service. Substantive conflict is not apparent over these land use issues; the vast majority of verbal and written comments received during scoping meetings and on the environmental assessment were in favor of the establishment of the Flint Hills Legacy Conservation Area through the use of voluntary conservation easements.

In determining whether this project is a major action significantly<sup>1</sup> affecting the quality of the human environment, we looked at both the context and intensity of the action (40 CFR § 1508.27, 40 CFR § 1508.14) as required by NEPA. In terms of context, the proposed action will occur in eastern Kansas, but we have evaluated whether it may have effects to the human environment<sup>2</sup> on a broader scale, particularly in regard to wind energy development and grassland bird populations. The project will be implemented over time dependent upon the Fish and Wildlife Service's ability to obtain the funding needed for easement acquisitions. Of the 3.3 million acres of tallgrass habitat within the boundary area, 1.1 million acres may be entered into voluntary easements with the Service, on a strictly voluntary basis with willing sellers only. Therefore, in evaluating the intensity, or severity of the impact of the proposed action, we looked at the remaining potential area for wind energy development throughout the state of Kansas. The 1.1 million acres constitute a small portion (2.34%) of the state of Kansas available for wind energy development. In fact, over 89% of the state has the potential for wind energy development most of which will still be available for development regardless of the proposed action. In contrast, migratory grassland birds, which will benefit by the proposed action, are the fastest declining guild of birds in North America. Those that require tallgrass prairie have only this area of approximately 4% of the remaining tallgrass prairie habitat to rely on to sustain healthy populations.

Because the human environment is interpreted by the National Environmental Policy Act to mean the natural and physical environment and the relationship of people with that environment (40 CFR § 1508.14), in addition to our thorough analysis of physical environmental effects, we carefully assessed the manner in which the local people relate to the environment in the Flint Hills. Economic or social effects are not intended by themselves to require the preparation an environmental impact statement (40 CFR § 1508.14). The location of the proposed action is largely rural and dominated by agricultural industries, mainly ranching. The vast majorities of commentators on the Flint Hills Legacy Conservation Area project supported the proposed action indicating in various comments that it would help them to relate to their natural and physical environment in much the same way they do now- via a ranching economy. Those who are interested in pursuing other economic development opportunities, such as wind energy, will not be precluded from doing so because the proposed action involves easements acquired on a voluntary basis only.

Therefore, in consideration of the fact that the Fish and Wildlife Service's conservation easement approach has a proven track record of effectiveness and minimal controversy due to its fundamental basis of voluntary participation to accomplish mutual goals of the Service and landowners, the compelling science in support of the project, and my review and evaluation of the information contained in the supporting reference, I have determined that establishing an executive boundary for the Flint Hills

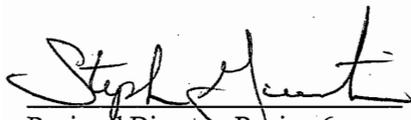
Legacy Conservation Area is not a major federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969.

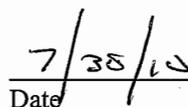
The Finding of No Significant Impact (FONSI) and supporting assessment will be available to the public. Copies of the Environmental Assessment are available for all affected landowners, agencies, private groups, and other interested parties.

The FONSI, Environmental Assessment, and other supporting documents are on file at the U.S. Fish and Wildlife Service, Refuges, Division of Planning, P.O. Box 25486-DFC, Denver, Colorado 80225 (telephone 303-236-4345). They are available for public inspection upon request.

**Supporting Reference**

U.S. Fish and Wildlife Service. 2010. *Environmental Assessment and Land Protection Plan, Flint Hills Legacy Conservation Area*, Denver, Colorado.

  
Regional Director, Region 6  
U.S. Fish and Wildlife Service

  
Date

<sup>1</sup> 40 CFR § 1508.27 "Significantly" as used in NEPA requires considerations of both context and intensity: (a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant; and (b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action.

<sup>2</sup> 40 CFR § 1508.14 "Human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. (See the definition of "effects" (40 CFR § 1508.8).) This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment.



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
Washington, D.C. 20240



SEP 08 2010

In Reply Refer To:  
FWS/ANRS-NRCP/045895

Memorandum

To: Regional Director, Region 6

From: **Acting**  
Director *Paul R. Schmidt*

Subject: Approval to Proceed with Publication and Distribution of the Final Planning Documents for a New Unit of the National Wildlife Refuge System, Flint Hills Legacy Conservation Area, to be located in eastern Kansas.

I concur with your findings and authorize this new unit of the system referenced in record 045895 within the data tracking system.

Your thorough job with the Environmental Assessment (EA) and Finding of No Significant Impact is recognized (FONSI). I am extremely excited about landscape projects such as this that strive to protect large areas for the conservation of fish and wildlife species. Your proposal for acquisition appears to embrace the principles of strategic habitat conservation.

However, prior to proceeding with any easement or fee acquisitions I would like the region to provide me with a detailed briefing demonstrating application of the spatially-explicit processes of biological planning and conservation design that are well described conceptually in section 5 of the EA. I expect that this briefing will show how available data will be used to target acquisitions to ensure progress toward the explicit population goals that are described in the EA.

I thank you for the hard work in preparing the EA and look forward to working with you on this exciting project.



# Appendix D

## Compliance Certificate

U.S. Fish and Wildlife Service  
Region 6  
Denver, Colorado

### ENVIRONMENTAL ACTION STATEMENT

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and have determined that the action of establishing an executive boundary for the Flint Hills Legacy Conservation Area:

- is a categorical exclusion as provided by 516 DM 2, Appendices 1 and 2, and 516 DM 6, Appendix 1. No further documentation will be made.
- is found not to have significant environmental effects as determined by the attached Finding of No Significant Impact and Environmental Assessment.
- is found to have special environmental conditions as described in the attached environmental assessment. The attached Finding of No Significant Impact will not be final nor any actions taken pending a 30-day period for public review [40CFR 1501.4(e)(2)].
- is found to have significant effects and, therefore, a notice of intent will be published in the *Federal Register* to prepare an environmental impact statement before the project is considered further.
- is denied because of environmental damage, Service policy, or mandate.
- is an emergency situation. Only those actions necessary to control the immediate impacts of the emergency will be taken. Other related actions remain subject to NEPA review.

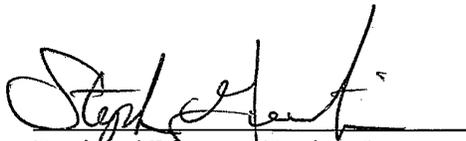
Other supporting document:

*Environmental Assessment and Land Protection Plan, Flint Hills Legacy Conservation Area*



Assistant Regional Director  
National Wildlife Refuge System, Region 6

7/30/10  
Date



Regional Director, Region 6  
U.S. Fish and Wildlife Service

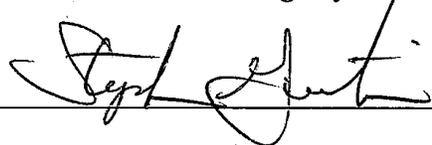
7/30/10  
Date

**U.S. FISH AND WILDLIFE SERVICE, REGION 6  
ENVIRONMENTAL COMPLIANCE CERTIFICATE**

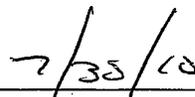
PROJECT: **Flint Hills Legacy Conservation Area**  
STATE: **Kansas**

ACTION (indicate if not applicable)	DATE
NEPA (NATIONAL ENVIRONMENTAL POLICY ACT)(INDICATE ONE)	
Categorical Exclusion.....	N/A
Environmental Assessment/Finding of No Significant Impact .....	7/09/10
Environmental Impact Statement/Record of Decision .....	N/A
Executive Order 11593, Protection of Historical, Archaeological, and Scientific Properties.....	5/18/10
Executive Order 11988, Floodplain Management .....	5/18/10
Executive Order 11990, Protection of Wetlands .....	7/8/10
Executive Order 12372, Intergovernmental Review of Federal Programs .....	7/8/10
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.....	5/18/10
Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System.....	7/8/10
Endangered Species Act, Section 7 .....	4/29/10
Coastal Zone Management Act, Section 307 .....	N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act.....	N/A
Level I Contaminants and Hazardous Waste (Secretarial Order 3127: 602DM2).....	5/18/10

I hereby certify that all requirements of the law, rules, and Service regulations or policies applicable to planning for the above project have met with compliance. I approve the establishment of an executive boundary for the Flint Hills Legacy Conservation Area to be administered and managed as part of the National Wildlife Refuge System.



Regional Director, Region 6  
U.S. Fish and Wildlife Service



Date

## STATEMENT OF COMPLIANCE

The following Executive Orders and legislative acts have been reviewed as they apply to the establishment of an executive boundary for the Flint Hills Legacy Conservation Area:

1. **Executive Order 11593. Protection of Historical, Archaeological, and Scientific Properties.** The regional archaeologist determined that the acquisition of easements within the Flint Hills Legacy Conservation Area is not an undertaking under section 106 of the National Historic Preservation Act. In fact, the project has the potential to protect cultural resources. If, in the future, the Service grants a special permit for the landowner under the easement, section 106 may be relevant at that time. If so, the Service will take the necessary steps to address any historical or archaeological issues.
2. **Executive Order 11988. Floodplain Management.** No structures that could be damaged by or that would significantly influence the movement of floodwater are planned for construction by the Fish and Wildlife Service on easements acquired as part of this project.
3. **Executive Order 11990. Protection of Wetlands.** This action is consistent with protection of existing wetland resources from incompatible activities and thereby complies with this executive order.
4. **Executive Order 12372. Intergovernmental Review.** The Service has discussed the proposal to establish the Flint Hills Legacy Conservation Area with landowners; conservation organizations; other federal agencies; tribal, state, and county commissioners; and other interested groups and individuals.

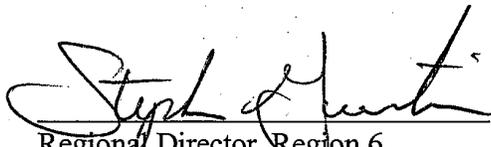
At the federal level, the Service staff has coordinated with the U.S. Department of Agriculture (Natural Resources Conservation Service), Department of Defense (Fort Riley Army Installation), National Park Service, and the Environmental Protection Agency. At the state level, Governor Parkinson's staff, Senators Brownback and Robert's staff, and the Kansas Department of Wildlife and Parks have been notified of this proposed action and given the opportunity to review the Environmental Assessment. In addition, the Service has provided information to eleven Tribes with potential interest in this project

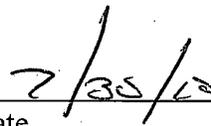
5. **Executive Order 12898. Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.** Establishing the Flint Hills Legacy Conservation Area will not have a disproportionately high or adverse human health or environmental effect on minority or low-income populations. Therefore, this action complies with this Executive Order.
6. **Executive Order 12996. Management and General Public Use of the National Wildlife Refuge System.** The public has been invited to participate in the planning process and has been very engaged. The Service held a total of six public meetings; three scoping and three open houses to get input on the draft environmental assessment and land protection plan in the project area. Over 100 comments have been received from the public. The public's issues and comments have been incorporated into the Environmental Assessment and a copy of the final document will be sent to all interested landowners, agencies, private groups, and other parties. Since this project will strictly be easement acquisition, the Service will not

manage or have control over public access to the protected lands. This right will remain with the private landowner and therefore a compatibility determination is not needed for this project.

7. **Endangered Species Act, section 7.** An internal section 7 consultation concluded the proposed action would have a No Effect, No Adverse Modification on listed species within the acquisition project area.
8. **Coastal Zone Management Act.** Due to the location of the project area, compliance of this Act was determined not to be needed.
9. **Uniform Relocation Assistance and Real Property Acquisition Policies Act.** Since the Service will not be acquiring any land within the project area in fee-title, no relocation assistance will be needed and no real property acquisition will occur.
10. **Secretarial Order 3127. Contaminants and Hazardous Waste.** A Level 1 pre-acquisition contaminant survey will be completed prior to the purchase of any easement.

I hereby certify that the Service has complied with all requirements of law, rules, or regulations applicable to pre-acquisition planning for the above project. I approve the establishment of an executive boundary for the Flint Hills Legacy Conservation Area and the subsequent acquisition of up to 1,100,000 acres of easements from willing sellers:

  
Regional Director, Region 6  
U.S. Fish and Wildlife Service

  
Date



# Appendix E

## *Level 1 Report*

---

Due to the large project size, Level 1 Site Assessments will be conducted on a tract-by-tract basis prior to acquisition.



# Appendix F

## Section 7 Biological Evaluation

### INTRA-SERVICE ENDANGERED SPECIES ACT SECTION 7 EVALUATION FORM

**Originating Persons:** Amy Thornburg  
Region 6, Division of Planning, NWRS

**Telephone Number:** 303-236-4345

**Date:** 4/29/10

**I. Region:** Region 6

**II. Service Activity:** Refuges, Division of Planning, Denver Regional Office

**III. Pertinent Species and Habitat**

**A. Listed species and/or their critical habitat within the 21 county action area:**

<b>BUTLER COUNTY</b>		
Topeka shiner	<i>Notropis topeka</i>	E
<b>CHASE COUNTY</b>		
Neosho madtom	<i>Noturus placidus</i>	T
Topeka shiner	<i>Notropis topeka</i>	E
<b>CHAUTAUQUA COUNTY</b>		
American burying beetle	<i>Nicrophorus americanus</i>	E
<b>CLAY COUNTY</b>		
(none listed for this county)		
<b>COWLEY COUNTY</b>		
Arkansas darter	<i>Etheostoma cragini</i>	C
Interior least tern	<i>Sterna antillarum</i>	E
Rabbitsfoot	<i>Quadrula cylindrica</i>	C
<b>DICKINSON COUNTY</b>		
Topeka shiner	<i>Notropis topeka</i>	E
<b>ELK COUNTY</b>		
American burying beetle	<i>Nicrophorus americanus</i>	E

<b>GEARY COUNTY</b>		
Topeka shiner	<i>Notropis topeka</i>	E
<b>GREENWOOD COUNTY</b>		
Neosho mucket	<i>Lampsilis rafinequena</i>	C
Topeka shiner	<i>Notropis topeka</i>	E
Rabbitsfoot	<i>Quadrula cylindrica</i>	C
<b>HARVEY COUNTY</b>		
Whooping crane	<i>Grus americana</i>	E
<b>JACKSON COUNTY</b>		
(none listed for this county)		T
<b>LYON COUNTY</b>		
Neosho madtom	<i>Noturus placidus</i>	T
Topeka shiner	<i>Notropis topeka</i>	E
<b>MARION COUNTY</b>		
Neosho madtom	<i>Noturus placidus</i>	T
Topeka shiner	<i>Notropis topeka</i>	E
<b>MARSHALL COUNTY</b>		
Topeka shiner	<i>Notropis topeka</i>	E
<b>MORRIS COUNTY</b>		
Neosho madtom	<i>Noturus placidus</i>	T
Topeka shiner	<i>Notropis topeka</i>	E
<b>POTTAWATOMIE COUNTY</b>		
Interior least tern	<i>Sterna antillarum</i>	E
Piping plover	<i>Chardarius melodus</i>	T
Topeka shiner	<i>Notropis topeka</i>	E
<b>RILEY COUNTY</b>		
Interior least tern	<i>Sterna antillarum</i>	E
Piping plover	<i>Chardarius melodus</i>	T
Topeka shiner	<i>Notropis topeka</i>	E

<b>SHAWNEE COUNTY</b>		
Interior least tern	<i>Sterna antillarum</i>	E
Topeka shiner	<i>Notropis topeka</i>	E
<b>WABAUNSEE COUNTY</b>		
Interior least tern	<i>Sterna antillarum</i>	E
Piping plóver	<i>Chardarius melodus</i>	T
Topeka shiner	<i>Notropis topeka</i>	E
<b>WASHINGTON COUNTY</b>		
(none listed for this county)		
<b>WOODSON COUNTY</b>		
Neosho madtom	<i>Noturus placidus</i>	T
Neosho mucket	<i>Lampsilis rafinequena</i>	C
Rabbitsfoot	<i>Quadrula cylindrica</i>	C

C - Candidate  
T - Threatened  
E - Endangered

**B. Proposed species and/or their proposed critical habitat within the county / action area:**  
None

**C. Candidate species within the county / action area:**  
Listed above

#### IV. Geographic Area/Action

This Intra Section 7 covers the establishment of the Flint Hills Legacy Conservation Area (FHLCA) in portions of 21 counties in eastern Kansas.

#### V. Location

The site proposed boundary expansion and fee title acquisition (see attached map):

- State of Kansas
  - A. Counties: Butler, Chase, Chautauqua, Clay, Cowley, Dickinson, Elk, Geary, Greenwood, Harvey, Jackson, Lyon, Marion, Marshall, Morris, Pottawatomie, Riley, Shawnee, Washington, Waubensee and Woodson

- Description of extent of boundary for the new refuge:

The proposed boundary for the FHLCA includes a narrow band of tallgrass prairie that extends from the northern to the southern border of the state in eastern Kansas. The boundary area includes approximately 3.3 million acres within the Flint Hills Ecoregion of Kansas, (EPA Omernick). This remaining, high quality, ecologically functioning stretch of tallgrass prairie runs along a north-south axis averaging as narrow as 20 miles wide (see attached map).

## **VI. Description of the Proposed Action**

The Service is proposing to establish the Flint Hills Legacy Conservation Area in order to protect important tallgrass prairie and associated riparian habitat, and key migration corridors for migratory birds. The Service is evaluating a proposal to acquire perpetual conservation easements from willing sellers on up to 1.1 million acres of tallgrass prairie in eastern Kansas.

Less than 4 percent of the once vast tallgrass prairie region remains. Cultivation, agriculture, tree encroachment, and development activities have pushed grassland-dependent species into ever-shrinking areas of tallgrass prairie. Approximately three-quarters of the remaining tallgrass prairie located within the Flint Hills ecoregion of eastern Kansas and northeastern Oklahoma, with about 3.5 million acres present in the Kansas portion of the Flint Hills. The outer edge of this region is presently suffering a rapid conversion to forest due in part to a declining fire culture within the agricultural communities of the region. The intact, inner core of this region is approximately 3.3 million acres in size. It is within this project boundary, the Service intends to acquire perpetual conservation easements.

## **VII. Determination of Effects**

At the federal level, nine Flint Hills species are listed as threatened and endangered, or are candidates for listing; these include the American burying beetle, western prairie-fringed orchid, piping plover, Topeka shiner, least tern, whooping crane, Neosho madtom, and the Arkansas River shiner. Species that are candidate for listing include the rabbitsfoot mussel, Arkansas darter and Neosho mucket.

The proposed creation of the Flint Hills Legacy Conservation Area will have a beneficial effect on species listed in section III. One of the purposes for the establishment of the FHLCA is to support the recovery and protection of threatened and endangered species, and to reduce the likelihood of future listings under the Endangered Species Act.

The project will provide for the conservation of up to 1,100,000 acres of the only remaining landscape-scale expression of tallgrass prairie. This program would protect essential tallgrass habitat, and prairie-dependent resident and migratory wildlife species from the threats of a variety of fragmentation sources. Prioritization of areas considered for conservation easements within the 3.3 million project area will be based on the biological needs of the wildlife species of concern, (grassland-dependent migratory birds and threatened and endangered species), the threat of development, connectivity with other protected lands, and quality of native tallgrass prairie habitat for trust species.

The Flint Hills region provides habitat integral to larger national conservation efforts. The region is a north-south migration linkage for many grassland birds, the fastest declining avian cadre in North America. The Flint Hills tallgrass region provides essential habitat for numerous grassland bird species, including greater prairie-chicken, Henslow's sparrow, short-eared owl, Bell's vireo, American golden-plover, grasshopper sparrow, dickcissel, eastern meadowlark, upland sandpiper, buff-breasted sandpiper, scissor-tailed flycatcher, loggerhead shrike, Smith's longspur, Harris' sparrow, Swainson's hawk and northern harrier.

In addition, the project area contains many of the state's most pristine surface waters, many of which currently serve as ecological "reference" systems in environmental monitoring programs administered by state and federal natural resource agencies (e.g., Kansas Department of Health and Environment 2007). These streams support a rich variety of native fish (over 80 species) and shellfish, including the world's largest remaining populations of the federally protected Topeka shiner and Neosho madtom.

Uplands and stream corridors provide habitat for many small mammals including shrews, mice, voles, pocket gophers, ground squirrels, weasels, mink, and bats. These mammals provide critical food sources for prairie raptors such as bald eagles, ferruginous hawks, northern harriers, prairie falcons, and short-eared owls. Big game animals such as white-tailed deer, pronghorn, and the occasional mule deer use the upland prairie habitat. Mountain lion, badger, bobcat, coyote, red fox are examples of carnivores that occur throughout the project area.

Adding the Flint Hills Legacy Conservation Area to the refuge system will provide important connectivity between areas already under protection in the region, and will maintain the north-south migration corridor for grassland birds in eastern Kansas.

The creation of the FHLCA will provide an opportunity to protect historically important tallgrass prairie and associated riparian habitats. Without the protection of private land with conservation easements, the future of tallgrass habitat for wildlife in the project area would be uncertain.



**VIII. Effects Determination and Response Requested**

**A. Listed Species / designed critical habitat**

No Effect / no adverse modification  Concurrence

May affect, but is not likely to adversely affect species / modify critical habitat  Concurrence

May affect, and is likely to adversely affect species / modify critical habitat  Formal Consultation

**B. Proposed Species / proposed critical habitat**

No effect on proposed species / no adverse modification of proposed critical habitat (species: none)  Concurrence

Is likely to jeopardize proposed species or adversely modify proposed critical habitat (species: none)  Concurrence

  
 \_\_\_\_\_  
 Amy Thornburg  
 Land Protection Planning Team Lead  
 Division of Planning  
 National Wildlife Refuge System  
 Region 6

**IX. Reviewing ESO Evaluation**

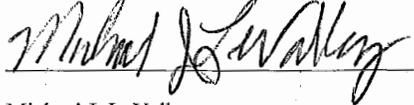
Concurrence

Non-Concurrence

Formal Consultation Required

Conference Required

Informal Conference Required

  
 \_\_\_\_\_  
 Michael J. LeValley  
 Kansas Ecological Services Field Office Supervisor



# Appendix G

## Comments and Responses

### General Support

**Comment 1.** *I like the landscape/regional-scale approach that should result in a regional awareness of the need for conservation across the area. I like the voluntary nature of conservation easements.*

**Response 1.** The U.S. Fish and Wildlife Service (Service) agrees that a regional approach will be critical to conservation of the tallgrass prairie and grassland-dependent wildlife species.

It is Service policy to seek easements from willing sellers only.

**Comment 2.** *I strongly support the U.S. Fish and Wildlife's plan to purchase conservation easements as described in your draft EA and land protection plan. This is a very effective way of protecting the wildlife habitat in the Flint Hills, allowing for consistent corridors for birds and wildlife. It will provide protection for an extremely endangered ecosystem—the tallgrass prairie. It also allows for the local ranching economy to participate in one's own destiny, without compromising outright ownership. From a political and conservation standpoint, I applaud the plan. Please register my support for the plan.*

**Response 2.** Thank you for your comments.

**Comment 3.** *You did a good job on the meetings I attended as well as the drafts presented. I think the initiative is a very positive one. Thank you.*

**Response 3.** Thank you for your comments.

**Comment 4.** *We support the draft of the USF&WS [U.S. Fish and Wildlife Service] Flint Hills Legacy Conservation Area initiative and applaud their efforts to preserve the Flint Hills tallgrass prairie.*

**Response 4.** Thank you for your comments.

**Comment 5.** *You presented at Alma, Kansas last week and I wanted to thank you for your excellent presentation and answers to our questions.*

*I also wanted to thank [the U.S.] Fish and Wildlife [Service] for this superb effort. The draft plan and environmental assessment look excellent. We are especially pleased with the affirmation of good prairie management (fire, etc.) and the banning of*

*destructive intrusions, such as industrial-scale wind facilities. We in the Flint Hills are so encouraged by this effort that could make a hugely significant difference for wildlife in the tallgrass prairie.*

**Response 5.** Thank you for your comments.

**Comment 6.** *[I am pleased about] protecting the Flint Hills of Kansas.*

**Response 6.** Thank you for your comments.

**Comment 7.** *I was unable to attend any of the meetings, but I read completely the land protection plan and environmental assessment. I am very supportive of them in their entirety. I believe that this is a very well-conceived plan that may be the best way to achieve the goals of effective large scale conservation in the Flint Hills, to the landscape objectives mentioned. I am hopeful that this will be successfully implemented. Please keep up the communication as to progress and issues being encountered, and help needed.*

**Response 7.** Thank you for your comments.

As a part of communication and outreach efforts for the project, the Flint Hills National Wildlife Refuge has established a mailing list for persons wishing to receive information on the project in the future. Please feel free to contact the refuge or the website for additional project information.

