



Draft Environmental Assessment and Land Protection Plan

Flint Hills Legacy Conservation Area

Kansas

April 2010

Prepared by

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In accordance with the National Environmental Policy Act and U.S. Fish and Wildlife Service policy, an environmental assessment and land protection plan have been prepared to analyze the effects of establishing the Flint Hills Legacy Conservation Area in eastern Kansas. Both documents, which stand alone, are contained within this volume.

- The environmental assessment analyzes the environmental effects of establishing the Flint Hills Legacy Conservation Area.
- The land protection plan describes the priorities for purchasing 1,100,000 acres of easements within the proposed project boundary.

Note: Information contained in the maps within these documents is approximate and does not represent a legal survey. Ownership information may not be complete.



Abbreviations

| | |
|----------------|---|
| FHLCA | Flint Hills Legacy Conservation Area |
| KDWP | Kansas Department of Wildlife and Parks |
| PFW | Partners for Fish and Wildlife program |
| Service | U.S. Fish and Wildlife Service |
| USFWS | U.S. Fish and Wildlife Service |



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Chapter 1—Purpose of and Need for Action

“Conservation is a state of harmony between men and land.”

—Aldo Leopold

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.

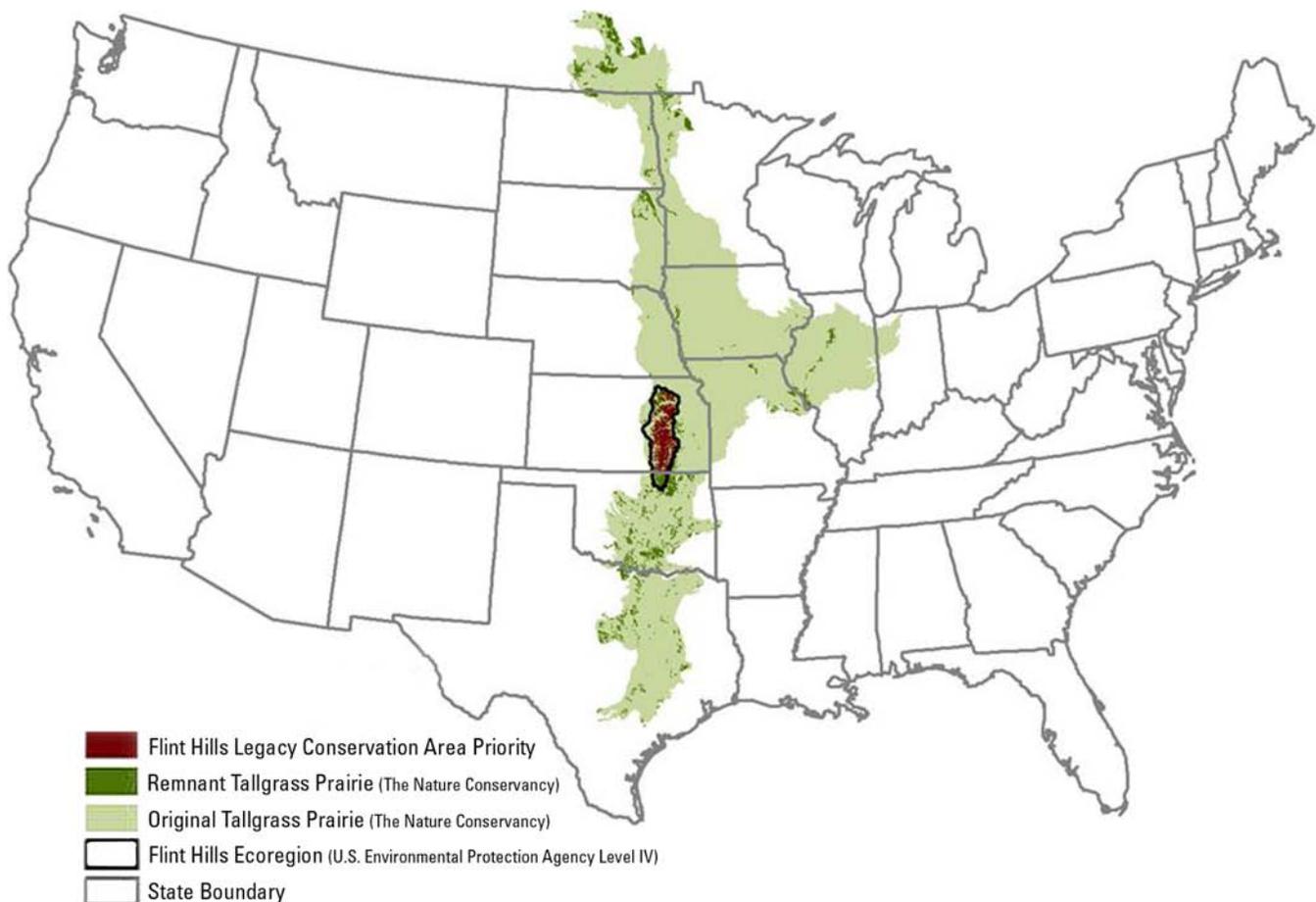


Figure 1. Historical tallgrass prairie distribution.

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 avian cadre 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 due in part to a declining fire culture 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 and ecosystem function and value.

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 Flint Hills Legacy Conservation Area (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 maintained 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 incompatible 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.

Proposed Action

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

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