**Comment 8.** *I want to go on record as a supporter of the Flint Hills Legacy Conservation Area as proposed by the U.S. Fish and Wildlife Service.*

*I live less than 25 miles from the Kansas Flint Hills that is part of the North American tallgrass prairie and own 3200 acres near Maple Hill, Kansas. I can attest to the beauty of the area and the dire need to conserve the last 4% of this endangered original ecosystem that is now and should remain in private hands.*

*Past experience has proven that conservation easements are one of the most efficient and cost effective methods of preserving the tallgrass prairie for future generations of Americans. Conservation easements in the Flint Hills are funded by several organizations including Kansas Department of Wildlife and Parks, Ranchland Trust of Kansas, The Nature Conservancy, Kansas Land Trust, and*

*the USDA [U.S. Department of Agriculture]. To preserve the tallgrass habitat on a large landscape scale, the above listed organizations need the assistance of the USFWS [U.S. Fish and Wildlife Service].*

*If the USFWS's goal of 1.1 million acres of conservation easements can be met in conjunction with private landowners and land trusts, the Flint Hills tallgrass ecosystem will be ensured protection and can remain largely unfragmented.*

**Response 8.** Thank you for your comments.

## **Wind Energy and Oil and Gas Development**

**Comment 9.** *I do understand there are no wind farms allowed in a broad context, but the second paragraph on page 28 [of the draft EA] where it reads, "The proposed action would affect location and distribution, but not rate or density, of wind energy infrastructure development." I don't understand what that sentence means, the "rate or density" part.*

**Response 9.** The language has been changed to clarify it.

## **Funding**

**Comment 10.** *I just learned of your Flint Hills Legacy Conservation Area. This is going to cost money to set up and manage. Is there a Friends group set up so the public can provide support directly to this FWS initiative?*

**Response 10.** Currently there is not an established Friends group, but one may be established in the future. The Land and Water Conservation Fund (LWCF) will be the primary funding source for this project. Currently, LWCF money is derived primarily from offshore oil development in the Gulf of Mexico.

**Comment 11.** *Am I correct in understanding that the only planned federal money would be Land and Water Conservation Funds; if other money is involved, it would come from various non-federal groups or individuals? If the Land and Water Conservation Fund is not the only source of funding, what other sources are being considered/have been selected?*

**Response 11.** The main source of funding for the Flint Hills Legacy Conservation Area project would be Land and Water Conservation Funds, which are derived primarily from oil and gas leases on the outer continental shelf, motorboat fuel tax revenues, and sale of surplus federal property. However, as with other conservation projects, it is possible that non-profit organizations or individuals may wish to donate easements, or that some funds may be appropriated by Congress at some point. The Service hopes to work with a variety of conservation organizations

and agencies that already have successful projects underway, and would take into consideration any opportunities to work with these groups.

The other traditional source of funding for conservation projects, the Migratory Bird Conservation Fund (duck stamp) would not be available for the Flint Hills Legacy Conservation Area. There is a possibility that grants or other funding opportunities may present themselves down the road.

## **Small Holdings vs. Large Holdings**

**Comment 12.** *We were unable to attend the second round of community forums regarding the Flint Hills initiative, so [we] want to take this means to express our approval of the initiative and its form as we understand it. Particularly for its exclusion of industrial wind turbines, oil and gas exploration, and subdivision development, because allowing such would defeat the purpose of protecting this unique remnant of a (what is now an even more) vital ecosystem.*

*At the same time we hope you will not rigidly follow the numbers that say large holdings are cheaper per acre to acquire than small ones, for three reasons:*

- *Including some small holdings should increase general public interest in and support of the initiative;*
- *Some small holdings could have strategic locations; and*
- *Some small holdings could be useful adjuncts to larger ones.*

*We thank you for all the time, thought, and work that has been given.*

**Response 12.** Using ranking criteria, the Service will acquire the most intact, highest quality habitat available from willing sellers. The Fish and Wildlife Service will work to obtain the highest quality tallgrass prairie habitat available for purchase with the available funding. A variety of property sizes will likely need to be acquired in order to provide the up to 10,000-acre total patch size the Service seeks to provide. Properly managed grassland will have a mosaic of prairie vegetation and minimal tree encroachment.

## **Expansion of Flint Hills Legacy Conservation Area**

**Comment 13.** *The North American tallgrass prairie is one of our most endangered ecosystems. Less than 4% of the original ecosystem remains and most of it is located in the Kansas Flint Hills. I do wish that in the future, the U.S. Fish and Wildlife Service will*

include the southern Flint Hills which go down into Oklahoma. I don't feel that it should have been left out because it is in a different district office.

Conservation easements are cost effective methods of preserving the tallgrass prairie for future generations of Americans. Many organizations fund conservation easements in the Flint Hills; however, these organizations need the assistance of the USFWS if the tallgrass habitat is to be preserved on a large landscape scale.

The U.S. Fish and Wildlife's goal of 1.1 million acres of conservation easements will, in conjunction with private landowners and land trusts, ensure that the Flint Hills tallgrass ecosystem remains largely unfragmented.

I fully support the creation of the Flint Hills Legacy Conservation Area and am eager to help the United States Fish and Wildlife Service make the plan a reality.

**Response 13.** Several comments were received from the public on the possibility of the addition of a conservation program for the tallgrass prairie habitat located in the state of Oklahoma. Region 2 of the Service will take into consideration the possibility of future tallgrass conservation efforts in Oklahoma.

Thank you for your comments.

## Multiple Comments

**Comment 14.1.** *I am very pleased with landscape-scale protection of the Flint Hills!*

**Comment 14.2.** *I am very pleased with the preservation of ranching culture.*

**Response 14.1–14.2.** A landscape-scale approach with the ranching culture's use of appropriate grazing and fire regime is essential to the conservation of the tallgrass prairie and its grassland-dependent wildlife.

**Comment 14.3.** *I am very pleased with prohibition of industrial-scale wind energy, and oil and gas development.*

**Response 14.3.** The Fish and Wildlife Service fully supports the Department of the Interior alternative energy development initiatives. However, the incorrect siting of energy development infrastructure could have serious impacts on grassland birds.

**Comment 14.4.** *Well done!*

**Response 14.4.** Thank you for your comment.

**Comment 15.1** *I support the assessment and plan as developed and presented. The Flint Hills are truly deserving [of] protection and conservation easements are the logical approach to provide this*

*protection. This is a great use of Land and Water Conservation Funds.*

**Response 15.1.** Thank you for your comments.

**Comment 15.2.** *I hope through time you will expand the acreage beyond the initial 1+ million acres.*

**Comment 15.3.** *I also hope you will target land along the interstate to protect that corridor. That land is under a lot of pressure for development (Topeka to Kansas).*

**Response 15.2–15.3.** The Flint Hills landscape is worthy of protecting with conservation easements using LWCF. The Service will carefully consider the location of areas of acquisition to address development pressure and to assess the need for expansion of potential conservation efforts in the future.

**Comment 16.1.** *I would like to see the tallgrass prairie not go to houses and development. I would also like to preserve the prairie.*

**Response 16.1.** Thank you for your comments.

**Comment 16.2.** *Forever is a long time. I think generational easements may let each generation...*

**Response 16.2.** Perpetual conservation easements are utilized instead of short-term contracts to provide long-term protection of the habitat and wildlife resources.

**Comment 16.3.** *Is water considered a mineral right?*

**Response 16.3** Water rights are not being pursued as a part of this project, but would be considered separately from any mineral resources in a Service easement.

**Comment 16.4.** *Your figure 2 map needs to add easements from the Grassland Reserve program.*

**Response 16.4.** The project area map includes only conservation areas under a permanent form of protection.

**Comment 16.5.** *I think people would be more willing to do easements by parcels, maybe by farm and tract, like FSA [Farm Service Agency] and NRCS [Natural Resources Conservation Service].*

**Response 16.5.** The easement program will allow some flexibility for landowners on what portions of their land is covered in the easement.

**Comment 17.0.** *First, let me say that I am very impressed by the amount of research and effort put into your study, the history of the area, ecology, and culture of the Flint Hills. I know your time was limited, but feel you did a thorough job and covered*

*all aspects well. The aspects of the plan I am most pleased about include:*

**Comment 17.1.** *The actual area targeted is correctly identified as the Flint Hills in Kansas.*

**Comment 17.2.** *The priority areas targeted are well identified and should help in choosing easements.*

**Response 17.0–17.2.** Thank you for your comments.

**Comment 17.3.** *The projection that without additional conservation easements the Flint Hills will be increasingly fragmented, encroached by trees, residential units, industrial and commercial development, is correct. The tallgrass prairie would be lost. In particular, it is essential to prevent future industrial wind complexes from fragmenting the prairie. In addition, future residential or “ranchette” development could soon turn Flint Hills into brush country as has been seen in the Texas Hill Country.*

**Response 17.3.** The Service agrees that Flint Hill’s tallgrass prairie habitat is likely to be increasingly fragmented by trees and development if current trends continue without an overall, landscape-scale conservation effort.

**Comment 17.4.** *The projection that these conservation easements will help protect the culture and ranching heritage, which in turn will help protect and manage the tallgrass prairie is also correct.*

**Response 17.4.** The fire-climax tallgrass prairie ecosystem and grassland-dependent wildlife require an appropriate fire and grazing regime for long-term sustainability. The ranching culture provides these essential management practices.

**Comment 17.5.** *The proposal that any land under the conservation easement agreement must not increase the amount of tree or brush coverage, and the landowner will be encouraged to decrease the amount of woody invasion is a very good one.*

**Comment 17.6.** *The proposal that landowners with easements will be assisted with advice and information in noxious weed control and best management practices is good.*

**Response 17.5–17.6.** Control of woody plants and other invasive plants is vital to maintaining healthy prairie habitat. The programs and assistance offered by Partners for Fish and Wildlife (PFW), and the NRCS have been very important to these control efforts.

**Comment 17.7.** *The proposal that all easements must be from willing sellers and no fee-title land acquisitions will be made is essential.*

**Comment 17.8.** *The fact that public access remains in the hands of the landowners is essential.*

**Response 17.7–17.8.** The Service only obtains conservation easements from willing sellers. It is clear from input by landowners and the public that the acquisition program in the Flint Hills would need to be through a conservation easement program, and not by fee-title. Service easement acquisitions are with willing sellers only, and allow the landowner to retain control of public access.

**Comment 17.9.** *The mosaic pattern of 10,000-acre parcels separated by a maximum distance of 20 miles concerns me. The 10,000-acre parcels may be fine, but a distance between them of 20 miles is too far. That allows for an entire wind complex in that space, or much commercial or residential development. I would rather see a tighter network of easements, even if it includes smaller parcels, either contiguous or at 5 or 10 miles apart.*

**Response 17.9.** Placement of easements will be determined by the biological needs of the trust resources of the Flint Hills—grassland birds. As more scientific information becomes available over time, the prioritization strategy will be refined to incorporate new information.

**Comment 17.10.** *Ranchers must be certain that future policy changes by the USFWS or the Department of the Interior do not rescind any of the land use rights that are provided in these easements. The government has a habit of putting different people in charge of established programs and changing the game rules. It must not happen that some future politician can come along and decide the Flint Hills should be an ungrazed public park.*

**Response 17.10.** Service conservation easements are legal, binding contracts for both the landowner and the Service. The terms defined in the easement document will remain constant despite changes in refuge personnel.

**Comment 17.11.** *Access to water and all existing water rights is essential and should be included in the wording of the easements.*

**Response 17.11.** Flint Hills Legacy Conservation Area (FHLCA) conservation easement terms do not limit access to water, or address water rights usage.

**Comment 17.12.** *Historically proven and generally accepted ranching practices including fire, must be acceptable and that wording should be included in the easements.*

**Response 17.12.** The appropriate use of prescribed fire is essential for maintaining healthy tallgrass prairie. Easement language will not dictate fire practices by the landowner, but will state that the end-state/purpose of the easement is for providing intact tallgrass prairie.

**Comment 17.13.** *Equal considerations should be given for large or small tracts of land. Reasoning: the*

*smaller ranchers need the lease fee as much or more than the larger ranches, otherwise smaller ranchers might be more easily enticed to sell to developers or residential buyers creating a patchwork of fragmentation.*

**Response 17.13.** The Service recognizes that to obtain approximately 10,000-acre blocks of high quality habitat, consideration will need to be given to a variety of ranch sizes.

**Comment 17.14.** *Since preserving the large landscape habitat and ecology of the prairie is the goal of these easements, splits and carve-outs should be kept at a minimum, although the size of the property under easement should be considered. My recommendation would be that on acreage of one section or less (640 acres), there should only be one 5-acre carve-out allowed and one agricultural split with possibly one additional future family residence, not to be in the center of the easement.*

**Comment 17.15.** *Larger contiguous easements two sections or less (1280 acres) that do not already have established home sites on them, should be allowed the same; one 5-acre carve-out, one agricultural split, and one possible future family residence, preferably in the existing carve-out and not to be in the center of the easement.*

**Comment 17.16.** *Easements of over two contiguous sections could be allowed one more agricultural split, but I would not recommend any more residences.*

**Comment 17.17.** *Easements that are not contiguous acreage could be allowed agricultural splits of the separate parcels (but the parcels themselves should not be split), which would allow for neighbors or family members to purchase them, but I would not allow any more residences. A possible exception could be made if a parcel already had an old existing home site or a former home site on it.*

**Response 17.14–17.17.** Careful consideration will be given to the number of splits (agricultural or residential carve-outs) from the footprint covered by the easements. It will be essential for the landowner and Service staff to discuss future needs and plans for any parcel being considered for an easement. Local zoning requirements will also determine the minimum size of parcels.

**Comment 17.18.** *Easements should allow for access to streambed gravel for ranching roads or ranching purposes only.*

**Comment 17.19.** *Easements should allow for reshaping and general erosion management of creek crossings regularly used for vehicles, livestock, or fences.*

**Response 17.18–17.19.** Easements terms will allow for traditional (non-commercial) ranching practices

such as use of streambed gravel on the landowner's roads, and for general erosion control management.

**Comment 17.20.** *Easements should allow for erosion control in creeks and watersheds; for example streambed erosion control as approved by NRCS.*

**Response 17.20.** Service conservation easement areas will be available for NRCS funding and assistance.

**Comment 17.21.** *Initial applications will be slow in coming due to general distrust of the government. But if you present a stable, open, and honest up-front program, you will get applications. Once a few easements have been accepted and [are] in place, area landowners will closely watch the results. Good results will yield many more easements.*

*I hope these suggestions will assist you in your final planning. We certainly hope you are successful in your proposal for the Flint Hills Legacy Conservation Area. It would lend a great amount of stability to the ranching community and the tallgrass prairie.*

**Response 17.21.** We have implemented similar conservation easement projects in other areas. The Service looks forward to working with landowners in the Flint Hills to develop a successful program.

Thank you for your comments.

**Comment 18.1.** *I am pleased that no commercial wind projects would be allowed in the proposed easements. Also it appears there is some flexibility on the lease agreement language regarding splits.*

**Response 18.1.** The biological needs of grassland bird species dependent on prairie preclude wind (or other tall vertical structures) on conservation easement lands.

See also the response to comment 17.14–17.17.

**Comment 18.2.** *[The environmental assessment] needs to address watershed issues, especially the federal-funded watersheds.*

**Response 18.2.** See the response to 17.11 and 17.20.

**Comment 18.3.** *On page 28, second paragraph, first sentence [of the draft EA] reads, "the proposed action would affect location and distribution, but not rate or density, of wind energy infrastructure development."*

**Response 18.3.** The language has been changed to clarify it in the final EA (see page 28).

**Comment 18.4.** *Good meeting you have hosted. Keep up the good work.*

**Response 18.4.** Thank you for your comments.

**Comment 19.1.** *I am generally supportive of the idea of using conservation easements to preserve wildlife in the Flint Hills. However, I have some concern about how the U.S. Fish and Wildlife Service plans to implement this program.*

*After reading the proposed Flint Hills Legacy Conservation Area (FHLCA) material (September 2009) and attending scoping meetings held last fall, several issues come to mind. They can be sorted into three categories: ecological, economic, and cultural.*

*Although the material mentions flora and fauna that may benefit from said easements, no metrics are mentioned that would actually substantiate this claim over time.*

**Response 19.1.** The benefits to flora and fauna are substantiated by research that points out that the native species are negatively impacted by habitat fragmentation in a number of ways that this project hopes to prevent (Kuvlesky et al. 2007, McDonald et al. 2009, Giesen 1994, Fuhlendorf et al. 2002, Robel 2002). See specific information on ecological impacts and responses of fragmentation pages 23–26 of the final EA.

There are a variety of levels of tallgrass prairie habitat quality throughout the Flint Hills. Using ranking criteria for evaluation, the Service will acquire the highest quality, most intact tallgrass habitat available from willing sellers with the funds that are available.

**Comment 19.2.** *Further, there appears to be no level of accountability regarding range health asked of landowners who participate in the program. Preserving the “status quo” is an inadequate result for such an extensive venture.*

**Response 19.2.** It is generally accepted that reducing or eliminating habitat fragmentation is the first step toward protecting the Flint Hills habitat. If the conditions of the easement are so restrictive to landowners that they are unwilling to participate, then there is no chance for project success. The Service had discussions with landowners during the scoping process about requirements to maintain tree encroachment at or below the current level and to restrict herbicide application to spot treatments.

**Comment 19.3.** *The effects of annual and excessive range burning in the Flint Hills have come into question. There was even a time (1950s) when the practice was discouraged.*

**Response 19.3.** We recognize that while grazing and prescribed burning practices are essential to maintaining tallgrass prairie in the Flint Hills, they can also degrade habitat when not used properly. The fire-climax tallgrass prairie ecosystem and grassland-dependent wildlife require appropriate fire and grazing regimes for long-term sustainability.

The ranching culture provides these essential management practices.

The PFW program and other conservation programs have been working with Flint Hills ranchers to alter management practices in ways that benefit habitat but do not significantly decrease ranch profitability.

Also, see the response to comment 19.2.

**Comment 19.4.** *Preserving “ranching lifestyles and economies” may be in direct contradiction to the stated “preserve and protect” mission of the USFWS.*

**Response 19.4.** See the response to comment 19.2.

**Comment 19.5.** *More specifically, there appears to be a direct correlation between Early Intensive Stocking, which began in the 1980s, and the decline of the greater prairie-chicken.*

**Response 19.5.** See the response to comment 19.3.

**Comment 19.6.** *The easements prohibit residential and commercial development, but do not prohibit further extraction of petroleum resources as they are grandfathered as a “traditional” use. This too, flies in the face of the stated purpose of the FHLCA which is “to help maintain the integrity of ... stream water quality.”*

**Response 19.6.** The Service has no authority to prevent mineral extraction from property where the mineral rights have already been sold (severed estate) (USFWS Manual 612 FW2). If the mineral rights are not severed, the easement that the Service acquires will require any mineral extraction (or other energy development) to occur off-site to prevent habitat fragmentation.

**Comment 19.7.** *If an easement permanently severs and removes distinct economic values from the landscape, it is short sighted to allow that event to benefit the initial generation only.*

**Response 19.7.** The easements will be obtained from willing sellers only. Maintaining healthy tallgrass prairie and its aesthetic values for future generations can provide economic benefits for wildlife recreationists and for agri-tourism in the region. Conserving tallgrass prairie may even increase land values on adjacent properties. The easement program would to a large extent maintain the existing conditions for landowners and the general public, and will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).

**Comment 19.8.** *An easement that is perpetual should pay in perpetuity. The same money currently designated to make one-time payments for easements could be pooled, invested wisely, and made to*

*produce an enduring stream of income for current and future landowners.*

**Response 19.8.** This comment is received and considered, however, the Service's normal practice is to make a one-time payment. How that income is managed or invested will be left to the individual landowner.

**Comment 19.9.** *Stripping off development rights in one generation will depress the value of land carrying an easement and therefore the easement will negatively affect local tax rolls.*

**Comment 19.10.** *However, land that has kept this value intact through a pre-established flow of easement funds (as suggested in item #4 [comment 19.8]) will have an elevated value just as land sold with an ongoing mineral royalty is more highly valued.*

**Response 19.9–19.10.** Tax valuation is based on the agricultural value of the land, which would not be impacted by an easement. Land values can actually increase if there are protected viewsheds and lands adjacent to a property.

**Comment 19.11.** *If there are measurable improvements in the flora and fauna due to the implementation of an easement, an enhanced recreational value will emerge. Many "traditional" ranches in Texas now garner more return from hunting and fishing than from cattle (the "historic" use). FHLCA easements now being considered would make it more difficult, if not impossible, for a landowner to develop any additional infrastructure to capture the economic benefit of an enriched landscape.*

**Response 19.11.** Landowners may have some limited options for carving out portions of their property from the easement, thereby allowing other uses or future structures/building construction. The easement will only limit the construction of additional structures in areas that are not located in carve-out portions of the property. The landowners will retain access control, including public recreational activities.

**Comment 19.12.** *FHLCA easements will disallow all local and regional power of eminent domain regarding electrical transmission lines. Only the federal Department of Energy would have the authority to require a transmission easement across affected property.*

**Comment 19.13.** *Essentially, the FHLCA easements could present a significant barrier between the rich wind energy resource in western Kansas and load centers in the eastern U.S. eager for renewable power.*

**Response 19.12–19.13.** Of the 3.3 million acre acquisition boundary we would have authority to purchase easements on one third of that area, leaving

the remainder as avenues for any necessary energy transmission routes. Currently there are already a number of transmission lines in place throughout the Flint Hills region and Kansas. (A map is available at [http://kec.kansas.gov/chart\\_book/Chapter6/02\\_KSWindEnergyElectricTransMap.pdf](http://kec.kansas.gov/chart_book/Chapter6/02_KSWindEnergyElectricTransMap.pdf))

Also, Service easements would not affect areas with a utility right-of-way already in place.

**Comment 19.14.** *The greatest impediment to broad-scale cultural acceptance of these easements will be the perpetual nature of them: people are generally uncomfortable about compromising an asset's value in the face of the uncertain needs of the future. USFWS may wish to allow an "opt-out" window every 25 years.*

**Comment 19.15.** *It is unlikely that a landowner will opt-out of the easement for the following reasons.*

- *Having received a steady cash flow (item #4 [comment 19.8]) for 25 years, landowners would be unlikely to relinquish that income.*
- *Penalties for opting out should be severe; for example, four times the amount received over the past 25 years.*

**Response 19.14–19.15.** This comment is taken under advisement. The current easement acquisition strategy permanently prevents habitat destruction resulting from residential and commercial development activities. The easements will be acquired from willing sellers only.

**Comment 19.16.** *USFWS may find its objectives better served by a long-term contract as implemented in the USDA's Conservation Reserve Program that has been well accepted by the agricultural community.*

**Response 19.16.** In addition to the option of shorter-term programs such as the USDA program, there is now interest in a Flint Hills conservation program that can provide perpetual preservation of tallgrass prairie.

Perpetual conservation easements are preferred by the Service instead of short-term contracts in order to provide long-term protection of the habitat and wildlife resources.

**Comment 20.1** *The draft environmental assessment of the proposed Flint Hills Legacy Conservation Area says that the project "would be monitored as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966." Does that mean that NWRSA [National Wildlife Refuge System Administration Act of 1966] regulations would apply, just as if this were in fact a refuge?*

**Response 20.1** If approved, the Flint Hills Legacy Conservation Area will be established as a unit

of the National Wildlife Refuge System (NWRS). The National Wildlife Refuge System is the largest network of lands in the world dedicated to the protection of wildlife and its habitats. The NWRS has now been in existence more than one hundred years and there are numerous designations, legal authorities, etc., that have been used to create what we have today. You will notice we have national wildlife refuges, waterfowl production areas, conservation areas, wetland management districts, etc. The NWRS also has a wide variety of interests in lands—ranging from unique deed relationships with states, for example, the Rockefeller Refuge in coastal Louisiana—to management responsibilities associated with New Deal programs. The Flint Hills Legacy Conservation Area will be managed as a unit of the National Wildlife Refuge System consistent with the mission of the NWRS.

Although FHLCA would be managed as a unit of the National Wildlife Refuge System, conservation easement refuges differ from traditional national wildlife refuges in that the landowner retains ownership, control of public access and land management practices, and no additional fencing or posting of signage is required by the NWRS.

In this EA, the Service has determined that conservation easements are the appropriate manner to enhance population goals where fragmentation and degradation of habitat is a limiting factor on declining species. The Service has a long history of success using conservation easements to support the biological needs of such species. Strategic habitat conservation is essential across such large landscapes and we hope the document allows readers to understand that it is possible to best achieve the conservation protections we desire by working with landowners in the Flint Hills to develop a long-term (multi-generational) approach to preserve a very important piece of the American landscape.

**Comment 20.2.** *The draft EA says what the Refuge System's mission is, but doesn't appear to articulate the proposed [Flint Hills Legacy] Conservation Area's mission. It does state the area's purpose. Is the mission the same as the purpose? If there is a separate mission statement, can you send that to me? If it has not yet been drafted, what is the time frame for creating it and who will draw it up?*

**Response 20.2.** There is not a mission statement for each land designation. Specifically you ask if there is a mission for conservation areas. No, all units of the National Wildlife Refuge System mission will be managed in accordance with existing laws and regulations and under the mission statements of the Service and the National Wildlife Refuge System.

**Comment 20.3.** *Has it been determined where the funding will come from? If the Land and Water Conservation Fund is not the only source of funding,*

*what other sources are being considered/have been selected.*

**Response 20.3.** The main source of funding for the Flint Hills Legacy Conservation Area will be Land and Water Conservation Funds, which are derived primarily from oil and gas leases on the outer continental shelf, motorboat fuel tax revenues, and sale of surplus federal property. However, as with other conservation projects, it is possible that non-profit organizations, or individuals may wish to donate easements, or that some funds may be appropriated by Congress at some point. The Service hopes to work with a variety of conservation organizations and agencies that already have successful projects underway, and would take into consideration any opportunities to work with these groups.

**Comment 21.1.** *I agree with the terms of these easements as outlined in the draft.*

**Response 21.1.** Thank you for your comments.

**Comment 21.2.** *Prioritization for large blocks of intact property in the heart of the Flint Hills is important in that it will provide for ample habitat for tallgrass prairie wildlife such as the "key" lesser prairie-chicken species.*

**Response 21.2.** Conservation of large blocks of intact tallgrass prairie will be essential to providing habitat for grassland-dependent birds and maintaining a migration corridor.

**Comment 21.3.** *I was pleased to hear that the plan will preclude wind energy development. Turbines and towers have no place in a natural ecosystem conservation project such as this one.*

**Response 21.3.** Preliminary studies indicate tall vertical structures fragment large tracts of otherwise appropriate habitat, making it unsuitable for some grassland bird species.

**Comment 21.4.** *On the same note, your approach to existing oil and gas operations and mineral royalty rights seems practical in that non-mineral owners with existing operations will be managed to minimize impact, while owned minerals will be valued and paid for to preclude development.*

**Comment 21.5.** *Maybe the same approach being used with oil and gas could be used concerning power lines and other easements that might exist.*

**Response 21.4–21.5.** On properties where wind, oil and gas, or mineral rights have already been sold (severed from the estate), the Service will work with landowners and developers to minimize any negative impacts of development and extraction activities (50 CFR 25.11). On land where the rights for wind, oil and gas, or mineral development have not been sold (estate is still intact), conservation easements would

require non-surface occupancy (off-site development) for any future development activities. The Service would consider development of energy and mineral resources on the easement properties, if they can be implemented without disturbing the surface or creating vertical barriers, which would fragment the grassland habitat for wildlife.

**Comment 21.6.** *Concerning management practices, I strongly believe that three things must exist to sustain a tallgrass prairie: fire, grazing, and substantial spring precipitation. Therefore, I was happy to hear that restrictions on burning are not anticipated. Fire is important to prairie habitat and as smaller acreage properties encroach upon the Flint Hills prairie there seems to be an undertone of detractors to the use of fire.*

**Response 21.6.** The fire-climax tallgrass prairie ecosystem and grassland-dependent wildlife require an appropriate fire and grazing regime for long-term sustainability. The ranching culture provides these essential management practices.

**Comment 21.7.** *Additionally, there are recent claims that prairie fire has some correlation with the reduction in prairie-chicken numbers. I would be careful in concluding that this issue is a result of fire. Fire has occurred on this specific prairie for hundreds of years, and the Flint Hills remain as the last 2% of the tallgrass prairie that once stretched from Canada to Mexico.*

**Response 21.7.** We recognize that while grazing and burning practices are essential to maintaining tallgrass prairie in the Flint Hills, they can also degrade habitat when not used properly. The PFW program and other conservation programs have been working with Flint Hills ranchers to alter management practices in ways that benefit habitat but do not significantly decrease ranch profitability.

**Comment 21.8.** *Reasons why the Flint Hills and the prairie chickens have remained include continued use of fire, grazing, and un-interruption of large blocks of prairie lands. Areas that were once tallgrass prairie and have discontinued using grazing and fire have lost prairie-chickens and prairie to woody plant species. Prairie-chickens need prairie and healthy prairie needs fire and grazing.*

**Response 21.8.** The fire-climax tallgrass prairie ecosystem and grassland-dependent wildlife require an appropriate fire and grazing regime for long-term sustainability. The ranching culture provides these essential management practices.

**Comment 21.9.** *All in all, I believe you have generated a sound environmental assessment and land protection plan. I hope Congress appropriates sufficient funding for this project and easement purchases begin soon.*

**Response 21.9.** Thank you for your comments.

**Comment 22.0.** *I was excited to hear that the U.S. Fish and Wildlife Service was considering a conservation easement program to preserve prairie in the Flint Hills. However, after reviewing the draft document, I am disappointed to see the apparent exclusion of required range management practices in the easements; specifically, the lack of prohibition of annual burning and early intensive stocking as currently practiced by most Flint Hills landowners. I would, therefore, like to submit the following comments:*

**Comment 22.1.** *The fact that only two alternatives (no action and the proposed action) were considered is in my experience quite unusual. Obviously, an alternative requiring best range management practices should have been included. In fact, it is not even mentioned in the alternatives considered but not studied (draft EA, page 10).*

**Response 22.0–22.1.** Typically, Conservation Area land protection plans (LPPs) typically involve two alternatives, a no action (non-acquisition alternative), or an acquisition option that will establish a new unit of the National Wildlife Refuge System.

The text of the draft EA has been revised to reflect the additional alternatives that were considered but not studied further, such as fee-title acquisition, or options considering smaller and larger project boundaries (see page 10 of the final EA).

Specifically, Service-defined range management and prescribed fire management practices would have to be implemented on lands owned in fee-title by the Service, such as Quivira National Wildlife Refuge. Conservation Areas, such as the Flint Hills Legacy Conservation Area, are easement refuges with minimal interest (typically just non-development rights) acquired. Although the Flint Hills Legacy Conservation Area will be considered a part of the National Wildlife Refuge System, the land will still remain in private ownership and as such cannot be held to the same requirements and limitations placed upon a refuge owned in fee-title.

**Comment 22.2.** *As cited in the draft environmental assessment, the prairie ecosystem developed under burns estimated to have occurred at 3–5 year intervals and in a patch pattern, resulting in the mosaic of habitats the plan claims to want to achieve. In fact, FWS uses patch, or rotational burning on its own properties (for example Quivira National Refuge) and specifies land management practices on easements it holds in other areas. Why then would FWS not require use of such management practices on the easements it is seeking under this program?*

*FWS personnel stated at both meetings I attended that management practices are subject to change and therefore cannot be included in a perpetual easement. In face of the fire history record (as cited), best management practices should be required and be modeled after those conditions under which the ecosystem developed.*

**Response 22.2.** The fire-climax tallgrass prairie ecosystem and grassland-dependent wildlife require an appropriate fire and grazing regime for long-term sustainability. The ranching culture provides these essential management practices.

**Comment 22.3.** *FWS must certainly be aware that Kansas is under mandate by the Environmental Protection Agency to develop a smoke management plan because of the impacts of the Flint Hills burns. These annual, spring burns have resulted in exceedence of Clean Air Act standards in Kansas City and Wichita, and impact air quality in areas several states away. Surely, requiring less burning each year could be part of such a smoke management plan and should be incorporated into the proposed FWS easements.*

**Response 22.3.** The Service considered that there would likely be little to no change in the impact to human health as a result of this project and maintains that we are not requiring landowners to change their burning practices (see the response to comment 22.1). The Service hopes to work through the PFW program to influence landowners to burn less frequently, but there is no evidence that decreasing frequency would result in decreased air quality problems—if an area is burned once every three years, it may produce three times the amount of smoke as when it is burned annually because of the increased fuel load. This may result in a no net gain across the region. Future programs such as the BlueSkyRAINS program through Kansas State propose to provide information on smoke and air quality effects from prescribed fires in the Flint Hills.

**Comment 22.4.** *At both meetings I attended, FWS indicated that current range management practices would be considered in selecting properties for potential easement and that burning practices would be part of that consideration. If that is so, why shouldn't that be spelled out in the draft as part of the easement acquisition process parameters (draft EA, page 8)?*

**Response 22.4.** There are a variety of levels of habitat quality for tallgrass prairie throughout the Flint Hills. Using ranking criteria the Service will acquire the most intact, highest quality habitat available from willing sellers. Properly managed grassland will have a mosaic of prairie vegetation and minimal tree encroachment.

The Service has determined that local landowners, with few exceptions, would be unwilling to

accept an easement if it involves giving up such management practices as burning or determining their own stocking rates. In order to have control of management activities such as stocking rates and burning, we would have to own the property in fee-title. Fee-title sales of land to the federal government would not be supported by Flint Hills landowners. Additionally, fee-title would cost approximately three times the amount of a conservation easement. Annual operation and maintenance costs for the Service would also be considerable. While not specifically addressed in the final EA, the Service will include provisions in the easement for maintaining tree encroachment at no more than current status when the easement is established. The Service expects local and state requirements for noxious and invasive weed control to be observed, and plans to work with landowners through the PFW program to assist them in accomplishing weed control.

**Comment 22.5.** *Finally, no mention is made in the draft environmental assessment of the documented, extremely negative impact annual burning has had on wildlife habitat that FWS is supposed to be protecting. One could easily argue, that current range management practices in the Flint Hills are the single greatest cause of habitat reduction, particularly that needed for grassland birds such as the greater prairie-chicken. Such lack of control of management practices on land under jurisdiction of FWS is counter to the FWS mission.*

**Response 22.5.** While the Service recognizes that there are examples of land mismanagement across the 3.3 million acre project area, and that mismanagement often leads to habitat degradation, the most important contribution the Service can make is to protect the land from fragmentation.

Service policy is to acquire land only when other means, such as zoning or regulation, of achieving program conservation goals and objectives are not appropriate, available, or effective. When lands are to be acquired, the minimum interest necessary to reach management objectives is to be acquired or retained. If fee-title ownership is required, full consideration will be given to extended use reservations, exchanges, or other alternatives that will lessen impact on the owner and the community.

Also see response to comment 22.4.

**Comment 22.6.** *Thank you for your consideration of these comments. I hope that the agency sees fit to make appropriate changes in the final documents.*

**Response 22.6.** Thank you for your comments.

**Comment 23.1.** *It is critical that individuals with a demonstrated experience of successfully working with ranchers and landowners in the Flint Hills region be directly involved in the development and drafting of the conservation easement document*

*and the ranking process/procedures for determining those properties on which USFW will purchase a conservation easement. One size does not fit all and without the direct influence of “local knowledge,” I am concerned that the initial easement document and ranking process will miss the mark and make it more difficult for USFW to establish the credibility and trust needed for this project to be a long-term success.*

**Response 23.1.** The Service will continue to involve local partners/landowners in the planning process, along with local Service personnel who have local experience or expertise working with conservation easements.

**Comment 23.2.** *Fragmentation and fire exclusion are the two most dangerous enemies of Flint Hills conservation. I would prefer that the USFW easement did not allow for future building envelopes. That said, in order to preserve the ranching culture of the Flint Hills (which culture, in turn, preserves the Flint Hills), it may be prudent to allow a very limited number of future building sites ... if so, please mandate that such sites be located in already disturbed areas that are not capable of carrying fire and are located below the horizon line. It's important that any future building sites do not become additional physical or psychological barriers to fire and that they do not contribute to the further degradation and fragmentation of the natural viewshed. A good rule of thumb would be to locate future building envelopes only in timbered locations proximate to nineteenth century home sites.*

**Response 23.2.** The Service agrees that a landscape-scale approach with the ranching culture's appropriate use of a grazing and fire regime is essential to the conservation of the tallgrass prairie and its grassland-dependent wildlife.

Landowners may have some limited options for carving out portions of their property from the easement, thereby allowing other uses or future structures/building construction. The easement will only limit the construction of additional structures in areas that are not located in carve-out portions of the property. The landowners will retain access control, including public recreational activities. Carve-outs would be allowed along already fragmented areas, for example, roads and buildings, and on cropland that is not important to the overall intactness of the landscape.

**Comment 23.3.** *It is critical that the final plan and conservation easement explicitly prohibit any development of wind energy, oil/gas (including coal-bed methane) or any other industrial or commercial development. Properties that already have oil/gas development should not be excluded from the project, but should rank lower than a comparable property that is not encumbered by such development.*

**Response 23.3.** Industrial and commercial development that fragments the grasslands will not be allowed. The Service would consider development of energy and mineral resources on the easement properties, if they can be implemented without disturbing the surface or creating vertical barriers, which would fragment the grassland habitat for wildlife.

**Comment 23.4.** *The exception to allow stream bed gravel use should apply to all existing ranch uses—not just to the homesite. For example, a sizeable ranch may have many miles of two-track ranch roads and property owners should be allowed to continue to maintain these roads with their own gravel. Cattle pens are also a place where creek gravel is commonly used and such use should be allowed to continue.*

**Response 23.4.** A number of comments were received during public meetings on the maintaining landowner access to gravel resources. Stream bed gravel extraction will be allowed for ranching processes. No commercial gravel extraction activities will be allowed. Stream bed gravel extractions will be subject to all local, state, and federal laws. Individual landowners will need to determine any tax implications.

**Comment 23.5.** *The USFW should not require a landowner to offer all of her land holdings to be placed under easement at the same time. For practical and personal reasons, it is likely that many interested landowners may not be willing or able to sell an easement on all of their otherwise eligible land at any one time.*

**Response 23.5.** Conservation easements will be acquired from willing sellers. No one will be forced to offer land they do not wish to place under an easement.

**Comment 24.1.** *I am disappointed to know that the 30 day comment period started, apparently, when the EA was posted on the web and not when the first public meetings were held. I understand the legalities involved, but what's right isn't always what's correct.*

**Response 24.1** The draft EA and LPP were provided prior to the public meetings to provide the public with an opportunity to review the documents in advance of the public meetings and to have the time to provide substantive comments on the specific information in the plans.

**Comment 24.2.** *I support the concept of the plan BUT I have great concerns over the EA document itself, and what that casts on the entire plan. The bird list in the appendix is a horrible mess and I think it reflects very badly on the entire document. Any biologist that really looks at this and pays attention will notice this and wonder what's up with the rest of the document. Whomever put the document together*

*did not use a current American Ornithologists Union taxonomic order as a guide. At least once, a bird is listed twice and some species have the wrong scientific name associated with them. Species that are commonly found in the Flint Hills region are omitted and species that are far less common are included. In at least one case (American Dipper, *Cinclus mexicanus*) you have a species that isn't even documented to have ever occurred in Kansas, let alone in the Flint Hills. I started reading this list and to be right honest, I was appalled. There are lots of resources and people, myself included, available to make this list a correct list. Just give us the chance!*

**Response 24.2.** The EA species appendix has been modified to correct the errors in the bird species list.

**Comment 24.3.** *I continue to be concerned by the lack of coordination with entities that could make or break this project. For this to be successful many groups need to buy in to it and support it. As this has been ran so far, it looks quickly and shoddily thrown together and driven from the top down. That doesn't fly well in this state where private property rights and local control are so highly valued. I fear that this project has started off on the wrong foot and will make it very difficult for a potentially extremely valuable program to have success.*

*Thank you for taking the time to listen to my concerns. As always, I am available to help make this a positive program with countless benefits to the Flint Hills ecoregion and its residents.*

**Response 24.3.** The Service became involved in the Flint Hills tallgrass conservation effort due in a large part to the interest expressed by a variety of organizations and agencies for an overall landscape-scale Service-led conservation effort in the region. The Service believes that ongoing coordination and communication regarding conservation of tallgrass prairie resources is essential to the success of the project. The Service will continue to work collaboratively with individuals, nongovernmental organizations, federal, state, and local agencies on a variety of issues, including renewable energy

development. Also, the Service has initiated a program using Landscape Conservation Cooperatives (LCCs) as a means of addressing conservation and climate change challenges through partnership opportunities (see page 35 of the final EA).

Thank you for your comments.

## ***Agency, Organizations, and Commercial Corporation Comments***

Agency comments received include the original letter received and our responses. Comment 25 is on the following page.

**Comment 25.** Attachments included in the letter are as follows:

- NOAA Hazard Mapping System graphic
- Downwind Monitors with Ozone Exceedances in Smoke Plumes by Satellite Imagery table
- Unlabeled map
- USFWS Real Property Part 341, Chapter 6, Directors Orders 164 and 170
- Major Negative Impacts of Early Intensive Cattle Stocking on Tallgrass Prairies: The Case of the Greater Prairie-Chicken. *North American Birds*, Volume 56 (2002) Number 2 pp. 239–244
- Location and Success of Lesser Prairie-chicken Nests in Relation to Vegetation and Human Disturbance. *Journal of Wildlife Management* 69: 1259–1269; 2005
- Sample Grassland Easement (Region 6)
- Sample Habitat Easement (Form 1)
- Sample Habitat Easement (Form 2)
- Sample Habitat Easement (Form 4)
- Article by Jan Stiles, Birds declining in the Flint Hills
- Article by Jan Stiles, Prairie chicken habitat being lost

Comment #

Letter # 25

Response



**Sierra Club**

608 North 72nd Street • Kansas City, KS 66112  
913-334-0656  
voland@kansasierraclub.org

**Kansas Chapter**  
www.kansas.sierraclub.org

5 - 12 - 2010

Certified Mail – Return Receipt Requested

To: U. S. Fish and Wildlife Service  
Flint Hills National Wildlife Refuge  
530 West Maple Avenue  
Hartford, Kansas 66854

**Comment on the USFWS Flint Hills Legacy Conservation Area including the Environmental Assessment (EA) and Draft Land Protection Plan (LPP)**

These comments are submitted on behalf of the Sierra Club.

25.1

**I. The Environmental Assessment**

We will show that the EA is incomplete and profoundly flawed. Further the LPP is very unlikely to meet its stated objective and does not conform to the stated mission of the USFWS Refuge System. We will make comments approximately in the order of the text and then provide a summary of the numerous deficiencies in this EA.

*Failure to address current rangeland burning practices.* The EA states that the overall stated purpose of the Project (p. 5) is “to provide the landscape scale, strategic habitat conservation necessary to maintain ecological community function for eastern tall grass prairie, including grassland-dependent wildlife.” If further states under Alternative B on page 9 that the conservation easements “would specify perpetual protection of habitat for trust species and restrict development.” However it expressly excludes any limitation on land management, “including invasive weed and tree control,” even though such management techniques are known to be destroying the habitat of grassland birds.

Please find attached the following documents that demonstrate that current grassland burning practices in the Flint Hills are destroying the habitat of grassland birds and contributing to the decline in their populations:

1. Kansas University researchers describe how rangeland management practices, called *early intensive stocking* (EIS) where wholesale annual burning was initiated *after 1980*, are contributing to the decline of the greater prairie chicken in the Flint Hills.<sup>1</sup>
2. Noted KSU prairie chicken expert, Robert Robel and others describe the decline of greater prairie chicken in Kansas due to intensive annual burning in the Flint Hills.<sup>2</sup>

**Response 25.** Thank you for your interest in the FHLCA project. The U.S. Fish and Wildlife Service would like to take this opportunity to address some concerns and misinformation and/or misconceptions that the Sierra Club perceives as part of the FHLCA project.

**Response 25.1.** While the Service recognizes that there are examples of land mismanagement across the 3.3 million acre project area, and that the mismanagement often leads to habitat degradation, the most important contribution the Service can make is to protect the land from fragmentation. In addition to the importance of proper grazing practices, one of the management articles submitted suggested in the Journal of Wildlife Management article submitted with the Sierra Club comments is the protection of lesser prairie-chicken habitat from development, and acquisition of lands without anthropogenic features present. A number of other authors have addressed the fragmentation effects of infrastructure on prairie grouse (Kuvlesky et al. 2007, McDonald et al. 2009, Giesen 1994, Fuhlendorf et al. 2002, Robel 2002).

Service policy is to acquire land only when other means, such as zoning or regulation, of achieving program conservation goals and objectives are not appropriate, available, or effective. When lands are to be acquired, the minimum interest necessary to reach management objectives is to be acquired or retained. If fee-title ownership is required, full consideration will be given to extended use reservations, exchanges, or other alternatives that will lessen impact on the owner and the community.

The Service has determined that local landowners, with few exceptions, would be unwilling to accept an easement if it involves giving up such management practices as burning or determining their own stocking rates. In order to have control of management activities such as stocking rates and burning, we would have to own the property in fee-title. Fee-title sales of land to the federal government would not be supported by Flint Hills landowners. Additionally, fee-title would cost approximately three times the amount of a conservation easement. Annual operation and maintenance costs for the Service would also be considerable. While not specifically addressed in the draft EA, the Service will include provisions in the easement for maintaining tree encroachment at no more than current status when the easement is established. The Service expects local and state requirements for noxious and invasive weed control to be observed, and plans to work with landowners through the PFW program to assist them in accomplishing weed control.

Comment #	Letter # 25	Response
<p><b>25.2</b></p>	<p>3. Dr. Robel explains why intensive annual burning in the Flint Hills inhibits breeding of the greater prairie chicken.<sup>3</sup></p> <p>4. Researchers from Kansas State University and Oak Ridge National Laboratory describe how three bird species are experiencing severe population declines due to current land management practices in the Flint Hills. Dr. Kimberly With recommends patch burning as a solution.<sup>4</sup></p> <p>Since this is such an obvious omission Sierra Club representatives who attended the scoping meetings and the open house meetings to discuss the draft EA asked why excessive burning had not been addressed. USFWS personnel responded that they could not address, in a perpetual easement, rangeland management practices, that may change over time.</p> <p>That argument is directly contradicted by sample easements that we obtained from USFWS Service Manual, Chapter 341. See attached manual text and associated sample easements. The Sample Grassland Easement used in Region 6, which includes Kansas, is a <i>perpetual</i> easement which clearly limits ranchland management practices. The Sample Habitat Easement used in Region 3, which could cover prairie chicken habitat in Missouri and Iowa, also clearly limits ranchland management practices and specifically mentions burning.<sup>5</sup></p> <p>On page 8 under Habitat Protection and Easement Acquisition Process, USFWS says, “The basic considerations in acquiring an easement interest in private land are <i>the biological significance of the area, the biological requirements of wildlife species of management concern, existing and anticipated threats to wildlife resources</i> (emphasis ours), and landowner interest in the program.” Yet, by ignoring destructive burning practices, the type of easement proposed under the subject program utterly fails to conform to the bulk of the considerations claimed. There is no reason why USFWS could not specifically list patch or rotational burning as a basic consideration in acquiring easements under the subject program.</p> <p>It is a serious conceptual error to take the position that any modification of existing range burning practices must maintain the existing level of ranchers’ profits. Both the loss of wildlife habitat and the air pollution affecting the health of downwind human communities are classic cost externalities. That’s when the ranchers are able to throw off a portion of their production costs onto the public health and environment, so they can achieve a desired price for their cattle at the gates of the cattle feedlot. The American public has every right to expect that ranchers responsible for negative impacts should forgo those practices in return for the substantial payments proposed by USFWS. Further the USEPA has recognized the public health threat from the annual spring burns, and USFWS should not facilitate the very practices that concern other federal agencies.</p> <p><i>Failure to conform to USFWS mission.</i> The EA states on page 7 that the Flint Hills Legacy Conservation Area will be monitored as part of the National Wildlife Refuge System. Executive Order 12996 of March 25, 1996 states that the mission of the National Wildlife Refuge System is to “preserve a national network of lands and waters for the conservation and management of fish, wildlife, and plant resources of the United States for the benefit of present and future generations.” Then under Section 2, Guiding Principles concerning Habitat, it states that “Fish and wildlife will not prosper without high-quality habitat, and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve</p>	<p><b>Response 25.2.</b> The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The mission of the National Wildlife Refuge System is to preserve a national network of lands and waters for the conservation, management, and, where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.</p> <p>Although the FHLCA will be considered a unit of the National Wildlife Refuge System, the land will still remain in private ownership and as such cannot be held to the same requirements and limitations placed upon a refuge owned in fee-title.</p> <p>There are a variety of levels of habitat quality for tallgrass prairie throughout the Flint Hills. Using ranking criteria the Service will acquire the most intact, highest quality habitat available from a willing seller with the funding that is available. By preventing additional fragmentation, the Service and other conservation partners plan to help preserve tallgrass prairie habitat for future generations.</p> <p>Also, see the response to comment 20.</p> <p><b>Response 25.3.</b> There is not a National Environmental Policy Act requirement to conduct scoping meetings, or how to specifically incorporate comments. Scoping comments were used to develop the draft EA, and were consolidated into broad categories of interest included in the “Issues Identified and Selected for Analysis” on page 5. To address substantive comments on the draft EA and page 91 of this final EA, the Service decided to use the format used here to address the comments in more detail.</p> <p>The text will be revised to read, “Concern about short-term activities, (including annual burning and early, intensive grazing) are having long-term impacts to the tallgrass prairie.” To address the more specific, substantive comments received for the draft EA and LPP, individual comments and responses are included in Appendix G of the final EA and LPP documents.</p> <p><b>Response 25.4.</b> The Service did not construct additional alternatives for controlling burning and stocking rates because as mentioned earlier, it is not feasible, or necessary, for the Service to use fee-title acquisition in the Flint Hills. The text of the draft EA has been revised to reflect additional alternatives that were considered, but not studied further, such as fee-title acquisition, or</p>

Comment #	Letter # 25	Response
25.3	<p>and enhance the quality and diversity of fish and wildlife habitat within refuges.” Since the LPP does not address the current damaging burning practices (EIS) in the Flint Hills, it will not deliver “high-quality habitat” and does not “conserve” such habitat. Thus the LPP is in violation of Executive Order 12996.</p> <p><i>Mis-characterization of scoping comments.</i> The range of comments received in the USFWS scoping meetings is mischaracterized on page 8. The USFWS does not list or describe any opposing or negative comments despite the fact that representatives of the Kansas Chapter of Sierra Club attended one or more of these meetings and strongly criticized the lack of consideration of rangeland burning methods that destroy grassland bird habitat. Sierra Club subsequently submitted a written comment that strongly questioned whether the program would actually preserve grassland bird habitat.</p> <p><i>Insufficient EA Alternatives (page 9).</i> NEPA requires that an EA is needed “to evaluate reasonable alternatives that will meet the stated objective and to assess the possible impacts to the human environment, as stated on page 31 of the EA. Yet this EA includes only one alternative (B) other than the standard “no action” alternative (A). USFWS did not construct and analyze an alternative that addresses land management and grazing practices widespread in the Flint Hills such as Early Intensive Stocking (EIS) and wholesale annual burning known to be destroying wildlife habitat.</p> <p>USFWS did not address the impacts to human health and environment of allowing these practices to continue on land covered by the LPP. For example, the EA failed to mention the fact that current burning practices are causing serious and long standing air quality problems in major urban areas in Kansas and other downwind states. KDHE has set up a website page<sup>6</sup> where one can view the KDHE presentation for the meeting in Newton, Kansas on April 9, 2010 which brought together various stakeholders to pursue a Smoke Management Plan. This page also includes complete information on the April 8 – 11, 2010 Flint Hills Smoke Event. For example, attached are the most recent ozone exceedances in Topeka, Wichita and at the Konza prairie near Manhattan and a representative map of a smoke plume. It is no secret that the USEPA and KDHE are seeking changes in burning practices in the Flint Hills. USFWS has an obligation under NEPA to both acknowledge and discuss the impacts of their plan in this regard.</p> <p>In addition the USFWS acknowledges on page 20 the value and the use of the Flint Hills for bird viewing, nature photography and hiking, but the EA does not consider impacts of intensive burning practices on these activities.</p> <p>The USFWS’s Alternative B focuses entirely on habitat fragmentation issues and ignores other issues that could alter the outcome, such as the impact of the existing improved road network and intensive grazing and burning practices. There are, for example, serious questions about whether even the efforts to reduce fragmentation of habitat in the LPP will succeed when the Flint Hills is already heavily fragmented by a network of improved roads that, according to Dr. Robel, are very instrumental in retarding the breeding of prairie chickens.</p> <p>On page 21 of the EA it is suggested that as much as 15,000 acres of intact prairie is needed to support a single prairie-chicken lek. By intact USFWS means a block of land that is 95%</p>	<p>a smaller or a much larger project boundary in the “Alternatives Considered but not Studied” section (see page 10 of this final EA).</p> <p><b>Response 25.5.</b> The Service considered that there would likely be little to no change in the impact to human health as a result of this project and maintains that we are not requiring landowners to change their burning practices. The Service hopes to work with landowners through the Partners for Fish and Wildlife program to influence landowners to burn less frequently, but there is no evidence that decreasing frequency would result in decreased air quality problems—if an area is burned once in three years it may produce three times the smoke when it is burned because of the increased fuel load, which may result in a no net gain across the region. Future programs such as the BlueSkyRAINS program through Kansas State propose to provide information on smoke and air quality effects from prescribed fires in the Flint Hills.</p> <p>Concerning the affects of burning on bird viewing, photography, and hiking; the Service’s easements will not control burning timing or frequency, so little or no change is expected as a result of the conservation easement, and therefore, no change to human health and environment is expected. To ensure that tallgrass prairie and the grassland-dependent wildlife species are available for viewing, it is necessary to conduct prescribed burning at regular intervals to maintain the fire climax prairie ecosystem.</p> <p><b>Response 25.6.</b> The Service focused on what is within the scope of the FHLCAs conservation easement project. The Service recognizes that fragmentation is a serious existing condition, and that efforts to reverse the decline in greater prairie-chicken populations face serious challenges. However, the Service considers the preservation of tallgrass prairie, resident and migratory birds, and other wildlife which may benefit from this effort, a worthy cause.</p> <p>The research referred to here is based on the lesser prairie-chicken. The Flint Hills are currently populated with greater prairie-chickens, and we have found no research that indicates that we cannot be successful in protecting greater prairie-chickens and other grassland-dependent bird species with a landscape level conservation effort supported by private landowners and other partners.</p>
25.4		
25.5		
25.6		

Comment #	Letter # 25	Response
<p><b>25.7</b></p>	<p>grassland. James Pitman, Christian Hagen, Robert Robel et al found that lesser prairie chickens would not breed at all within 252 to 465 meters of an improved road in his study of PC's in the Sand Sage Prairie of southwest Kansas. Only 10% of the nests were found from 715 to 1095 meters from such roads. They defined improved roads as paved or unpaved roads that carried three vehicles or more per day, which would include both local roads and primary roads.</p> <p>A consultant for the Sierra Club assumed a buffer of 200 to 500 meters from such roads and 700 meters from transmission lines and overlaid the existing road grid over the Flint Hills Legacy Conservation Project area. He found that only one intact block of 15,000 acres would be available for preservation and only thirteen blocks were available in size from 5000 to 14,999 acres.<sup>8</sup> While this analysis may be subject to other interpretations, it does call into question the assumptions made by USFWS that prevention of further fragmentation will actually result in large areas of suitable prairie chicken habitat. At a minimum USFWS should have included a discussion in the EA of the potential for the existing road grid to undermine the goals of their project in the Flint Hills.</p> <p><i>Fire History &amp; alternate practices:</i> On page 13, the USFWS embarks on a lengthy description of traditional burning practices in the Flint Hills that note the desirability of a natural mosaic burning pattern. Then, incredibly, the USFWS on page 14 reduces the discussion of current burning practices to a single sentence! This clearly demonstrates the intent of the USFWS to avoid discussing this issue.</p> <p>Yet they acknowledge that "patch burning is more representative of historical burn regimes in the region." Further, USFWS notes on page 5 "The Service's PFW program has been working with many landowners to help restore and enhance fish and wildlife habitat on private land. PFW activities include habitat restoration and improvement (invasive plant control and grazing and burning modifications (emphasis ours))." On page 17 the EA confirms that grassland birds are at risk and notes they need a "mosaic of vegetation structures."</p> <p>On page 24 the USFWS says the conservation easements "would support management activities such as prescribed fire, grazing, and efforts to control the spread of woody vegetation and invasive weeds" without specifying any limitations whatsoever on the nature of these activities. Then they note that "patch or rotation burning of prairie provides the mosaic of habitat conditions required by grassland birds." Patch or rotation burning is currently being practiced by few ranchers in the Flint Hills. <i>We conclude from the foregoing that USFWS is well aware of the need and desirability of changing burning practices in the Flint Hills.</i></p> <p><i>Annual burning not necessary.</i> On page 21 the USFWS confirms the LPP's focus on the fragmentation of habitat. They say fragmentation reduces the ability to burn, but they do not acknowledge that excessive annual burning is also part of the problem per our previous citations. On page 23 USFWS acknowledges that "when tall grass prairie remains unburned for 10 years or more it begins to convert to woodlands." <i>This also means that it is not necessary to burn every year as ranchers are currently doing under EIS practices.</i></p> <p><i>Flawed analysis and conclusions.</i> On page 26 USFWS incorrectly states that their program will conserve wildlife habitat. On page 29 USFWS discusses the expected cumulative impacts of the</p>	<p><b>Response 25.7.</b> See the response to comments 25.1 and 25.5.</p> <p><b>Response 25.8.</b> On page 29 of the final EA, "Cumulative Impacts—Alternative B" in fact does refer to the impact to the program goals, "This would have long-term positive impacts on wildlife habitat and result in the long-term conservation of migratory birds, threatened and endangered species, native plants, and the overall biological diversity of the Flint Hills tallgrass prairie." The other comments were previously addressed.</p> <p>The Service will send a copy of the final EA to the Kansas chapter of the Sierra Club, when it becomes available.</p>
<p><b>25.8</b></p>	<p>4</p>	

Comment #	Letter # 25	Response
25.9	<p>LPP but only in terms of acres covered. They do not discuss cumulative impacts with respect to program goals such as preservation of wildlife habitat. In view of the fact that destructive practices like EIS will be allowed to continue under this program, the conclusions in this section have no basis in fact. On page 32 under "bio-planning" the Greater Prairie Chicken (GPC) is cited as the focal species, but then USFWS fails to assess the impact of annual burning practices on the GPC.</p> <p><b>II. The Flint Hills Legacy Conservation Area Draft Land Protection Plan (See also related comments on the EA above)</b></p> <p>The LPP lists the purposes of the program on page 2 and then fails to establish a strategy that will achieve the objective. On page 4 the USFWS confirms that landowner management practices, which would include EIS, would continue. The LPP is predicated on sustaining the current land use of livestock grazing and prescribed fire.</p> <p>In effect the USFWS Flint Hills Conservation Area program will be paying ranchers substantial sums of money while continuing to allow destructive agricultural practices, like EIS, that will destroy wildlife habitat. This will have two consequences that are not addressed in the EA:</p> <p>(1) USFWS will be using public money for a program that is very unlikely to achieve its stated objective to significantly preserve habitat. This will divert public funds from other more effective efforts across the nation;</p> <p>(2) The conveyance of funds to ranchers who continue to use damaging burning practices will likely retard beneficial changes in range management practices. Thus serious air quality and public health damages in Kansas will persist during the time this program is being implemented. On page 20 of the EA, the USFWS notes that many Flint Hills properties (ranches) are in the possession of absentee landowners. One of our representatives at the El Dorado open house meeting of April 21 asked Mike Rich of USFWS about this, and he estimated that absentee ownership was 70%. These investors are unlikely to suffer the environmental impacts of the practices implemented by their ranch managers, but they are reaping the financial rewards.</p> <p><b>Summary.</b> This EA is grossly inadequate and incomplete. As presently presented the Project is likely to divert valuable public funds from other programs in the country with a higher chance of success. In other words, it is highly likely to become an extraordinary waste of public funds.</p> <p>The most important flaws are:</p> <ol style="list-style-type: none"> <li>1. The EA fails to meet the requirements of NEPA:             <ol style="list-style-type: none"> <li>a. The EA fails to consider or study other alternatives that are more likely to achieve the stated objectives of the program even though the USFWS clearly acknowledges that alternative range management practices are possible and desirable;</li> <li>b. The EA fails to consider the impacts of the Flint Hills Legacy Conservation Area LPP on the human environment in general;</li> <li>c. The EA fails to assess the impacts of the LPP on <i>air quality and human health</i> of paying ranchers substantial sums of money for easements which allow them to continue to conduct</li> </ol> </li> </ol>	<p>See the responses to comments 25.1 and 25.5.</p> <p><b>Response 25.9.</b> See the responses to comments 25.1, 25.2, 25.4, 25.5, and 25.6.</p> <p>The Service did not develop additional alternatives for controlling burning and stocking rates because as mentioned in the response to comment 25.1, it is not feasible, or necessary, for the Service to use fee-title acquisition in the Flint Hills. The text of the draft EA has been revised to reflect the alternatives that were considered, but not studied further, such as fee-title acquisition, or a much larger project boundary.</p> <p>The conservation easement program would seek to limit additional construction of infrastructure that would result in further habitat fragmentation. Ranking criteria will be used to select the most intact, high quality tallgrass habitat. It is not within the scope of the FHLCA project to assess the impacts of existing fragmentation from roads (or other structures) throughout the entire Flint Hills.</p> <p>Assessing the measure of success for the LPP will be a long-term process and will use ongoing, adaptive management strategies outlined in the Strategic Habitat Conservation strategies outlined on page 33 of the final EA. As new data and science become available, the information will be incorporated into the initial prioritization model and will be used to adjust the ranking criteria for potential acquisition parcels.</p>

Comment #	Letter # 25	Response
	<p>environmentally damaging range management practices.</p> <p>At present the EA is so deficient in the above respects that it is not possible to determine if a full Environmental Impact Statement is warranted.</p> <ol style="list-style-type: none"> <li>The EA completely ignores the effects of current grazing and land management practices on the efficacy of the LPP and on the chances for its success;</li> <li>The LPP fails to conform to the mission of the USFWS National Wildlife Refuge System and is in violation of Executive Order 12996.</li> <li>The EA fails to analyze the risk that the existing fragmentation of grassland bird habitat by the existing network of roads in the Flint Hills may reduce the chance of program success.</li> <li>The EA used the wrong measures for assessing LPP success.</li> </ol> <p>The Kansas Chapter is a legal subdivision of the Sierra Club which has over one million members nationwide. The Kansas Chapter of the Sierra Club has an important interest in seeing that this program is properly designed to achieve the stated objective to preserve wildlife habitat. Members of the Chapter are interested in and participate in activities in the Flint Hills such as hiking and observation and photography of wildlife such as grass land birds. Many Chapter members live in urban areas and their health is being impacted by high ozone and particulate matter pollution from the extensive, annual burning of rangeland in the Flint Hills</p> <p>We hereby request that USFWS correct the deficiencies noted above and notify the undersigned by registered US mail within 3 days of the issuance of the final EA, and that such notification include where and how a copy can be obtained.</p> <p>Sincerely,</p>  <p>Craig S. Volland, for the Sierra Club 609 N. 72<sup>nd</sup> St Kansas City, Ks 66112 913-334-0556</p> <p>cc. USFWS Mountain-Prairie Region - Denver</p>	

**Comment #**

**Letter # 26**

**Response**



May 17, 2010

**VIA E-MAIL AND U.S. MAIL**

Amy Thornburg  
 Land Protection Planning  
 U.S. Fish and Wildlife Service  
 P.O. Box 25486, DFC  
 Denver, Colorado 80225

**RE:** Comments on U.S. Fish and Wildlife Service Draft Environmental Assessment and Land Protection Plan for Flint Hills Legacy Conservation Area

Dear Ms. Thornburg:

**Introduction**

Wind Capital Group, LLC ("Wind Capital") is a developer of utility-scale wind energy generation projects with offices in St. Louis, Missouri; Madison, Wisconsin and Chicago, Illinois. Wind Capital was formed in 2005, and has developed wind energy facilities with a generating capacity in excess of 900 MW. Wind Capital is currently developing 20 wind energy projects totaling more than 2,200 MW of capacity. The projects are located primarily in the central region of the country. Wind Capital's mission is to "develop, build and manage quality wind energy projects under the highest ethical and professional standards to "Bring Wind Energy Home@."

Wind Capital is committed to building wind projects that minimize impacts to environmentally sensitive resources and wildlife. We begin consideration of environmental resources very early in the project development process. On-going consideration of critical habitat and environmentally sensitive areas remains an integral part of project design, construction, and operation. Our dedicated environmental team oversees all aspects of site review, environmental studies, and associated permitting for our wind projects. As an owner/operator of wind energy facilities, we proactively consult with regulatory agencies, such as the U.S. Fish and Wildlife Service (FWS), throughout the project life cycle. We work with qualified environmental consultants to develop scientifically-sound study plans and to assist us with implementation. In summary, we strive to minimize potential impacts to wildlife and sensitive habitat areas at our wind project sites.

1430 Washington Ave • Suite 300 • St. Louis, MO 63103  
 314.683.9000 • Office • 314.685.3000 • Fax  
 www.windcapitalgroup.com  
 2920 Marketplace Dr. • Suite 101 • Madison, WI 53719  
 608.819.2400 • Office • 608.819.2401 • Fax

Comment #	Letter # 26	Response
26	<p>Ms. Amy Thornburg May 17, 2010 Page 2</p> <p>In addition, Wind Capital actively participates in the AWEA Siting and Permitting Committees.<sup>1</sup> These Committees are working collaboratively with the FWS to develop project siting guidelines, regional habitat conservation plans, and consistent survey protocols. With this in mind, please consider our comments on the draft Land Protection Plan for Flint Hills.</p> <p style="text-align: center;"><b>Background and General Comments</b></p> <p>Wind Capital focuses wind development efforts primarily in the central region of the United States, including Kansas and Oklahoma. We currently are developing several projects in close proximity to the proposed Flint Hills Legacy Conservation Area (FHLCA), as currently outlined in the Draft Environmental Assessment and Land Protection Plan. These projects are at various stages of development, and we have actively engaged with local FWS staff throughout the development process.</p> <p>Wind Capital is an interested and vested Stakeholder in the FHLCA proposal. We are concerned that this proposal will limit, and even prevent, wind development in this region. Wind energy is a clean, renewable source of energy that is important to our Nation's economy. This renewable source of energy is highly protective of the environment. Wind energy is compatible with the protection of wildlife, highly-valued land resources, and habitat areas, and environmental resource such as the Flint Hills area.</p> <p>Wind Capital respectfully submits the following specific comments on the proposed FHLCA Draft Environmental Assessment (EA) and Land Protection Plan ("EA/LPP").</p> <p style="text-align: center;"><b>Specific Comments</b></p> <p>I. <b>The Proposed Action will have a significant impact on wind power development, and will conflict with policies previously announced by the U.S. Department of Interior to promote renewable energy.</b></p> <p>The "Proposed Action" of the FHLCA EA/LPP is to establish a voluntary conservation easement program in eastern Kansas under which the FWS would acquire conservation easements on 1.1 million acres of land within a 3.3 million acre project boundary area. As proposed, the FHLCA conservation easements would explicitly prohibit commercial and industrial-scale development of wind energy. See Draft FHLCA EA, p. 24.</p> <p>This prohibition on wind energy development conflicts with the Secretary of the U.S. Department of Interior's (DOI) policy declarations with respect to renewable energy development and climate change. Specifically, in March 2009, Secretary Salazar issued Order 3285, declaring that one of the DOI's "highest priorities" is to encourage the</p> <p><sup>1</sup> Wind Capital has reviewed the separate comments on the Proposed Action submitted by AWEA and supports those comments.</p>	<p><b>Response 26.</b> (Background and general comments) Wind energy development is not inherently compatible, or incompatible, with wildlife and habitat protection. An assessment needs to be made based on the requirements of the species involved. Preliminary studies indicate tall vertical structures fragment large tracts of otherwise appropriate habitat, making it unsuitable for interior grassland species such as greater prairie-chickens in Kansas. A number of authors have addressed the fragmentation effects of infrastructure on prairie grouse (Kuvlesky et al. 2007, McDonald et al. 2009, Giesen 1994, Fuhlendorf et al. 2002, Robel 2002). See specific information on ecological impacts and responses of fragmentation on pages 23–26 of the final EA.</p> <p><b>Response 26.1.</b> The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.</p> <p>The mission of the National Wildlife Refuge System is to preserve a national network of lands and waters for the conservation, management and, where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.</p> <p>The Flint Hills Legacy Conservation Area project would be administered as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, executive orders, regulations, and policies (page 6 of the final EA).</p> <p>The Service supports the U.S. Department of the Interior policy on renewable energy development, including Secretarial Orders 3285 and 3289. However, the strategies contained in these Secretarial Orders are to be addressed for appropriate areas on public lands and the outer continental shelf. The Flint Hills Legacy Conservation Area project would be administered as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, executive orders, regulations, and policies (see page 6 of the final EA). A significant directive of the Refuge Administration Act is to ensure that the U.S. Fish and Wildlife Service maintains the biological integrity, diversity, and environmental health of the National Wildlife Refuge System for present and future generations of Americans. Fragmentation of the National Wildlife Refuge System's wildlife habitats is a direct threat to the integrity of the National Wildlife Refuge System, both today and in the decades ahead. Uses that we reasonably anticipate may reduce</p>

Comment #	Letter # 26	Response
<p>26.2</p>	<p>Ms. Amy Thornburg May 17, 2010 Page 3</p> <p>production, development, and delivery of renewable energy. See U.S. DOI, Secretary Salazar, Order No. 3285 (March 11, 2009). In that Order, Secretary Salazar declared that “[a]gencies and bureaus within the [DOI] will work collaboratively with each other, and with other Federal agencies, departments, states, local communities, and private landowners to encourage the timely and responsible development of renewable energy and associated transmission while protecting and enhancing the Nation’s water, wildlife, and other Natural Resources.” <i>Id.</i> To achieve this, Secretary Salazar established a Department Task Force on Energy and Climate Change. <i>Id.</i></p> <p>In a subsequent order, issued in February 2010, Secretary Salazar renamed the “Climate Change Response Council” within the Office of the Secretary to the “Energy and Climate Change Council,” and tasked the newly-named Council with, <i>inter alia</i>, executing a coordinated DOI-wide strategy to address renewable energy efforts. See U.S. DOI, Secretary Salazar, Order No. 3289, Amendment No. 1 (Feb. 22, 2010). The Council is to help coordinate activities within and among the DOI’s agencies and bureaus to develop and implement an integrated strategy for responding to renewable energy efforts and climate change impacts on resources managed by the DOI. <i>Id.</i> Further, with respect to climate change planning, Secretary Salazar ordered each bureau and office of the DOI to consider and analyze potential climate change impacts when undertaking long-range planning exercises, developing multi-year management plans, and making major decisions regarding potential use of resources under the DOI’s purview. <i>Id.</i></p> <p>These declarations by Secretary Salazar, and other federal government renewable energy policy initiatives not summarized herein, recognize the vital national interests advanced by development of renewable energy and corresponding reductions in carbon emissions. Further, these declarations make it clear that all activities of the agencies within DOI must be considered in light of, and balanced with respect to, the nation’s interest in encouraging “timely and responsible development of renewable energy” resources.</p> <p>The FHLCA EALP/PP does not acknowledge these DOI national policies, or discuss how a balance will be struck between the conservation interests which the Proposed Action seeks to promote and the DOI’s strong interest in encouraging responsible renewable energy development. The Proposed Action would prohibit wind energy development within the FHLCA – an area of over 1 million acres which the EA acknowledges has “high potential for wind development.” See Draft FHLCA EA, p. 22. Further, implementing the Proposed Action likely would lead to additional restrictions on areas near, but not within the FHLCA, through the review of impacts on the FHLCA under the National Environmental Policy Act (“NEPA”), or through the Endangered Species Act section 7 consultation process in connection with other federal permits. These potential secondary impacts are not acknowledged in the EA for the Proposed Action.</p> <p>Moreover, the Proposed Action promotes fossil fuel extraction activities to the detriment of renewable energy development because it would allow subsurface exploitation of land within the FHLCA for oil and gas so long as the surface activities related to those activities do not occur on parcels within the FHLCA. See, e.g., EA, p. 24. This tailoring of the Proposed Action to allow oil and gas production, but prohibit</p>	<p>the quality or quantity or fragment habitats on a national wildlife refuge would not be consistent with Service policy.</p> <p>The FHLCA project would use voluntary conservation easements that would be acquired from willing sellers only. The easement program would to a large extent maintain existing conditions for landowners and the general public, and will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).</p> <p>The U.S. Fish and Wildlife Service will continue to work collaboratively with individuals, nongovernment organizations, federal, state, and local agencies on a variety of issues, including renewable energy development. The Service has initiated a program using LCCs as a means of addressing conservation and climate change challenges through partnership opportunities (see page 35 of the final EA).</p> <p>Additionally, through the FHLCA project the Service seeks to conserve part of remaining 4% of relatively intact tallgrass prairie habitat, thereby providing more system resiliency in a changing climate by maintaining a migration corridor for migratory grassland birds, and also by providing carbon sequestration benefits (page 27 of the final EA).</p> <p>Currently the FHLCA provides a significant north-south migration corridor for grassland birds, and links many areas of high quality tallgrass habitat (page 14 of the final EA). Retaining migratory corridors is a key adaptation strategy for wildlife response to climate change (S03289, USFWS 2009). The FHLCA project would use voluntary conservation easements that would be acquired from willing sellers only. Landowners could continue to pursue energy development on their land without Service conservation easements. The easement program would to a large extent maintain the existing conditions for landowners and the general public, and will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).</p>
<p>26.3</p>		
<p>26.4</p>		

Comment #	Letter # 26	Response
26.5	<p>Ms. Amy Thornburg May 17, 2010 Page 4</p> <p>use of parcels within the FHLCA for wind energy production, cannot be reconciled with the policies expressed in Orders 3285 and 3289.</p> <p>Wind Capital supports the goals of prairie and grassland preservation. However, Wind Capital also believes that such preservation should be harmonized with other important national goals and priorities, in particular with the national policies that support responsible wind energy development. We submit that, without significant change, and meaningful consideration of additional alternatives not addressed in the EAL/PP (see below), the Proposed Action cannot be found to be consistent with those policies.</p> <p>Therefore, the Proposed Action should not be approved until it is (a) reviewed for consistency with the DOI's policies by the Task Force on Energy and Climate Change established by Order 3285 and the Energy and Climate Change Council established by Order 3289, and (b) those bodies determine that it is consistent with the policies articulated by the Orders.</p> <p><b>II. The FHLCA EAL/PP does not account adequately for the existing and ongoing FWS programs designed to balance wind energy development with species and habitat protection.</b></p> <p>For years, FWS has administered programs and measures which have sought to balance the development of renewable energy resources with habitat and species protection and conservation goals. In recent years, these measures have included species and habitat-related consultations conducted, and impact avoidance and mitigation measures developed, under section 7 of the Endangered Species Act, the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and NEPA. In the future, the measures also are likely to include the Recommended Guidelines submitted by the Wind Turbine Guidelines Advisory Committee to the Secretary of Interior on March 4, 2010 ("Recommended Guidelines"). The Committee developed the Guidelines to present "the most effective, feasible, practicable and appropriate approaches available to the Department of Interior, Tribes, states, local jurisdictions, and the wind industry to address their respective responsibilities to protect wildlife resources while encouraging responsible siting and operation of wind energy projects." See U.S. Fish and Wildlife Service, Wind Turbine Guidelines Advisory Committee, p. 1.</p> <p>However, the EAL/PP does not adequately address the development of wind energy resources within the context of these existing policies. The EAL/PP simply assumes that any wind power development would be contrary to the conservation aims of the FHLCA. Wind Capital believes, contrary to the assumption embedded in the EAL/PP, that responsible wind energy development and grassland habitat preservation are compatible objectives. The Proposed Action should not be implemented until the EAL/PP is revised to give meaningful consideration to whether development of wind energy resources consistent with the Recommended Guidelines, and with the habitat and protected species impact avoidance and mitigation measures typically required for wind energy projects, can be accommodated within the FHLCA. Such consideration is needed not only to assure that Orders 3285 and 3289 are given proper effect, but also to give effect to the purposes for which the Guidelines were developed. Proper consideration of the Recommended Guidelines will require analysis of whether the conservation purposes of the FHLCA could be achieved if responsible wind energy development in accordance with the Recommended Guidelines were allowed to proceed in portions of the FHLCA.</p>	<p><b>Response 26.2.</b> Although the Service supports renewable energy development, it is beyond the scope of this project to incorporate a discussion of all national policies, energy programs, recommendations, and initiatives.</p> <p>Through the FHLCA project the Service seeks to conserve part of a remaining 4% of relatively intact tallgrass prairie habitat, thereby providing more system resiliency in a changing climate by maintaining a migration corridor for migratory grassland birds, and by providing carbon sequestration benefits (page 25 of the final EA).</p> <p>From the final EA page 14, "Currently, the FHLCA provides a significant north-south migration corridor for grassland birds, and links many areas of high quality tallgrass habitat. Retaining migratory corridors is a key adaptation strategy for wildlife response to climate change (S03289, USFWS 2009)."</p> <p><b>Response 26.3.</b> The Service is not proposing a buffer zone, or any development restrictions other than areas where Service conservation easements are in place. The conservation easements are voluntary and in no way restrict use on neighboring lands. All federal, state, and local regulations would still apply whether the Service has an easement in the area or not. Rather than increase the likelihood of additional requirements under the Endangered Species Act, one of the purposes of the FHLCA is to support the recovery and protection of threatened and endangered species and reduce the likelihood of future listings under the Endangered Species Act (final EA page 4).</p> <p><b>Response 26.4.</b> The Service is not biased against wind, or other forms of energy development. The Service would consider development of energy and mineral resources on the easement properties, if they can be implemented without fragmenting the grassland habitat.</p> <p>Although at least one Kansas county (Wabaunsee) has passed an ordinance banning commercial wind farms countywide, it would be speculative to anticipate potential secondary impacts for the Flint Hills.</p> <p>The Service is not promoting oil and gas extraction over other forms of energy development. On properties where wind, oil and gas, or mineral rights have already been sold (severed from the estate), the Service will work with landowners and developers to minimize any negative impacts of development and extraction activities (50 CFR 25.11). On land where the rights for wind, oil and gas, or mineral development have not been sold (estate is</p>
26.6		
26.7		

**Comment #**

**Letter # 26**

**Response**

Ms. Amy Thornburg  
May 17, 2010  
Page 5

The assumption that wind power development can never be carried out in a manner that would enable the conservation goals of the FHLCA to be achieved does not constitute adequate consideration of whether a balance can be struck between wind energy development and the conservation goals of the Proposed Action.

**III. The FHLCA Draft EA Fails to Meet the NEPA Standards for EAs**

A. The “Alternatives” Analysis is Over-Simplified and Inadequate

40 CFR § 1508.9 requires that EAs include “discussions of alternatives as required by section 102 (2)(E) of NEPA. Section 102 (2)(E) requires that agencies study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources. The alternatives analysis in Chapter 2 of the EA does not satisfy these requirements. It identifies only two alternatives for the proposed project – either a “no-action” alternative or the “proposed action” to give the FWS authority to create the FHLCA. This “alternatives” analysis is over-simplified, especially considering the agency’s own acknowledgement that the proposed FHLCA area has a “high potential for wind development.” Notably, the “alternatives” analysis does not consider a wide range of options that exist beyond the status quo “no-action” approach and the proposed action.

For example, other alternatives that should have been considered include: a smaller sized conservation area; limiting the conservation area to land within better defined boundaries, designed also to accommodate wind energy development; identification of siting guidelines and mitigation measures that would enable wind energy development to proceed within the conservation area; use of local land use authority or other federal permitting authorities to control development; and the impacts of development consistent with the guidelines recently developed by the Wind Turbine Guidelines Advisory Committee. Chapter 2 of the draft EA should be amended to include a much more rigorous review of alternatives and not simply adopt an oversimplified, “all-or-nothing” analytical approach.

B. The Summary of the “Affected Environment” is also Inadequate

Although Chapter 3 (“Affected Environment”) of the draft EA references how the FHLCA conservation easement program would advance the FWS’s strategic response to climate change issues by preserving the character of the tallgrass prairie of the Flint Hills and securing the existing carbon stores to sequester atmospheric carbon, Chapter 3 remains entirely silent on another of FWS/DOI’s strategic goals – the production, development, and delivery of renewable energy. See Draft FHLCA EA, p. 12. In addition, Chapter 3 omits any reference to wind energy development and its related beneficial economic impact on local communities in the “Socioeconomic Environment” analysis section. Id. at pp. 19-20. Chapter 3 of the draft EA should be revised to address those issues adequately and fairly as part of the affected environment.

C. The “Environmental Consequences” Analysis is Conclusory and Insufficient

1. *Effects on the Biological Environment*

still intact), conservation easements would require non-surface occupancy (off-site development) for any future development activities. The Service would consider development of energy and mineral resources on the easement properties, if they can be implemented without disturbing the surface or creating vertical barriers, which would fragment the grassland habitat for wildlife.

The Service respectfully disagrees that the proposed action is inconsistent with energy policy. The U.S. Fish and Wildlife supports the U.S. Department of Interior policy on renewable energy development, including Secretarial Orders 3285 and 3289. However, the strategies contained in these Secretarial Orders are to be addressed for appropriate areas on public lands and the outer continental shelf. The Flint Hills Legacy Conservation Area project would be administered as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, executive orders, regulations, and policies (see page 6 of the final EA). A significant directive of the Refuge Administration Act is to ensure that the U.S. Fish and Wildlife Service maintains the biological integrity, diversity, and environmental health of the National Wildlife Refuge System for present and future generations of Americans. Fragmentation of the National Wildlife Refuge System’s wildlife habitats is a direct threat to the integrity of the National Wildlife Refuge System, both today and in the decades ahead. Uses that the Service reasonably anticipates may reduce the quality or quantity, or fragment habitats on a national wildlife refuge would not be consistent with Service policy.

**Response 26.5.** See responses to comments 26.1 and 26.2 regarding Service mission and policy.

**Response 26.6.** The Service respectfully disagrees with this assessment. Although wind energy and grassland habitat preservation may be compatible, the biological requirements vary for wildlife species and location. In some areas, such as some areas of North and South Dakota, initial studies indicate that waterfowl are able to use areas with wind energy developments.

The proposed Wind Turbine Guidelines Advisory Committee recommendations are currently under review by the Secretary of Interior, and are not approved policy. Upon approval, the Service will incorporate the policy for the FHLCA project, including the proposed Tier 1 evaluation and the considerations listed for sage and prairie grouse that merit special attention for several reasons.

**26.8**

**26.9**

**26.10**

Comment #	Letter # 26	Response
<p><b>26.10</b></p>	<p>Ms. Amy Thornburg May 17, 2010 Page 6</p> <p>The draft EA's assessment of the biological effects of the "no action" alternative and the "proposed action" provides only a cursory analysis of the impacts of the FHLCA conservation easement program and misconstrues the current restrictions placed on wind development by the FWS, as well as by other local, state and federal agencies. For example, with respect to the proposal's affect on wildlife habitat, the draft EA states that:</p> <p style="padding-left: 40px;">[I]f projects are sited without regard for ecological resources, wind power poses a serious risk to wildlife in some of North America's most diminished and ecologically sensitive habitats. Development of wind power poses a particularly high risk for the Flint Hills, because economically viable wind resource areas and conservation priority areas show a high level of geographic congruence.</p> <p>See Draft FHLCA EA, p. 23. The draft EA <i>assumes</i> that wind energy projects will be "sited without regard for ecological resources" and ignores the FWS's current coordination with wind developers in the permitting process with respect to ecological resources, including species and habitat protection (as discussed above), as well as the potential effect of wind energy development consistent with the guidelines recently developed by the Wind Turbine Guidelines Advisory Committee (also as discussed above). Specifically, that Committee developed the Guidelines to present "the most effective, feasible, practicable and appropriate approaches available to the Department of Interior, Tribes, states, local jurisdictions, and the wind industry to address their respective responsibilities to protect wildlife resources while encouraging responsible siting and operation of wind energy projects." See U.S. Fish and Wildlife Service, Wind Turbine Guidelines Advisory Committee, Recommended Guidelines, Submitted to the Secretary of Interior on March 4, 2010, p. 1.</p> <p>By disregarding the fact that wind development occurs with the coordination and cooperation of the FWS and other agencies and can and does occur with consideration for ecological resources, including species and habitat protection, the agency has made an overly broad and invalid assumption. This key assumption places the entire impact analysis in the EA on an invalid footing, and renders the impact analysis inadequate, arbitrary and capricious.</p> <p style="text-align: center;">2. <i>Effects on the Socioeconomic Environment</i></p> <p>Although this section of the draft EA does address wind energy development, it does so in only the most cursory manner. For example, the very first statement about the "no action" alternative asserts that the FHLCA would "remain in private ownership, having no additional restrictions" and landowners could profit by allowing wind energy infrastructure on their land. See Draft FHLCA EA, p. 27. The EA's reference to "no additional restrictions" mischaracterizes the current permitting regimes that apply to the development of wind energy projects and related transmission infrastructure, and ignores the existing restrictions on turbine and access road placement, species and habitat protection, and mitigation measures imposed by local, state and federal permitting entities.</p>	<p>"[The] scale and biotic nature of habitat requirements, ranges, and habitats are highly congruent with the nation's richest inland wind resources, known impacts of anthropogenic features (tall buildings, structures, energy facilities, roads, etc.) (Wind Turbine Advisory Committee Draft, USFS 2010)."</p> <p>The text of the draft EA has been revised to include Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines (2003) which recommends avoiding "placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features or structural habitat fragmentation (see page 26 of the final EA). In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds)." While wind turbines may be compatible with some wildlife species in other areas of Kansas, the Flint Hills tallgrass prairie dependent species have demonstrated sensitivity to vertical structures and habitat fragmentation.</p> <p>See also the response to comment 26.2.</p> <p><b>Response 26.7.</b> See responses to comments 26.1, 26.5, and 26.6.</p> <p><b>Response 26.8.</b> The Service respectfully disagrees with this statement. The decision of whether to establish a new unit Conservation Area of the National Wildlife Refuge System is a decision of whether to proceed with establishment, or not. Thus, Conservation Area LPPs typically involve two alternatives, a no action (non-acquisition alternative), and an acquisition option that will establish a new unit of the National Wildlife Refuge System. The text of the EA has been revised to reflect the additional alternatives that were considered, but not studied further, such as fee-title acquisition, or an option considering a much larger project boundary.</p> <p>When the decision to establish a new refuge is being made, Service policy is to acquire land only when other means, such as zoning or regulation, of achieving program conservation goals and objectives are not appropriate, available, or effective. When lands are to be acquired, the minimum interest necessary to reach management objectives is considered. If fee-title is required, full consideration will be given to extended use reservations, exchanges, or other alternatives that will lessen impact on the owner and the community.</p>
<p><b>26.11</b></p>		
<p><b>26.12</b></p>		
<p><b>26.13</b></p>		

Comment #	Letter # 26	Response
26.14	<p>Ms. Amy Thornburg May 17, 2010 Page 7</p> <p>In addition, the discussion of the “no action” alternative does not even acknowledge the renewable energy benefits of wind power generation or the economic impact that wind developments bring to local communities, in addition to the revenue generated for landowners. Secretary Salazar has stated that...if the U.S. fully pursues its potential for wind energy on land and offshore, wind can generate as much as 20 percent of our electricity by 2020 and create a quarter-million jobs in the process. As President Obama has said: it’s a win-win. Good for the environmental, great for the economy.</p>	<p>A rationale of why the Service has decided to use conservation easements to achieve its conservation purposes for the FHLCA project instead of other alternative is given under the “Alternatives Considered but not Studied” section on page 10 of the final EA. The analysis and information provided throughout the draft EA led to the definition of the project-approved acquisition boundary and the maximum acreage to be acquired by the Service for the FHLCA. Some of the factors considered in the EA include the narrowness of the intact prairie habitat in the north-south migration corridor; the rapid encroachment by trees, and residential and commercial development. The project acquisition acreage represents less than 1% of the physiographic boundary of the historic range of tallgrass prairie and only 2% of the potential wind energy development in Kansas.</p>
26.15	<p>See Remarks of Secretary of Interior Salazar, “New Energy Future: The Role of Public Lands in Clean Energy Production and Carbon Capture,” U.N. Conference on Climate Change, Copenhagen, Denmark, Dec. 10, 2009.</p> <p>Further, the “proposed action” analysis asserts, without support, that the FHLCA’s conservation easement program would affect the “location and distribution, not rate or density of wind energy infrastructure.” See Draft FHLCA EA, p. 28. This is simply untrue. Wind energy projects need to be sited to take maximum advantage of wind resources, and sufficient spacing between turbines is necessary to avoid wake effects on downwind turbines. If wind energy development were to be prohibited on over a million acres, such restriction will necessarily affect the rate or density of wind energy infrastructure that could be developed in an area with an important wind resource.</p>	<p>The Service acquires easements from willing sellers only. Landowners could continue to pursue energy development on their land without Service conservation easements. As a result, the eventual conservation mosaic/pattern will in large part be driven by the availability of willing sellers. Acquisition within the project area is based on the level of participation by willing sellers and available funding. It is an inherent fact that considerably fewer acres may be acquired within the FHLCA, resulting in a much smaller project area.</p>
26.16	<p>Further, the EA fails entirely to consider how the creation of the FHLCA would impact development of wind energy facilities outside of the boundaries ultimately established for the Area, but in proximity to the Area. Once created, a new, federally managed conservation area will undoubtedly need to be considered in any section 7, NEPA, and state and local environmental impact analyses of projects located near such an area.</p>	<p><b>Response 26.9.</b> It is beyond the scope of this project to incorporate details of all individual Department of the Interior strategic goals in this, or any other EA. See the response to comment 26.1 on the U.S. Fish and Wildlife Service and the National Wildlife Refuge System missions.</p>
26.17	<p>3. <i>Unavoidable Adverse Impacts; Irreversible and Irrecoverable Commitments of Resources; Short-term Use vs. Long-term Productivity; Cumulative Impacts</i></p> <p>The EA addresses the Proposed Action’s unavoidable adverse impacts, irreversible and irretrievable commitments of resources, short-term use vs. long-term productivity and the cumulative impact of the Proposed Action in less than two pages. The treatment of these areas is brief and inadequate, even when compared to EAs for other FWS/DOI conservation areas. The EA’s analysis (or lack thereof) within these categories fails to consider the impact of reduced renewable energy development in the short or long term and fails to acknowledge that it is possible to develop wind energy resources <i>and</i> achieve the conservation aims that the creation of the FHLCA is intended to achieve.</p> <p>For the reasons discussed herein, the EA does not satisfy the requirements of NEPA, and does not provide a fair or balanced basis for a determination of significance of the environmental impacts of the Proposed Action. Wind Capital submits that the</p>	<p>The “Affected Environment” section is a discussion of the existing biological and socioeconomic environment conditions and potential effects of the alternatives on those conditions. Any discussion of beneficial economic impacts of wind energy development on local communities would be speculative, due in part to the voluntary nature of landowner participation in selling wind leases.</p> <p>See also the response to comment 26.4.</p> <p><b>Response 26.10.</b> The EA addresses only the restrictions that would result from the proposed conservation easement program. All other local, state, and federal restrictions and laws would still be applicable.</p> <p>The text will be revised to remove the first sentence of the statement of the draft EA that states, “if projects are sited without regard to ecological resources, wind power poses a serious risk to</p>

Comment #	Letter # 26	Response
26.18	<p>Ms. Amy Thornburg May 17, 2010 Page 8</p> <p>FWS cannot properly make a determination of significance based upon the EA as it currently stands.</p> <p style="text-align: center;"><b>Conclusion</b></p> <p>Thank you for the opportunity to submit these comments. Wind Capital is committed to working with the FWS to find solutions to move development of wind facilities forward while also minimizing impacts to environmentally sensitive resources and advancing important preservation priorities. We would welcome the opportunity to discuss the concerns discussed herein with the Region 6 and National Wildlife Refuge staff, Steve Guertin, Regional Director and Noreen Walsh, Deputy Regional Director of Region 6 and responsible management to which the Directors report. We are confident that, if we work together, a path forward can be developed that balances all of the competing considerations and policies.</p> <p style="text-align: right;">Respectfully submitted,</p> <div style="text-align: right;">               George M. Knapp              General Counsel         </div>	<p>wildlife in some of North America's most diminished and ecologically sensitive habitats" (see page 28 of the final EA).</p> <p>See also the response to comment 26.3.</p> <p><b>Response 26.11.</b> The Service respectfully disagrees with the assessment that it is assumed that the project <i>will</i> be sited without regard for ecological resources. Text in the draft EA says, "if projects are sited without regard to ecological resources, wind power poses a serious risk to wildlife in some of North America's most diminished and ecologically sensitive habitats." This text will be removed to avoid confusion.</p> <p>The proposed Wind Turbine Guidelines Advisory Committee guidelines, currently under review, describe a number of concerns and considerations associated with wind energy development that would affect grassland wildlife species found in the FHLLCA, based on biological and habitat requirements.</p> <p>See the response to comment 26.6.</p> <p>The EA addresses only the restrictions that would result from the proposed conservation easement program. All other local, state, and federal restrictions and laws would still be applicable. In addition, the proposed Wind Turbine Guidelines Advisory Committee recommendations are currently under review by the Secretary of Interior, are not approved policy, and hence cannot be included in the EA.</p> <p><b>Response 26.12.</b> The Service respectfully disagrees with the assertion that overly broad and invalid assumptions have been made regarding coordination and cooperation. The Service believes that coordination and communication regarding conservation of ecological resources is essential. The Service will continue to work collaboratively with individuals, nongovernment organizations, federal, state, and local agencies on a variety of issues, including renewable energy development. The Service has initiated a program using Landscape Conservation Cooperatives (LCCs) as a means of addressing conservation and climate change challenges through partnership opportunities (see page 35 of the final EA).</p> <p>See also the response to comment 26.6.</p> <p><b>Response 26.13.</b> The language of the draft EA will be changed to reflect that there would not be any additional <i>Service</i> restrictions, and that landowners could potentially profit by allowing wind energy infrastructure on land that does not have conservation easements (see page 28 of the final EA).</p>

Comment #	Letter # 27	Response
<p style="text-align: center;"><b>27</b></p>	<div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;">May 17, 2010</p> <p style="text-align: center;">U.S. Fish and Wildlife Service, Mountain-Prairie Region              Flint Hills National Wildlife Refuge              530 Maple Avenue              Hartford, Kansas 66854              Attention: Vic Elam and Amy Thornburg</p> <p><b>Re:</b> Comments on the Draft Environmental Assessment and Land Protection Plan, Flint Hills Legacy Conservation Area</p> <p>Dear Mr. Elam and Ms. Thornburg:</p> <p>This letter sets forth the comments of the American Wind Energy Association (“AWEA”) and the Wind Coalition on the Draft Environmental Assessment (“EA”) and Land Protection Plan (“LPP”) for the Flint Hills Legacy Conservation Area (“FHLCA”), prepared by the U.S. Fish and Wildlife Service (“FWS”) pursuant to the National Environmental Policy Act (“NEPA”) and FWS policy.<sup>1</sup> The draft EA and accompanying LPP outline the actions that FWS believes are necessary to establish the conservation area and assess the potential impacts of the proposed conservation easement program (“the Program”) in the Flint Hills region. According to the EA, the outcome of the assessment will be to determine whether FWS should proceed with the establishment of the Program.</p> <p>AWEA is a national trade association representing a broad range of entities with a common interest in encouraging the expansion and facilitation of wind energy resources in the United States. AWEA members include wind turbine manufacturers, component suppliers, project developers, project owners and operators, financiers, researchers, renewable energy supporters, utilities, marketers, customers and their advocates. AWEA appreciates the opportunity to comment on the EA and the LPP.</p> <p>The Wind Coalition is a non-profit association formed to encourage the development of the vast wind energy resources of the south central United States. The Wind Coalition is</p> <hr/> <p><sup>1</sup> We note that these comments are being submitted on May 17 and the official comment date was May 15. In light of the fact that the end of the comment period fell on a weekend (a Saturday), AWEA sought leave from the FWS to submit comments on the close of the next business day and was granted such relief on Monday, May 17. See E-mail Correspondence from Gene Grace, AWEA, and Amy Thornburg, FWS (May 13) (on file with AWEA).</p>	<p>The EA addresses only the restrictions that would result from the proposed conservation easement program. All other local, state, and federal restrictions and laws would still be applicable.</p> <p><b>Response 26.14.</b> Any discussion of beneficial economic impacts of wind energy development on local communities would be speculative, due in part to the voluntary nature of landowner participation in selling wind leases.</p> <p><b>Response 26.15.</b> See the response to comment 9.</p> <p><b>Response 26.16.</b> Discussion of the impact of wind energy facilities outside of the FHLCA is beyond the scope of the EA.</p> <p><b>Response 26.17.</b> The FHLCA project will utilize voluntary conservation easements that would be acquired from willing sellers only. Landowners could continue to pursue energy development on their land without Service conservation easements. The easement program would to a large extent maintain the existing conditions for landowners and the general public, and will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).</p> <p>Although it is not necessary to address “the relationship between short-term uses of man’s environment and the enhancement of long-term productivity” and “irreversible or irretrievable commitments of resources” in an EA, the text has been revised to include additional information on “Irreversible and Irretrievable Commitments of Resources” in the final EA (see page 30).</p> <p><b>Response 26.18.</b> Thank you for your comments.</p> <p><b>Response 27.</b> (Background and general comments) The Service believes that wind energy development is not inherently compatible, or incompatible, with wildlife and habitat protection. Preliminary studies indicate tall vertical structures fragment large tracts of otherwise appropriate habitat, making it unsuitable for interior grassland species such as greater prairie-chickens in Kansas. A number of authors have addressed the fragmentation effects of infrastructure on prairie grouse (Kuvlesky et al. 2007, McDonald et al. 2009, Giesen 1994, Fuhlendorf et al. 2002, Robel 2002). See specific information on ecological impacts and responses of fragmentation on pages 23–26 of the final EA.</p> <p>Although at least one Kansas county (Wabaunsee) has passed an ordinance banning commercial wind farms countywide it would be speculative to anticipate potential additional restrictions in other areas.</p>

Comment #	Letter # 27	Response
<p><b>27.1</b></p>	<p>particularly active in Kansas. Its members include developers, manufacturers and public interest advocates.</p> <p>The purpose of the Program is to conserve important tallgrass habitat for fish and wildlife resources through the acquisition of conservation easements from willing sellers on up to 1.1 million acres in the Flint Hills region. AWEA and the Wind Coalition agree that the Flint Hills is a unique and highly diverse area of the United States and that the integrity of tallgrass prairie wildlife habitat, stream, and water quality of this area should be protected from incompatible development.</p> <p>AWEA and the Wind Coalition, however, believe that if the Program is finalized, as currently proposed, it would categorically preclude wind energy development in an extremely large area without sufficient analysis or justification for taking that step. Specifically, placing up to 1.1 million acres of private lands under restrictive easements that would not allow for any wind energy development in an area that is optimal for wind power production should only be undertaken based on an informed decision-making process. We are particularly concerned that the approach taken here could be replicated elsewhere and that additional land around the country could be restricted without adequate review or procedural protection. This is especially true in light of the fact that wind energy is an important renewable resource for the region and for national policy, and current research demonstrates that wind energy and habitat protection can be compatible. Therefore, AWEA and the Wind Coalition offer the following comments below to be considered in further refining this Program to ensure that it proceeds, consistent with an appropriate NEPA evaluation, with respect to whether or not wind development is compatible with the conservation goals of the FHLCA.</p> <p><b>Comment 1 – Failure to consider national energy policy.</b> While AWEA and the Wind Coalition are supportive of FWS’s habitat protection goals, as contemplated in the Program, we are concerned that the Program’s blanket preclusion of wind energy development in a large swath of eastern Kansas is unjustified. It appears that the intent of the Program is to utilize restrictive conservation easements to exclude wind energy, as well as other some other development activities, entirely from this enormous area in order to reduce habitat fragmentation, as described in the EA’s Purpose and Need section (EA, p. 5). This outcome, without any consideration of the countervailing benefits of wind energy or, as discussed further below, its potential compatibility with habitat protection at any sites within the 1.1 million acres to be covered by easements, would be contrary to the critical national goals of promoting clean, renewable wind energy. Clean energy presents one of the best means to reduce greenhouse gas emissions and their contribution to climate change, which the EA acknowledges “presents additional challenges to habitat conservation in the [Flint Hills]” (EA, p. 21). Accordingly, we urge to the FWS to consider these benefits in its further evaluation of this Program.</p>	<p><b>Response 27.1.</b> The Fish and Wildlife supports U.S. Department of Interior policy on renewable energy development, including Secretarial Orders 3285 and 3289. However, the strategies contained in these Secretarial Orders are to be addressed for appropriate areas on <i>public</i> lands and the outer continental shelf. The FHLCA project would be administered as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, executive orders, regulations, and policies (see page 6 of the final EA).</p> <p>A significant directive of the Refuge Administration Act is to ensure that the U.S. Fish and Wildlife Service maintains the biological integrity, diversity, and environmental health of the National Wildlife Refuge System for present and future generations of Americans. Fragmentation of the National Wildlife Refuge System’s wildlife habitats is a direct threat to the integrity of the National Wildlife Refuge System, both today and in the decades ahead. Uses that the Service reasonably anticipates may reduce the quality or quantity or fragment habitats on a national wildlife refuge would not be consistent with Service policy.</p> <p>Currently the FHLCA provides a significant north-south migration corridor for grassland birds, and links many areas of high quality tallgrass habitat (page 14 of the final EA). Retaining migratory corridors is a key adaptation strategy for wildlife response to climate change (USFWS 2009).</p> <p><b>Response 27.2.</b> The Service respectfully disagrees with the assessment that an overbroad presumption has been made. Although wind energy and grassland habitat preservation may be compatible, the biological requirements vary for wildlife species and location. In some areas, such as some areas of North and South Dakota, initial studies indicate that waterfowl are able to use areas with wind energy development.</p> <p>The proposed Wind Turbine Guidelines Advisory Committee recommendations are currently under review by the Secretary of Interior, and are not approved policy. Upon approval, the Service will incorporate the policy for the FHLCA project, including the proposed Tier 1 evaluation and the considerations listed for sage and prairie grouse that merit special attention for several reasons.</p>
<p><b>27.2</b></p>	<p><b>Comment 2 – Failure to consider the Wind Turbine Guidelines Advisory Committee report.</b> Throughout the EA, wind energy is presumed to be inherently and unavoidably incompatible with habitat protection. There is no recognition of even the possibility that careful siting, with the use of best practices and mitigation measures during project</p>	

**Comment #**

**Letter # 27**

**Response**

construction and operation, could allow wind energy and habitat to coexist within the FHLCA. This overbroad presumption is unsupported and inconsistent with other FWS guidance and actions.

On March 4, 2010, the Acting Director of FWS transmitted to the Secretary of the Interior a report by the Wind Turbine Guidelines Advisory Committee ("Advisory Committee"), convened under the Federal Advisory Committee Act, which included representatives of FWS, the Department of Energy, other federal, state and tribal governments, wildlife conservation organizations and the wind industry. This diverse and broadly representative group recommended to the Secretary a set of guidelines that provide a tiered approach for case-by-case, site-specific analysis of wind energy proposals. The guidelines do *not* presume that wind power generation and habitat protection are inherently incompatible. On the contrary, the Tier 1 analysis considers "landscape considerations" and habitat fragmentation issues, while later tiers (Report, pp. 34-35 and 41-42) consider the issues of tallgrass prairie habitat and protection for prairie chickens and sage grouse. Specifically, on these issues, the guidelines call for case-by-case investigation at multiple stages in the tiered process, in contrast to the EA's presumption of categorical incompatibility with wind energy in prairie chicken and sage grouse habitat.

While carefully addressing habitat fragmentation issues, both substantively and procedurally, the Advisory Committee report contains nothing that would justify broadly excluding whole swaths of a state from wind energy development without any real review of whether or not wind development is compatible with the conservation goals of the FHLCA. The Advisory Committee report (Report, p. 13) also notes that the Secretary of the Interior has directed FWS and other Department of Interior bureaus to develop "Landscape Conservation Cooperatives" for identification of large-scale areas for protection from fragmentation through a "collaborative process" involving all interested stakeholders.

Yet, even though this four-year effort by FWS and many stakeholders just reached its conclusion, FWS now proposes a Program that would unilaterally and preemptively remove an area of up to 1.1 million acres from consideration under the Advisory Committee's guidelines, thereby disregarding the carefully formulated, elaborate tiered review process before it has even been considered by the Secretary of the Interior. In fact, the EA – issued on April 15, 2010, more than a month *after* the release of the Advisory Committee report – fails to even mention the existence of the report or the extensive public debate on these issues that led to the formation of the Advisory Committee and its assignment to consider both the interests of habitat protection and wind energy development. Therefore, AWEA and the Wind Coalition urge the FWS to consider revising the EA, both to take the report's directly relevant analysis and conclusions into account, and to be consistent with the Secretary's forthcoming decision on adoption of the guidelines that is expected shortly.

**Comment 3 – Failure to prepare an EIS.** Should FWS proceed with carving out such a large region wholesale from wind energy development, thus rejecting the Advisory Committee's case-by-case approach, an Environmental Impact Statement ("EIS") and not

**27.3**

"[The] scale and biotic nature of habitat requirements, ranges and habitats are highly congruent with the nation's richest inland wind resources, known impacts of anthropogenic features (tall buildings, structures, energy facilities, roads, etc.)" (Wind Turbine Advisory Committee Draft, USFWS 2010).

Text on page 26 of the draft EA has been revised to include Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines (USFWS 2003) which recommends avoiding "placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds)." While wind turbines may be compatible with some wildlife species in other areas of Kansas, the Flint Hills tallgrass prairie-dependent species have demonstrated sensitivity to vertical structures and habitat fragmentation.

The US Fish and Wildlife Service will continue to work collaboratively with individuals, nongovernment organizations, federal, state, and local agencies on a variety of issues, including renewable energy development. The Service has initiated a program using LCCs as a means of addressing conservation and climate change challenges through partnership opportunities (see page 35 of the final EA). Although all of the LCCs have not been formally initiated yet, the FHLCA will be an active partner in the Eastern Tallgrass and Big Rivers LCC.

**Response 27.3.** After receiving largely supportive comments and input from public scoping meetings and discussions with a number of organizations, state, and federal agencies, the Service determined that the appropriate National Environmental Protection Agency (NEPA) document to prepare for the FHLCA project was an EA.

Significant controversy has been defined as "circumstances where a substantial dispute exists as to the environmental consequences of the proposed action and does not refer to the existence of opposition to a proposed action, the effect of which is relatively undisputed" (43 CFR 73 page 61299).

The FHLCA project will utilize voluntary conservation easements that would be acquired from willing sellers only. Landowners could continue to pursue energy development on their land without Service conservation easements. The easement program would to a large extent maintain the existing conditions for landowners and the general public, and will not significantly affect the quality of the

Comment #	Letter # 27	Response
<p><b>27.4</b></p>	<p>an EA is the appropriate document for the NEPA evaluation. Agencies proposing “major federal actions” must take a “hard look” at their environmental impacts to inform both the public and decision-makers of the consequences of proceeding with a proposed major action. FWS’s own NEPA procedures provide that an EIS, not an EA, is required for:</p> <p>major proposals establishing new refuge system units, fish hatcheries, or major additions to existing installations, which involve substantive conflicts over existing State and local land use [or] significant controversy over the environmental effects of the proposal. . .</p> <p>U.S. Department of the Interior, Departmental Manual, Part 516, Chapter 8: Managing the NEPA Process – U.S. Fish and Wildlife Service, section 8.7. While the FHLCA may not be a refuge, its 3.3 million acre scope is larger than any actual refuge in the continental United States, and only one refuge outside Alaska is larger than the 1.1 million acres to be placed under conservation easement (<a href="http://en.wikipedia.org/wiki/List_of_largest_National_Wildlife_Refuges">http://en.wikipedia.org/wiki/List_of_largest_National_Wildlife_Refuges</a>). The purported conflict between habitat protection and wind development, as well as the potential impacts on wind energy and resulting indirect impacts on climate change and the environment (discussed in more detail below), are clearly matters of substantial conflict over land use. Thus, the Program is clearly a major federal action requiring a full EIS.</p> <p><b>Comment 4 – Unsupported presumption of wind energy incompatibility with prescribed burning.</b> The EA summarily dismisses wind energy development and habitat protection as incompatible primarily for two reasons: purported constraints on maintaining tallgrass prairie by prescribed burning, and visual or barrier impacts causing prairie chickens and other bird species to avoid the area, resulting in fragmentation of their habitat (EA, pp. 5, 22-24). On the first issue, the EA cites no evidentiary support for its claim that “[i]ncreased wind energy development would limit prescribed burn activities” (p. 27). In fact, this claim is not correct. Wind energy developers do not ask that landowners refrain from their current practices of agricultural burning and, currently, wind farms exist on lands that utilized prescribed burning without conflict. Other habitat preservation measures, such as prevention of tree encroachment and exclusion of invasive species, can also be carried out by landowners, wind project operators or others with no impacts on wind operations.</p> <p>We note that the Tallgrass Legacy Alliance (“TLA”), for which FWS serves as an Advisor, compiled a Top Five List of threats to the tallgrass regions in Kansas (<a href="http://www.fws.gov/mountain-prairie/pf/w/kansas/ks7.htm">http://www.fws.gov/mountain-prairie/pf/w/kansas/ks7.htm</a>). Wind energy development was not included on that list, but certain land management practices were. Specifically, agricultural impacts (<i>i.e.</i>, cattle ranching) were cited as two of the top five threats to tallgrass habitat in Kansas. Nevertheless, the EA fails to consider the threats posed by such incompatible land management practices and instead focuses on other perceived threats, such as wind energy development.</p>	<p>human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).</p> <p>Under DOI Departmental Manual 516 DM 8.6, Actions Normally Requiring an EA include proposals to establish most new refuges and fish hatcheries; and most additions and rehabilitations to existing installations.</p> <p>U.S. Department of Interior; Departmental Manual, Part 51, Chapter 8.7B:</p> <p>“If, for any of the above proposals it is initially determined that the proposal is not a major federal action significantly affecting the quality of the human environment, an EA will be prepared and handled in accordance with 40 CFR 1501.4(e)(2). If the EA subsequently indicates the proposed action will cause significant impacts, an EIS will be prepared.”</p> <p>The FHLCA project is one of the larger units of the refuge system in the continental United States, but there are several larger management areas in the continental United States. For accurate information on national wildlife refuge lands see the Service website (<a href="http://www.fws.gov/refuges/land/LandReport.html">http://www.fws.gov/refuges/land/LandReport.html</a>).</p> <p><b>Response 27.4.</b> Pages 23–26 of the final EA contain general language on fragmentation and the increased difficulty of conducting prescribed fire, which is necessary to limit tree encroachment, when the level of infrastructure development is increased.</p> <p>The text will be changed in the final EA to say that fragmentation from wind energy infrastructure “could make prescribed fire more difficult to implement” instead of “would limit”. Although wind energy developers may not ask landowners to refrain from burning, the logistics and feasibility of burning around structures and roads makes prescribed fire more difficult (see page 25 of the final EA).</p> <p>The Tallgrass Legacy Alliance information on the Partners for Fish and Wildlife webpage lists fragmentation as the number two threat to tallgrass prairie. As is described in the EA, fragmentation of prairie habitat for grassland-dependent wildlife can result from a number of sources, including wind energy infrastructure.</p> <p>The FHLCA is a voluntary participation program for landowners. Energy and infrastructure development would only be restricted on the parcels offered by willing sellers that are accepted by the Service as an appropriate conservation easement purchase. Landowners could continue to pursue energy development on their land without Service conservation easements.</p>
<p><b>27.5</b></p>	<p style="text-align: center;">4</p>	<p>The Tallgrass Legacy Alliance information on the Partners for Fish and Wildlife webpage lists fragmentation as the number two threat to tallgrass prairie. As is described in the EA, fragmentation of prairie habitat for grassland-dependent wildlife can result from a number of sources, including wind energy infrastructure.</p> <p>The FHLCA is a voluntary participation program for landowners. Energy and infrastructure development would only be restricted on the parcels offered by willing sellers that are accepted by the Service as an appropriate conservation easement purchase. Landowners could continue to pursue energy development on their land without Service conservation easements.</p>

**Comment #**

**Letter # 27**

**Response**

prairie-chickens and other grassland bird species, the Advisory Committee report thoroughly reviewed the most current research on this issue and, as noted above, recommended a multi-tiered evaluation process for appropriate siting decisions, not a categorical ban on wind energy over large areas. AWEA and the Wind Coalition encourage FWS to take into account the Advisory Committee's conclusions as well as all of the current research (not only the limited studies cited in the EA), in a full EIS evaluation.

We also note that a categorical ban on this basis is inconsistent with FWS's own 2003 Interim Guidance on Avoiding or Minimizing Impacts from Wind Turbines ("Interim Guidance"), Appendix 6 and Attachment 2 of that document (Interim Guidance, pp. 40-44) evaluated then-available research for the express purpose of providing "guidance for considering compatibility determinations" and concluded that "current biological information" indicated that a low density of wind turbines "would not have any significant impact to grassland habitat and its value to migrating birds or other wildlife" (Interim Guidance, p. 40). By incorporating best practices and mitigation measures, such as siting facilities close to existing roads or on the edges of grassland tracts and incorporating buffer zones, FWS concluded that wind energy construction and maintenance could be accomplished "in such a manner as to minimize the destruction or alteration of habitat" (*id.*).

FWS took a similar approach in its November 2005 Biological Opinion for the Bureau of Land Management ("BLM") Wind Energy Development Program covering nine western states. In that analysis, FWS found that best management practices and mitigation measures were sufficient to conclude that the BLM program would not likely adversely affect nine target species, critical habitat or additional listed species (which included gallinaceous birds) (Biological Opinion, p. 2).

AWEA and the Wind Coalition acknowledge that wind energy development may, under some circumstances, impact birds and wildlife. However, the EA does not perform any evaluation to identify such instances and the ways to mitigate them, such as considering a range of development density alternatives or other mitigation measures. That is precisely the sort of analysis of impacts, alternatives, and mitigation that a NEPA document should contain. Instead, the EA conclusively presumes an unmitigable, categorical incompatibility, and, therefore, the Program imposes a blanket prohibition of any wind development in all easement lands. NEPA requires a complete evaluation of all readily available information and a weighing of competing evidence, especially when the information is readily available to FWS from its own 2003 evaluation and 2005 Biological Opinion and its lead role in the 2007-2010 Advisory Committee process. In contrast, the EA's summary presumptions do not provide such an evaluation, and fail to present the informed decision-making prescribed by NEPA.

**Comment 6 – Failure to consider impacts of precluding wind energy.** In a mere two sentences within the discussion of biological effects of the No Action Alternative, the EA briefly recognizes the "high potential for wind development in the region" and that "[w]ind power offers an emission-free source of electricity and lacks many of the

The decision to not allow wind energy structures on conservation easements in the FHLCA was based on available research that indicates while wind turbines may be compatible with some wildlife species in other areas, the Flint Hills tallgrass prairie dependent species have demonstrated sensitivity to vertical structures and habitat fragmentation.

**Response 27.5.** See the responses to comments 27.1 and 27.2.

The Fish and Wildlife supports U.S. Department of Interior policy on renewable energy development, including Secretarial Orders 3285 and 3289. However, the strategies contained in these Secretarial Orders are to be addressed for appropriate areas on public lands and the outer continental shelf. The FHLCA project would be administered as part of the Refuge System in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, executive orders, regulations, and policies (see page 6 of the final EA).

A significant directive of the Refuge Administration Act is to ensure that the U.S. Fish and Wildlife Service maintains the biological integrity, diversity, and environmental health of the National Wildlife Refuge System for present and future generations of Americans. Fragmentation of the National Wildlife Refuge System's wildlife habitats is a direct threat to the integrity of the National Wildlife Refuge System, both today and in the decades ahead. Uses that the Service reasonably anticipates may reduce the quality or quantity or fragment habitats on a national wildlife refuge would not be consistent with Service policy.

The FHLCA project would use voluntary conservation easements that would be acquired from willing sellers only. Landowners could continue to pursue energy development on their land without Service conservation easements. The easement program would to a large extent maintain the existing conditions for landowners and the general public, and will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).

Although wind energy development is not inherently compatible, or incompatible, with wildlife and habitat protection, an assessment needs to be made based on the requirements of the species involved. Available studies indicate tall vertical structures fragment large tracts of otherwise appropriate habitat, making it unsuitable for interior grassland species such as greater prairie-chicken in Kansas. A number of authors have addressed the fragmentation

**27.6**

Comment #	Letter # 27	Response
<p><b>27.7</b></p>	<p>environmental hazards associated with fossil fuels" (EA, pp. 22-23). The EA then ignores these benefits and instead stresses that wind energy represents a risk for the Flint Hills area such that "economically viable wind resource areas and conservation priority areas show a high level of geographic congruence" (EA, p. 23). The EA somewhat indirectly acknowledges the positive socioeconomic impacts to landowners from wind energy development, finding that under the No Action alternative they could obtain revenue from wind development, while under the Proposed Action alternative they would receive "some financial compensation" by selling easements (EA, p. 27-28). Moreover, for a program whose intent appears to be to categorically exclude wind energy development from a large area, the EA contains no section on impacts to "energy resources" at all, and concludes that the Proposed Action alternative will have no direct or indirect unavoidable adverse impacts to the environment (EA, p. 28). In addition, despite the EA's detailed discussion of climate change effects on the Flint Hills habitat (EA, pp. 11-12), and inclusion of buffering against climate change in the Program's purpose and need (EA, p. 6), the EA makes no mention of the benefits of wind energy in the context of climate change and its ability to avoid the conservation challenges posed by climate change through the avoidance of its cause: greenhouse gases.</p> <p>The NEPA analysis should have considered whether adverse environmental impacts could result from precluding wind energy development in easement lands. In general, wind generation results in greatly reduced land disturbance compared to other energy sources, including solar energy; does not produce air pollutant or greenhouse gas emissions from generating operations and produces only minor emissions from construction and maintenance activities; and involves far less water use and waste generation. See, e.g., BLM, Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States (2005), pp. 6-21 to 6-25. For these reasons, among others, increased wind generation is a key component of the country's strategic efforts to shift to more renewable energy resources and address climate change.</p> <p>Achieving the environmental benefits of developing the nation's renewable energy resources and preserving valuable habitat is usually compatible. In the rare instance in which those goals are not, an agency should take a "hard look" at how, if possible, to reconcile these goals. Congress adopted NEPA to ensure that federal agencies undertook such a hard look before making decisions. In this case, the EA did not take the requisite hard look to support a decision to forego all prospects of wind energy development in the FHLCA, precluding even the possibility of case-by-case consideration as provided in the Advisory Committee guidelines. NEPA, of course, does not bar FWS from making such a decision, but it does require the decision to be fully informed before doing so. AWEA and the Wind Coalition believe that the EA's failure to engage in that type of informed decision-making is inconsistent with the precepts of the NEPA process.</p> <p><b>Comment 7 – Failure to provide a balanced analysis.</b> The EA addresses none of the above issues and, therefore, does not achieve the goals of a fully informed NEPA document. Instead, it appears to display a uniformed bias against wind energy development rather than the balanced assessment and disclosure required by NEPA. For</p>	<p>effects of infrastructure on prairie grouse (Kuvlesky et al. 2007, McDonald et al. 2009, Giesen 1994, Fuhlendorf et al. 2002, Robel 2002). See additional specific information on ecological impacts and responses of fragmentation pages 23–26 of the final EA.</p> <p>The statement that current biological information "indicated that a low density of wind turbines would not have any significant impact to grassland habitat and its value to migrating birds or other wildlife" is not made in the Interim Guidance, page 40. It is stated that "information available at this time indicates that turbine densities at this level will not materially interfere with or detract from the purposes of the easement (Attachment 2). The species list referred to in Appendix 6, Attachment 2 is for North and South Dakota, and largely for different bird species than the priority species guild for the tallgrass prairie habitat of FHLCA. The Service examines species habitat requirements for each particular area.</p> <p>The Bureau of Land Management 2005 Biological Opinion does not cover the state of Kansas, or the wildlife and habitat resources that wind energy development would affect in the Flint Hills. Additionally, BLM has a "multiple use" mission including the development of minerals and energy production, which is a different focus from the Service's "wildlife first" mission. See the response to comment 27.1.</p> <p>Also, see the response to comment 27.4.</p> <p><b>Response 27.6.</b> Although the Service supports renewable energy development, the EA analyzes the impact from fragmentation on the trust resources in general, and it is not within the scope of the project to provide an analysis of the impact of all forms of energy development. It is also beyond the scope of this project to incorporate a discussion of all national policies, energy programs, recommendations, and initiatives. See also the response to comment 27.4.</p> <p>It is not within the scope of this project to determine how much energy can or would be generated by the development of wind, oil and gas, or any other type of energy within the FHLCA. The energy, and any revenues generated, will be determined by the number of landowners willing to sell the development rights on their non-easement property.</p>

Comment #	Letter # 27	Response
<p><b>27.8</b></p>	<p>instance, the EA explains at length that the No Action alternative will result in environmental consequences from allowing wind energy development, but ignores the fact that the Proposed Action alternative would also result in environmental consequences from precluding wind energy development in the same area.</p> <p>NEPA documents are not meant to provide such a one-sided analysis. The Council on Environmental Quality ("CEQ") regulations requires NEPA documents to consider "indirect effects" that are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." 40 C.F.R. § 1508.8(b). Notwithstanding the EA's assertion of no indirect impacts (EA, p. 28), precluding wind energy from all of the 1.1 million acres of area (which has high development potential for wind energy) is a reasonably foreseeable – in fact, an intended – result of the Program that will have effects that should have been considered in more detail. If wind development is not too speculative to be part of the EA's purpose and need and be addressed in an analysis of impacts in the No Project alternative, then it is also not too speculative to be included in analysis of impacts from the Proposed Action alternative.</p> <p><b>Comment 8 – Unsupported claim regarding wind development redistribution.</b> In lieu of analyzing adverse impacts resulting from preclusion of wind projects, the EA (p. 26) asserts that "the proposed action would affect the location and distribution, but not rate or density, of wind energy infrastructure development." There is no further discussion beyond this sentence and no evidentiary support is cited for that claim. This claim is inaccurate for several reasons. First, the 1.1 million acre area to be covered by easements is simply too large to reasonably expect that projects can be readily relocated, with no effect whatsoever on the progress of wind development in the region. Second, the proposed conservation area embodies a large north-south swath of the state. Since power transmission lines would be prohibited on easement lands, wind generation projects would have difficulty relocating to the west while still reaching the primary electricity markets to the east. Finally, as the EA acknowledges, FWS and conservation groups are planning further habitat protection initiatives in the region in the future, which will limit relocation opportunities for wind projects (see comment below regarding cumulative impacts).</p> <p><b>Comment 9 – Inadequate project description.</b> Another problem with the NEPA evaluation is that neither the EA nor the LPP actually discloses the proposed conservation easement terms. All that is stated, in a single sentence, is that the "conservation easements would not permit commercial and industrial-scale development of wind energy" and other forms of development (EA, p. 24). Given that the whole action consists of a program to place easements on properties within the conservation area, more detailed information on what terms the easements will contain is essential. In other words, in NEPA terminology, there is no adequate project description.</p> <p>The LPP (p. 4) states that easements will use "similar language and terms" compared to those of FWS's "standard conservation easement agreements" – although, again, the standard agreement terms are not disclosed. However, the standard terms apparently do not, in fact, prohibit wind energy development. On the contrary, FWS's 2003 Interim</p>	<p>The FHLCA project will utilize voluntary conservation easements that would be acquired from willing sellers only. Landowners could continue to pursue energy development on their land without Service conservation easements. The easement program would to a large extent maintain the existing conditions for landowners and the general public, and will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).</p> <p>Although the Service supports renewable energy development, it is beyond the scope of this project to incorporate a discussion of all national policies, energy programs, recommendations, and initiatives.</p> <p>Through the FHLCA project the Service seeks to conserve part of remaining 4% of relatively intact tallgrass prairie habitat, thereby providing more system resiliency in a changing climate by maintaining a migration corridor for migratory grassland birds, and also by providing carbon sequestration benefits (page 27 of the final EA).</p> <p>The statement that "developing renewable resources and preserving valuable habitat is usually compatible" needs to be assessed with specific information on the species potentially affected.</p> <p><b>Response 27.7.</b> The Service respectfully disagrees with the assessment that it is biased against wind, or other forms of energy development.</p> <p>On properties where wind, oil and gas, or mineral rights have already been sold (severed from the estate), the Service will work with landowners and developers to minimize any negative impacts of development and extraction activities (50 CFR 25.11). On land where the rights for wind, oil and gas, or mineral development have not been sold (estate is still intact), conservation easements would require nonsurface occupancy (off-site development) for any future development activities. The Service would consider development of energy and mineral resources on the easement properties, if they can be implemented without disturbing the surface or creating vertical barriers, which would fragment the grassland habitat for wildlife.</p> <p>The easement program would to a large extent maintain existing conditions for landowners and the general public,</p>
<p><b>27.9</b></p>	<p style="text-align: right;">7</p>	

Comment #	Letter # 27	Response
<p><b>27.10</b></p>	<p>Guidance, Appendix 6 (p. 41), states that FWS managers may “negotiate with the energy company and the easement landowner to allow wind development consistent with the purposes of the conservation easements” and that low-density “development [may be] found to be compatible with easement purposes.” Accordingly, it is not clear how “similar language” to the standard form language would categorically prohibit wind development. In sum, the lack of a clear description of the easement terms leaves decision-makers and the public with no clear understanding of the restrictions that would be placed on easement lands and their consequences.</p> <p><b>Comment 10 – Failure to analyze reasonable alternatives.</b> It has been often stated that the “alternatives analysis is the heart of NEPA.” The EA considers only two alternatives, the No Action alternative and the Proposed Action for acquiring conservation easements to preclude wind energy development on up to 1.1 million acres (EA, p. 24). Given the need to promote the interests of habitat protection and clean, renewable energy, the EA should have considered at least two other reasonable alternatives that might better satisfy both goals:</p> <p>(1) <i>Reduced Scope Alternative</i>, with a smaller acreage placed under conservation easements. This alternative would allow some portions of the Flint Hills area to be open for possible wind energy development, if determined appropriate under the case-by-case analysis recommended by the Advisory Committee; and</p> <p>(2) <i>Balanced Use Alternative</i>, with less restrictive easement terms that would restrict residential and other forms of habitat-fragmenting development on the full 1.1 million acres, but would allow for the possibility of wind energy development, again where appropriate under the case-by-case analysis recommended by the Advisory Committee.</p> <p>Both alternatives should be fairly evaluated in an EIS. Moreover, FWS itself recognized in the 2003 Interim Guidance, Appendix 6, that landowners who anticipate greater income from wind generation than from selling easements may not agree to voluntarily place their property under easements. As the Interim Guidance (p. 42) notes, “In this respect, the future success of the easement program could be compromised if these restrictions are unnecessary.” In other words, FWS’s own goals of habitat protection under the Program could be seriously undercut by the blanket exclusion of wind development, failing to allow any projects even in areas that, upon careful evaluation, could be found to compatibly support both wind energy and habitat protection. This point lends further support to the need to evaluate alternative (2), above, with less restrictive easement terms.</p>	<p>will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27). In effect, the conditions and consequences of precluding wind energy are currently being realized.</p> <p><b>Response 27.8.</b> The language has been revised in the final EA to provide clarification (see page 28 of the final EA).</p> <p>There is no expectation of relocation of any infrastructure covered by permits or leases that are already in place.</p> <p>Additionally, there is an established transmission grid in Kansas already (see the map at <a href="http://kec.kansas.gov/chart_book/Chapter6/02_KSWindEnergyElectricTransMap.pdf">http://kec.kansas.gov/chart_book/Chapter6/02_KSWindEnergyElectricTransMap.pdf</a>)</p> <p><b>Response 27.9.</b> The easement document is not a required NEPA component of the EA, and is not a description of a project. The possible terms, conditions, and requirements of Service conservation easements in general and specific issues for the FHLCA were discussed extensively in all of the public meetings. As is with other Service easements, and other conservation organization easements in the Flint Hills, the FHLCA easements will contain restrictions on development (residential and commercial structures), and will be in perpetuity. The final easement document developed by the Realty Division will incorporate the requirements and biological needs of the trust wildlife resources in the FHLCA, with what landowners have indicated through comments at meetings and letters will be acceptable to them. Most of the comments the Service received related to wind energy expressed support for the exclusion of commercial development in the Flint Hills.</p> <p><b>Response 27.10.</b> The decision of whether to establish a new unit Conservation Area of the National Wildlife Refuge System is a decision of whether to proceed with establishment, or not. Thus, typically, Conservation Area LPPs typically involve two alternatives, a no action (non-acquisition alternative), or an acquisition option that will establish a new unit of the National Wildlife Refuge System.</p> <p>The text of the draft EA has been revised to reflect the additional alternatives that were considered, but not studied further, such as fee-title acquisition, or an option considering a much larger, or smaller, project boundary.</p>
<p><b>27.11</b></p>	<p><b>Comment 11 – Inadequate cumulative impacts analysis.</b> The EA (p. 29) also cursorily dismisses the issue of significant cumulative impacts. As the EA (p. 2) notes, the FHLCA is part of a larger “landscape-scale, strategic habitat conservation effort.” While the immediate goal is to place up to 1.1 million acres under conservation easements, representing 1/3 of the 3.3 million acre conservation area, the “long-term project goal” is to protect roughly half of the 3.3 million acre total (EA, p. 3). “Related actions and</p>	<p><b>Response 27.10.</b> The decision of whether to establish a new unit Conservation Area of the National Wildlife Refuge System is a decision of whether to proceed with establishment, or not. Thus, typically, Conservation Area LPPs typically involve two alternatives, a no action (non-acquisition alternative), or an acquisition option that will establish a new unit of the National Wildlife Refuge System.</p> <p>The text of the draft EA has been revised to reflect the additional alternatives that were considered, but not studied further, such as fee-title acquisition, or an option considering a much larger, or smaller, project boundary.</p>

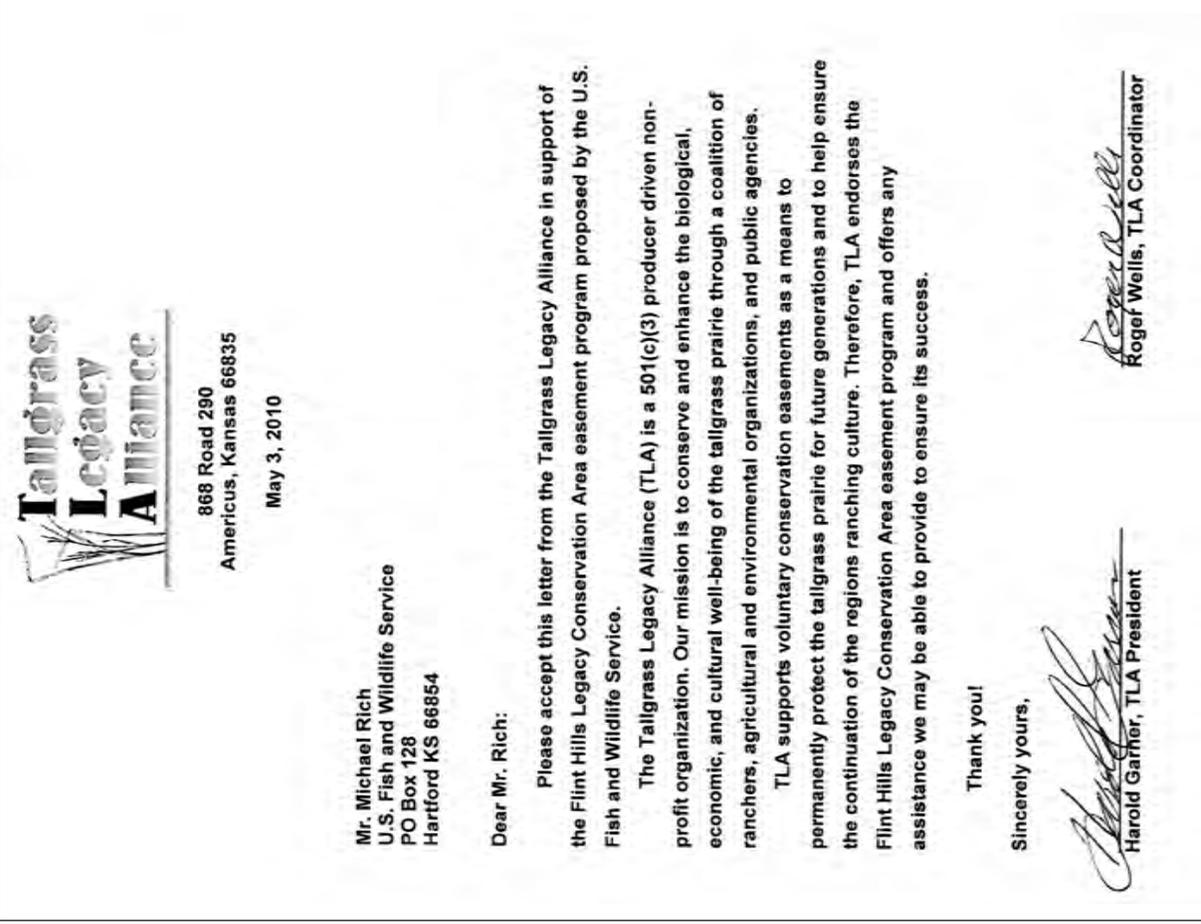
Comment #	Letter # 27	Response
27.12	<p>activities" acknowledged in the EA include tens of thousands of additional acres in the region, held under easement by nongovernmental conservation entities (EA, pp. 7-8). Finally, future phases of expanding the conservation area into Oklahoma are planned (EA, p. 10).</p> <p>NEPA requires an evaluation of the cumulative impacts of the proposed action, together with those of other, reasonably foreseeable, actions. See CEQ NEPA regulations, 40 C.F.R. section 1508.7. Related actions generally are included in NEPA documents for purposes of identifying cumulative impacts. However, the EA does not provide a substantive analysis of cumulative impacts, thus underestimating the combined effect of long-term plans for expanding regional land use restrictions, as well as overestimating the feasibility of relocating wind projects, as discussed above.</p> <p><b>Comment 12 – Failure to acknowledge irreversible and irretrievable commitment of land and wind energy resources.</b> As required by NEPA, the EA (p. 28) considers whether there would be any "irreversible or irretrievable commitment of resources" associated with establishing the Program, and finds that no such commitment would occur. This finding is contradicted by the EA's express intent to "preclude . . . wind energy development on private land" (p. 27; see also p. 5) together with its statements regarding the "high potential for wind development in the region." The EA further states that the factors for prioritizing areas for the purchase of conservation easements within the conservation area would be based on the biological needs of species of concern, the threat of development, connectivity with other protected lands and quality of prairie habitat (EA, p. 9; see also LPP, pp. 5-6 (identifying priority areas)). Accordingly, the consideration of potential wind energy development is not even to be considered when selecting properties for easements in perpetuity, within the boundaries of the FHLCA.</p> <p>AWEA and the Wind Coalition believe that placing up to 1.1 million acres of private lands under restrictive easements, which do not allow for wind energy development for perpetuity, constitutes an irreversible or irretrievable commitment of resources. In failing to acknowledge this commitment to the public and decision-makers, the EA is inadequate as an informational document that is consistent with NEPA principles.</p> <p><b>Comment 13 – Timing of NEPA review and decision.</b> Finally, we note that there is a procedural error in the statement in the EA on p. 6, under the heading "Decisions to be Made", that FWS will first "[d]etermine whether the Service should establish the Flint Hills Legacy Conservation Area" and then, "[i]f yes, determine whether the selected alternative would have a significant impact" and either make a Finding of No Significant Impact based on the EA, or prepare an EIS. On the contrary, NEPA requires an agency, using whatever form of document, to complete its analysis of environmental impacts and alternatives, including the No Action alternative – that is, the alternative of determining that FWS should <i>not</i> establish the conservation area – <i>before</i> making the decision to proceed with the action.</p>	<p>When the decision to establish a new refuge is being made, Service policy is to acquire land only when other means, such as zoning or regulation, of achieving program conservation goals and objectives are not appropriate, available, or effective. When lands are to be acquired, the minimum interest necessary to reach management objectives is considered. If fee-title is required, full consideration will be given to extended use reservations, exchanges, or other alternatives that will lessen the impact on the landowner and the community.</p> <p>A rationale of why the Service has decided to use conservation easements to achieve its conservation purposes for the FHLCA project instead of other alternative is given under the "Alternatives Considered but not Studied" section on page 10 of the final EA. The analysis and information provided throughout the EA led to the definition of the project approved acquisition boundary and the maximum acreage to be acquired by the Service for the FHLCA. Some of the factors considered in the EA include the narrowness of the intact prairie habitat in the north-south migration corridor; the rapid encroachment by trees, residential, and commercial development. The project acquisition acreage represents less than 1% of the physiographic boundary of the historic range of tallgrass prairie and only 2% of the potential wind energy development in Kansas.</p> <p>Less than 4% of intact tallgrass habitat remains in North America, the majority of which is located in the Flint Hills of Kansas. To adequately maintain the grassland bird migration corridor, genetic viability of the greater prairie-chicken, the minimum goal is the conservation of what amounts to less than 1% of the remaining tallgrass prairie, when fully appropriated.</p> <p>A "balanced use approach" that would allow wind infrastructure only, while excluding other types of development would still fragment grassland habitat and would not be appropriate for this project.</p> <p><b>Response 27.11.</b> See response to comment 27.1 and 27.8.</p> <p>Several comments were received from the public on the possibility of the addition of a conservation program for the tallgrass prairie habitat located in Oklahoma. Region 2 of the Service will take into consideration the possibility of future tallgrass conservation efforts in Oklahoma.</p> <p><b>Response 27.12.</b> The FHLCA project will utilize voluntary conservation easements that would be acquired from willing sellers</p>
27.13	<p style="text-align: center;">9</p>	

<p><b>Comment #</b></p>	<p><b>Letter # 27</b></p>	<p><b>Response</b></p>
<p><b>27.14</b></p>	<p>Thank you for considering our comments. We look forward to working with FWS on the further refinement of its Program proposal in a manner that promotes the protection of the nation's biological resources and the use of environmentally sustainable wind energy.</p> <p>Sincerely,</p> <p>Gene Grace Senior Counsel</p> <p>Tom Vinson Director of Federal Regulatory Affairs</p> <p>American Wind Energy Association Suite 1000 1501 M St, NW Washington DC 20005 Phone: (202) 383-2521 Fax: (202) 383-2505 E-mail: ggrace@awea.org</p> <p>Paul Sadler Executive Director Wind Coalition 100 Congress Ave., Ste. 800 Austin, Texas 78701 Phone: (512) 651-0291 E-mail: ExecutiveDirector@Windcoalition.org</p>	<p>only. Landowners could continue to pursue energy development on their land without Service conservation easements. The easement program would to a large extent maintain the existing conditions for landowners and the general public, and will not significantly affect the quality of the human environment, and will not have a close causal connection to a change in the physical environment (40 CFR 1508.27).</p> <p>Although it is not necessary to address "the relationship between short-term uses of man's environment and the enhancement of long-term productivity" and "irreversible or irretrievable commitments of resources" in an EA, the text has been revised to include additional information in the "Irreversible and Irretrievable Commitments of Resources" section on page 30 of the final EA.</p> <p><b>Response 27.13.</b> The first sentence under "Decisions to be Made" states that the Service planning team will complete an analysis (EA), and then based on this analysis, will proceed with the decision-making process.</p> <p><b>Response 27.14.</b> Thank you for your comments.</p>

Comment #	Letter # 28	Response
28	<p><b><u>Protect The Flint Hills</u></b>                      The Last Expanse of Tallgrass Prairie                      5694 NW 50<sup>th</sup>                      El Dorado, KS 67042</p> <p>Amy Thornburg, Land Protection Planning                      U.S. Fish and Wildlife Service                      P.O. Box 25486, DFC                      Denver, Colorado 80225</p> <p>May 11, 2010</p> <p>Dear Ms. Thornburg:</p> <p>The purpose of this letter is to enthusiastically support the <b>Flint Hills Legacy Conservation Area</b>, as proposed by the U.S. Fish &amp; Wildlife Service.</p> <p>The North American Tallgrass Prairie is one of our most endangered ecosystems. Less than 4% of the original ecosystem remains and most of it is located in the Kansas Flint Hills. The FHLCA initiative offers a realistic plan to preserve this vanishing ecosystem while leaving the land in private hands.</p> <p>Conservation easements are one of the most efficient and cost effective methods of preserving the Tallgrass Prairie for future generations of Americans. Many organizations, including The Nature Conservancy, Kansas Land Trust, USDA, Ranchland Trust of Kansas and Kansas Department of Wildlife &amp; Parks already fund conservation easements in the Flint Hills; however, these organizations need the assistance of the USFWS if the Tallgrass habitat is to be preserved on a large landscape scale.</p> <p>The U.S. Fish &amp; Wildlife's goal of 1.1 million acres of conservation easements will, in conjunction with private landowners and land trusts, ensure that the Flint Hills Tallgrass ecosystem remains largely unfragmented.</p> <p>Protect the Flint Hills is a grass roots organization of citizens who are dedicated to the conservation of the wide-open spaces of the Kansas Flint Hills, the last significant expanse of Tallgrass Prairie on the continent. We applaud the creation of the Flint Hills Legacy Conservation Area and are eager to help the United States Fish &amp; Wildlife Service make the plan a reality.</p> <p>Sincerely,                        Larry R. Patton, President                      Protect the Flint Hills                      5694 N.W. 50<sup>th</sup>                      El Dorado, Kansas 67042                      620-752-3455</p>	<p><b>Response 28.</b> Thank you for your comments.</p>

Comment #	Letter # 29	Response
29	 <p>Protecting nature. Preserving life.                      May 11, 2010</p> <p>Mr. Mike Rich, Coordinator                      Flint Hills Legacy Conservation Area                      U.S. Fish &amp; Wildlife Service                      315 Houston Street                      Manhattan, KS 66502-6191</p> <p>Dear Mr. Rich:</p> <p>We at The Nature Conservancy of Kansas appreciate the opportunity to comment regarding the Flint Hills Legacy Conservation Area (FHLCA) environmental assessment (EA). The Nature Conservancy strongly supports the FHLCA concept, primarily because it will complement the ongoing successful partnership work of private landowners and land trusts in the area. Conservation easements are among the most effective and cost efficient means for securing lasting, large-scale ecological integrity of the Flint Hills. This region merits the Service's full involvement, as it represents North America's only remaining landscape-level expression of tallgrass prairie. Below are specific comments regarding the EA and associated issues raised during the public meetings.</p> <p><b>Ranking properties for program participation:</b>                      The Service should target conservation easements within large blocks of relatively unfragmented tallgrass prairie. The Service's map depicting 95% native prairie within 10,000-acre blocks would be a good initial step or filter for prioritizing easement projects; this layer effectively identifies areas important for species that require large, unfragmented prairie landscapes, such as the American golden plover and greater prairie-chicken. Consideration should also be given to the condition of offered ranch properties (e.g., range condition, percent woody cover, presence of invasives, current land management, distinct plant/animal communities, etc.). Another ranking factor we feel is important is the analysis of landscape metrics within an approximate five-mile radius of offered property boundaries. Proximity to protected land (preserves &amp; other easements) is also important, but we do not feel that the distance shown in the EA is appropriate (see Fig. 1 of the Draft Protection Plan in the EA); proximity to protected areas within five miles is preferable, in our opinion.</p> <p><b>Gravel removal:</b>                      Allowing gravel removal in the easements, even with restrictions on methods, will eliminate the deductibility of bargain sale conservation easements; the IRS prohibits the deduction of conservation easements that allow surface mining of minerals and gravel, including stream gravel. We recommend that the Service use more restrictive gravel harvesting language for landowners who wish to take a tax deduction for bargain sale easements.</p> <p><b>Splits and Carve outs:</b>                      We believe the Service should exclude, or "carve out", tracts of cropland, buildings, etc. that do not match the goals of the FHLCA, similar to methods used under the USDA Grassland Reserve Program (GRP) in Kansas (i.e., offered tract must consist of 90% or greater native habitat). This would allow scarce conservation dollars to be used more strategically and effectively. We also recommend that the Service allow splits that do not affect the conservation values of the protected property.</p> <p><b>Trees:</b></p>	<p><b>Response 29.1.</b> Thank you for your comments.</p> <p><b>Response 29.2.</b> The Service believes that these are important ranking factors and will use many of these factors in the ranking criteria for the FHLCA.</p> <p><b>Response 29.3.</b> Comment noted. As new data and science become available, the information will be incorporated into the initial prioritization model and will be used to adjust the ranking criteria for potential acquisition parcels.</p> <p><b>Response 29.4.</b> Comment noted. A number of comments were received during public meetings on maintaining landowner access to gravel resources. Stream bed gravel extraction will be allowed for ranching processes. No commercial gravel extraction activities will be allowed. Stream bed gravel extractions will be subject to all local, state, and federal laws. Individual landowners will need to determine any tax implications.</p> <p><b>Response 29.5.</b> Landowners may have some limited options for carving out portions of their property from the easement, thereby allowing other uses or future structures/building construction. The easement will only limit the construction of additional structures in areas that are not located in 'carve-out' portions of the property. The landowners will retain access control, including public recreational activities.</p>
29.1		
29.2		
29.3		
29.4		
29.5		

Comment #	Letter # 29	Response
29.6	<p>Prohibiting the expansion of trees on Service easements in the Flint-Hills is a sound concept, but we urge you to set a percent threshold for added flexibility (e.g., no more than 10% increase).</p> <p><b>Herbicides:</b> Herbicide use was not mentioned at the public meeting, nor do we believe in the EA. Because herbicides can have such a lasting effect on the native herbaceous prairie plant community, which in turn can negatively affect wildlife, we strongly recommend the Service consider easement language that offers some protection against indiscriminant and broadcast use of herbicides. Below is language used in TNC easements in the Flint Hills, which reduces the risk to native plant communities from herbicides but also provides land management flexibility.</p> <p>There shall be no indiscriminant broadcast spraying of herbicides or pesticides. Herbicides and pesticides may be used by spot applications (including by gun or boom nozzles) of government-approved chemicals to control state-designated noxious weeds, invasive woody species or pest insect infestations, provided their use is designed to minimize the impact on the Conservation Values of the Protected Property. Broadcast spraying of herbicides or pesticides, including aerial applications, may be permitted with prior written approval by the Conservancy, provided that, at a minimum, the following conditions are met: (a) spot treatment is not practical because of the severity of the infestation; (b) timing of application is scheduled to minimize damage to non-target species; and (c) type of herbicide or pesticide used has the least impact to non-target species while still being effective in controlling target species. The Conservancy shall have sole discretion in granting or denying broadcast spraying of herbicides or pesticides. Herbicides and pesticides shall be used only in those amounts and with a frequency of application that reasonably constitute the minimum necessary for control and shall be used in compliance with all applicable governmental regulations.</p>	<p><b>Response 29.6.</b> Tree expansion will be addressed in the easement language to include provisions for maintaining tree encroachment at no more than the current level when the easement is established.</p> <p><b>Response 29.7.</b> Herbicide use was discussed at several of the public meetings. The Service anticipates using language similar to the language used by The Nature Conservancy to address herbicide application.</p> <p><b>Response 29.8.</b> Thank you for your comments.</p>
29.8	<p>In closing, I wish to reiterate TNC's strong support for the Flint Hills Legacy Conservation Area proposal. We applaud U.S. Fish &amp; Wildlife Service leaders and staff for this visionary initiative and are eager partners in conserving the rare and rich ecology and culture of the Flint Hills.</p> <p>Thanks for considering these comments. Please contact me at the telephone or e-mail above, if you require additional information.</p> <p>Sincerely,</p>  <p>Rob Manes          Director of Conservation, TNC of Kansas</p> <p>Cc: Alan Pollom          Brian Obermeyer          Mike Rich          Amy Thornton          Rick Coleman          Susan Ollivera          Mike Beam          Bill Sproull</p>	

<p><b>Comment #</b></p> <p>30</p>	<p><b>Letter # 30</b></p>	<p><b>Response</b></p>
	 <p>The image shows a scanned letter from the Tallgrass Legacy Alliance. At the top left is the Tallgrass Legacy Alliance logo, which features a stylized grass blade and the text 'Tallgrass Legacy Alliance'. To the right of the logo is the address: '868 Road 290 Americus, Kansas 66835' and the date 'May 3, 2010'. The letter is addressed to 'Mr. Michael Rich, U.S. Fish and Wildlife Service, PO Box 128, Hartford KS 66854'. The body of the letter begins with 'Dear Mr. Rich:' followed by a paragraph: 'Please accept this letter from the Tallgrass Legacy Alliance in support of the Flint Hills Legacy Conservation Area easement program proposed by the U.S. Fish and Wildlife Service.' The next paragraph states: 'The Tallgrass Legacy Alliance (TLA) is a 501(c)(3) producer driven non-profit organization. Our mission is to conserve and enhance the biological, economic, and cultural well-being of the tallgrass prairie through a coalition of ranchers, agricultural and environmental organizations, and public agencies.' The final paragraph reads: 'TLA supports voluntary conservation easements as a means to permanently protect the tallgrass prairie for future generations and to help ensure the continuation of the regions ranching culture. Therefore, TLA endorses the Flint Hills Legacy Conservation Area easement program and offers any assistance we may be able to provide to ensure its success.' The letter concludes with 'Thank you!' and 'Sincerely yours,' followed by two signatures. The first signature is for Harold Garber, TLA President, and the second is for Roger Wells, TLA Coordinator.</p>	<p>Response 30. Thank you for your comments.</p>

**Comment #**

**31**

**Letter # 31**



Mark Parkinson, Governor  
J. Michael Hayden, Secretary  
[www.kdwrp.state.ks.us](http://www.kdwrp.state.ks.us)

May 19, 2010

Mr. Michael Rich  
U.S. Fish and Wildlife Service  
PO Box 128  
Hartford, K.S. 66854

Dear Mr. Rich:

This letter serves to acknowledge the Kansas Department of Wildlife and Parks (Department) supports the Flint Hills Legacy Conservation Area (FHLCA) easement program proposed by the U.S. Fish and Wildlife Service. The mission of the Department, in part, is to conserve and enhance the wildlife and habitats of Kansas and provide the public with opportunities for the use and appreciation of these natural resources. The FHLCA easement program will contribute to achieving both parts of this mission through voluntary conservation easements with landowners in the Flint Hills, which supports a diversity of wildlife and constitutes the largest remaining tract of tallgrass prairie in the nation. The Department endorses the program and is available to assist with the development of program guidelines in a manner consistent with the state's existing priorities in the Flint Hills region and beyond.

Sincerely,

J. Michael Hayden, Secretary  
Kansas Department of Wildlife and Parks

**Response**

**Response 31.** Thank you for your comments.

<p><b>Comment #</b></p>	<p>32</p>	<p><b>Letter # 32</b></p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>KANSAS LIVESTOCK ASSOCIATION</b></p> </div> <p style="text-align: center;"><i>Since 1894</i></p> <p>May 18, 2010</p> <p>Mr. Steve Guertin, Regional Director          Mountain-Prairie Region          US Fish and Wildlife Service          134 Union Blvd, Suite 400          Lakewood, Colorado 80228</p> <p>Dear Director Guertin:</p> <p>The Kansas Livestock Association (KLA) has historically represented the business interests of the Flint Hills ranching community. In recent years, KLA formed a land trust to help ranchers and landowners permanently conserve working landscapes. This new land trust, called the Ranchland Trust of Kansas, was created by volunteer leaders of KLA because they feared the large intact grasslands of the Flint Hills were at risk of conversion to residential and/or commercial development.</p> <p>In recent years we've found several Flint Hills landowners are genuinely interested in conveying a perpetual conservation easement of their land, but only if they are compensated accordingly. We've seen incredible interest in USDA's NRCS Grassland Reserve Program, which is a conservation easement purchase program.</p> <p>The Flint Hills Legacy Conservation Area (FHLCA) initiative is being developed at an ideal time. There is considerable interest among landowners and the appraised values of these conservation easements appear to be significantly less than values in other grassland regions of the U.S.</p> <p>We appreciate the Services approach to developing the FHLCA. There have been several opportunities for stakeholders to provide comments on this proposal. KLA appreciates that this is a voluntary program and that the draft Environmental Assessment and Land Protection Plan recommends against fee title acquisition. The provisions of the conservation easement deed will be critical to landowner acceptance and participation. Please know we intend to provide continual input as this document is being developed.</p> <p>In the mean time, the Kansas Livestock Association is supportive of this project and wish to help make it become a reality.</p> <p>Sincerely,            Mike Beam          Sr. Vice President</p> <p style="text-align: right; font-size: small;">6031 SW 37th Street • Topeka, KS 66614-5129 • (785) 273-5115 • Fax (785) 273-3399 • E-mail: kla@kla.org • www.kla.org</p>	<p><b>Response</b></p>	<p><b>Response 32.</b> Thank you for your comments.</p>
-------------------------	-----------	---------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------	---------------------------------------------------------

# Bibliography

- Aber, J.S. 1997. [Geology, geomorphology, and geohydrology of the Flint Hills]. Revised 2008. <<http://academic.emporia.edu/aberjame/field/flint/flint.htm>> [Access date unknown].
- Angelo, R.T.; Cringan, M.S.; Fry J.E. 2002a. Distributional revisions and new and amended occurrence records for prosobranch snails in Kansas. *Transactions of the Kansas Academy of Science* 105(3-4):246-257.
- Angelo R.T.; Cringan, M.S.; Haslouer, S.G. 2002b. Response of stream biological communities to agricultural disturbances in Kansas: an historical overview with comments on the potential for aquatic ecosystem restoration. In: *Proceedings of the Central Plains Aquatic Bioassessment and Biocriteria Symposium*. Proceedings: Central Plains Aquatic Bioassessment and Biocriteria Symposium; 2002 September 18-19; University of Kansas, Lawrence, KS. Lawrence, KS: University of Kansas. 1-22.
- Angelo, R.T.; Cringan, M.S.; Hays, E.; Goodrich, C.A.; Miller, E.J.; Simmons, B.R.; VanScoyoc, M.A. 2009. Historical changes in the occurrence and distribution of freshwater mussels in Kansas. *Great Plains Research* (in press, on file at [bangelo@kdhe.state.ks.us](mailto:bangelo@kdhe.state.ks.us)).
- Axelrod, D. I. 1985. Rise of the grassland biome, Central North America. *Botanical Review* 51:163-201.
- Bragg, T.B. 1986. Fire history of a North American sandhills prairie. *Congress of Ecology* 4:99.
- Brown, B.T. 1993. Bell's vireo (*Vireo bellii*). In: Poole, A.; editor. *The birds of North America*. Ithaca, New York: Cornell Lab of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/35>> [Access date unknown].
- Canadell, J.P.; Ingram, J.S.; Pitelka, L.F. 1996. The effects of elevated CO<sub>2</sub> on plant-soil carbon below-ground: A summary and synthesis. *Plant and Soil* 187:391-400.
- Chapman, S.S.; Angelo, R.T.; Freeman, C.C.; Freeouf, J.A.; Huggins, D.G.; McCauley, J.R.; Omernik, J.M.; Schlepp, R.L.; Steinauer, G. 2001. Ecoregions of Nebraska and Kansas (1:1,950,000 scale map with color poster, descriptive text, summary tables, and photographs). Reston, VA: United States Geological Survey.
- Cutter, B. E.; Guyette, R. P. 1994. Fire frequency on an oak hickory ridgetop in the Missouri Ozarks. *American Midland Naturalist* 132:393-398.
- Dodds, W.K.; Oakes, R.M. 2004. A technique for establishing reference nutrient concentrations across watersheds affected by humans. *Limnology and Oceanography: Methods* 2:333-341.
- Dodds, W.K.; Bertrand, K.N.; Dalglish, H.J.; Falke, J.A.; Knight, G.L.; Rehmeier, R.L.; Wiggam, S.; Wilson, K.C. 2008. Comparing ecosystem goods and services provided by restored and native lands. *Bioscience* 58:837-845.
- Fagre, D.B.; Allen, C.D.; Birkeland, C.; Chapin III, F.S.; Charles, C.W.; Groffman, P.M.; Guntenspergen, G.R.; Knapp, A.K.; McGuire, A.D.; Mullholland, P.J.; Peters, D.P.C.; Roby, D.D.; Sugihara, G. 2009. Thresholds of climate change in ecosystems; a report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. Reston, VA: U.S. Geological Survey, U.S. Global Climate Change Research Program. 156 p.
- Fuhlendorf, S.D.; Davis, C.A.; Engle, D.E.; Hamilton, R.G.; Harrell, W.C.; Leslie, D.M. 2006. Should heterogeneity be the basis for conservation? Grassland bird response to fire and grazing. *Ecological Applications* 16(5):1706-1716.
- Fuhlendorf, S.D.; Engle, D.M. 2004. Application of the fire-grazing interaction to restore a shifting mosaic on the tallgrass prairie. *Journal of Applied Ecology* 41:604-614.
- Fuhlendorf, S.D.; Leslie, D.M.; Shackford, J.S.; Woodward, A.J.W. 2002. Multi-scale effects of habitat loss and fragmentation on lesser prairie-chicken populations of the U.S. Southern Great Plains. *Landscape Ecology* 17(7):617-628.
- Giesen, K.M. 1994. Movements and nesting habitat of lesser prairie-chicken hens in Colorado. *The Southwestern Naturalist* 39(1): 96-98.
- Haggerty, M. 1996. Costs of county and educational services in Gallatin County, Montana. Bozeman, MT: Local Government Center, Montana State University. 9 p.

- Haines, F. 1970. *The Buffalo*. New York: Thomas Y. Crowell Co. [Number of pages unknown].
- Hamerstrom, F.N.; Hamerstrom, F.; Mattson, O.E. 1957. A guide to prairie chicken management. Wisconsin Conservation Department, Technical Bulletin 15. [Place of publication unknown]: Wisconsin Conservation Department. 128 p.
- Haslouer S.G.; Collins, J.T.; Distler, D.A.; Eberle, M.E.; Edds, D.R.; Gido, K.B.; Huggins, D.G.; Mammoliti, C.S.; Stark, W.J.; Triplett, J.R. 2005. Current status of native fish species in Kansas. *Transactions of the Kansas Academy of Science* 108(1-2):32-46.
- Heisler, J.L.; Briggs, J.M.; Knapp, K.A. 2003. Fire frequency and the dynamics of shrub cover and abundance. *American Journal of Botany* 90(3):423-28.
- Higgins, K.F. 1986. Interpretation and compendium of historical fire accounts in the Northern Great Plains. United States Department of the Interior Fish and Wildlife Service resource publication 161. Washington DC: U.S. Department of the Interior, U.S. Fish and Wildlife Service. [Number of pages unknown].
- Homer, C.; Coan, M.; Dewitz, J.; Fry, J.; Herald, N.; Hossain, N.; Larson, C.; McKerrow, A.; VanDriel, J.N.; Wickham, J. 2007. Completion of the 2001 national land cover database for the conterminous United States. Volume 73. No. 4. [Place of publication unknown]: American Society for Photogrammetry & Remote Sensing. 337-341.
- Howe, H.F. 1993. Managing species diversity in tallgrass prairie: assumptions and implications. *Conservation Biology* 8(3):691-704.
- Hulbert, L. C. 1976. Woody plant invasion of unburned Kansas bluestem prairie. *Journal of Range Management* 29:19-23.
- Johnson, D.H.; Lawrence D.I.; Dechant Shaffer, J.A. series coordinators. 2004. [Effects of management practices on grassland birds]. Revised August 2004. <<http://www.npwrc.usgs.gov/resource/literatr/grasbird/index.htm>> [Access date unknown].
- Kansas Department of Agriculture. 2010. Kansas statistics. [Internet]. <[http://www.nass.usda.gov/Statistics\\_by\\_State/Kansas/index.asp](http://www.nass.usda.gov/Statistics_by_State/Kansas/index.asp)> [Access date unknown].
- Kansas Department of Revenue. 2008, [Internet]. [Revision date unknown]. <<http://www.ksrevenue.org/>> [Access date unknown].
- [KDHE] Kansas Department of Health and Environment. 2007. Kansas stream probabilistic monitoring program quality assurance management plan. In: Division of Environment quality management plan. Part III: Program level quality assurance management plans. Topeka, KS: Kansas Department of Health and Environment, Bureau of Environmental Field Services. 85 p.
- . 2008. [Kansas integrated water quality assessment]. [Revision date unknown]. <<http://www.kdheks.gov/befs/index.html>> [access date unknown].
- Kansas Geological Survey. 2008. [Kansas springs]. KGS Public Informational Circular 11. [Revision date unknown]. <[http://www.kgs.ku.edu/Publications/pic11/pic11\\_1.htm](http://www.kgs.ku.edu/Publications/pic11/pic11_1.htm)> [Access date unknown].
- Kansas State University Research and Extension. 2009. Watershed restoration and protection strategy, Neosho Headwaters Watershed. [Place of publication unknown]: Kansas State University Research and Extension. [Number of pages unknown].
- Knopf, F.L.; Samson, F.B. 1997. Ecology and conservation of Great Plains vertebrates. *Ecological Studies* 125:340 p.
- Kozlowski, T.T.; Ahlgren, C. E. 1974. Fire and ecosystems. New York: Academic Press, Inc. 552 p.
- Kuvlesky Jr., W.P. ; Ballard, B.M. ; Boydston, K.K.; Brennan ; Bryant, A.C.; Leonard, F.; Morrison , M.L. ; 2007. Wind energy development and wildlife conservation: challenges and opportunities. *Journal of Wildlife Management* 71:2487-2498.
- Leitner, L.A.; Dunn, C.P.; Guntenspergen, G.R. 1991. Effects of site, landscape features, and fire regime on vegetation patterns in presettlement southern Wisconsin. *Landscape Ecology* 4(4):203-217.
- McDonald, R,I.; Fargione, J.; Kiesecker, J.; Miller, W.M.; Powell, J. 2009. Energy sprawl or energy efficiency: climate policy impacts on natural habitat for the United States of America. *Journal of Conservation Planning* 1-14.
- Meltzer, D.J. 1989. Why don't we know when the first people came to North America. *American antiquity* 54(3) 471-490.
- Moore, C.T. 1972. Man and fire in the Central North American grassland 1535-1890: A documentary historical geography. [Place of publication unknown]: University of California. [Number of pages unknown].
- Mulchunas, D. G.; Burk, I.C.; Lauenoth, W.K. 1998. Livestock grazing; animal and plant biodiversity in the short grass steppe and the relationship to ecosystem function. *Okos* 83:65-74.
- National Renewable Energy Lab. 2010. [Wind resource assessment]. Revised April 14, 2010. <[http://www.nrel.gov/wind/resource\\_assessment.html](http://www.nrel.gov/wind/resource_assessment.html)> [Access date unknown].

- Niemuth, N.D.; Estey, M.E.; Reynolds, R.E. 2009. Data for developing spatial models: criteria for effective conservation. In: Rich, T.D.; Arizmendi, C.; Demarest, D.; Thompson, C.D. Proceedings of the fourth international Partners in Flight conference. 396–411.
- North American Bird Conservation Initiative. 2009. The State of the birds, United States of America, 2009. Washington, DC: U.S. Department of the Interior. 36 p.
- Noss, R.F.; LaRoe III, E.T.; Scott, J.M. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. [Place of publication unknown]: National Biological Service. [Number of pages unknown].
- Omernick, James M. 1987. Ecoregions of the conterminous United States. Corvallis, OR: U.S. Environmental Protection Agency, Environmental Research Laboratory. [Number of pages unknown].
- Poiana, K.A.; Chapman, K.A.; Merrill, M.D. 2001. Identifying conservation priority areas in a fragmented Minnesota landscape based on the umbrella species concept and selection of large patches of natural vegetation. *Conservation Biology* 15(2):513–522.
- Powell, A.F. 2008. Responses of breeding birds in tallgrass prairie to fire and cattle grazing. *Journal of Field Ornithology* 79(1):41–52.
- Pyne, S.J. 1982. Fire in America: a cultural history of wildland and rural fire. Princeton, NJ: Princeton University Press. [Number of pages unknown].
- Reynolds, R.E.; Batt, B.D.J.; Bruce, D.J.; Renner, R.W.; Shaffer, T.L.; Newton, W.E. 2001. Impact of the conservation reserve program on duck recruitment in the U.S. prairie region. *The Journal of Wildlife Management* 65(4):765–780.
- Reynolds, R.E.; Cox Jr., R.R.; Loesch, C.R.; Shaffer, T.L. 2006. The Farm Bill and duck production in the Prairie Pothole Region: increasing the benefits. *Wildlife Society Bulletin* 34(4):963–974.
- Ribic, C.A.; Bakker, K.K.; Herkert, J.R.; Johnson, D.H.; Koford, R.R.; Naugle, D.E.; Neimuth, N.D.; Renfrew, R.B.; Sample, D.W. 2009. Area sensitivity in North American grassland birds: patterns and process. *The Auk* 126(2):233–244.
- Robel, R.J. 2002. Expected impacts on greater prairie-chickens of establishing a wind turbine facility near Rosalia, Kansas. On file at Zikha Renewable Energy, [Location unknown].
- Robel, R.J.; Briggs, J.N.; Cebula, J.J.; Silvy, N.J.; Viers, C.E.; Watt, P.G. 1970. Greater prairie-chicken ranges, movements, and habitat usage in Kansas. *The Journal of Wildlife Management* 34(2):286–306.
- Robel, R.J.; Hagen, C.A.; Harrington, J.A.; Pitman, J.C.; Recker, R.R. 2004. Effect of energy development and human activity on the use of sand sagebrush habitat by lesser prairie-chickens in southwestern Kansas. In: Transactions of the North American Wildlife National Resource Conference. [Date of conference unknown]. [Location of conference unknown]. [Place of publication unknown]: [Publisher unknown]. 69:251–66.
- Roe, F.; 1970. The North American buffalo; a critical study of the species in its wild state. 2nd edition. Toronto: University of Toronto Press. 991 p.
- Samson, F.B.; Knopf, F.L.; 1994. Prairie conservation in North America. *Bioscience* 44(6):418–21.
- Samson, F.B.; Knopf, F.L.; Ostlie, W.R. 1999. Grasslands. In: Mac, M.J.; Doran, P.D.; Opler, P.A.; Puckett Haecker, C.E.; editors. Status and trends of the nation's biological resources. 2 volumes. U.S. Geological Survey, Reston, VA: Biological Resources Division. 437–45.
- Shaw, J.H.; Martin, L. 1995. Ecological interpretation of historical accounts of bison and fire on the southern plains with emphasis on tallgrass prairie. Stillwater, OK: Oklahoma State University, Department of Zoology. [Number of pages unknown].
- Southwick Associates, Inc. 2007. State-level economic contributions of active outdoor recreation—technical report on methods and findings. Fernandino Beach, FL: Outdoor Industry Foundation. 165 p.
- Steinauer, E. M.; Collins, S. L. 1996. Prairie ecology—the tallgrass prairie. In: Samson, F.; Knopf, F.; editors. *Prairie conservation: preserving North America's most endangered ecosystem*. Washington DC: Island Press. 39–65.
- Svedarsky, W.D. 1988. Reproductive ecology of female greater prairie-chickens in Minnesota. In: Bergerud, A.T.; Gratson, M.W.; editors. Adaptive strategies and population ecology of northern grouse. Volume 2. Minneapolis: University of Minnesota Press. 192–239.
- U.S. Census Bureau. 2009. Census of agriculture; volume 1—geographic area series; part 31—Kansas, state and county data. Washington DC: U.S. Census Bureau. [Number of pages unknown].
- [USDA] U.S. Department of Agriculture. 2010. State Fact Sheets: Kansas. [Internet]. Revised July 30, 2010. <<http://www.ers.usda.gov/StateFacts/KS.htm>> [Access date unknown].
- U.S. Energy Information Administration. 2010. Kansas Quick Facts. [Internet]. Revised July 22, 2010. <[http://tonto.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=KS](http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=KS)> [Access date unknown].

- [USFWS] U.S. Fish and Wildlife Service. 2003. [U.S. Fish and Wildlife service interim guidance on avoiding and minimizing wildlife impacts from wind turbines]. [Revision date unknown]. <<http://www.fws.gov/habitatconservation/wind.pdf>> [Access date unknown].
- . 2008. Strategic habitat conservation handbook—a guide to implementing the technical elements of SHC. Washington DC: U.S. Department of the Interior, U.S. Fish and Wildlife Service. 22 p.
- . 2009. Strategic plan for responding to accelerating climate change in the 21st century. Washington DC: U.S. Department of the Interior, U.S. Fish and Wildlife Service. 41 p.
- . 2010. Wind Turbine Guidelines Advisory Committee recommendations. Draft. [Internet]. Revised March 4, 2010. <[http://www.fws.gov/habitatconservation/windpower/Wind\\_Turbine\\_Guidelines\\_Advisory\\_Committee\\_Recommendations\\_Secretary.pdf](http://www.fws.gov/habitatconservation/windpower/Wind_Turbine_Guidelines_Advisory_Committee_Recommendations_Secretary.pdf)> [Access date unknown].
- [USGS] U.S. Geological Survey. 2008. Trends in peak flows of selected streams in Kansas. Water-Resources Investigations Report 01-4203. [Internet]. [Revision date unknown]. <<http://ks.water.usgs.gov/pubs/reports/wrir.01-4203.html>> [Access date unknown].
- Vickery, P.D. 1996. Grasshopper Sparrow (*Ammodramus savannarum*). In: Poole, A.; editor. The birds of North America No. X. Ithaca, New York: Cornell Lab of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/239>> [Access date unknown].
- Weir, J.R.; Fuhlendorf, S.D.; Engle, D.M.; Bidwell, T.G.; Cummings, D.C.; Elmore, E. 2007. Patch burning: integrating fire and grazing to promote heterogeneity. Department of Natural Resource Ecology and Management. Oklahoma Cooperative Extension Service publication E-998. [Place of publication unknown]: Department of Natural Resource Ecology and Management. 25 p.
- Williams, M.A.; Owensby, C.; Rice, C.W. 2004. Carbon and nitrogen pools in a tallgrass prairie soil under elevated carbon dioxide. Soil Science Society of America Journal 68:184–153.
- Wright, H. A.; Bailey, A.W. 1982. Fire ecology. New York: John Wiley and Sons. [Number of pages unknown].
- Zimmerman, J.L. 1988. Breeding season habitat selection by the Henslow's sparrow (*Ammodramus henslowii*) in Kansas. Wilson Bulletin 100(1):17–24.

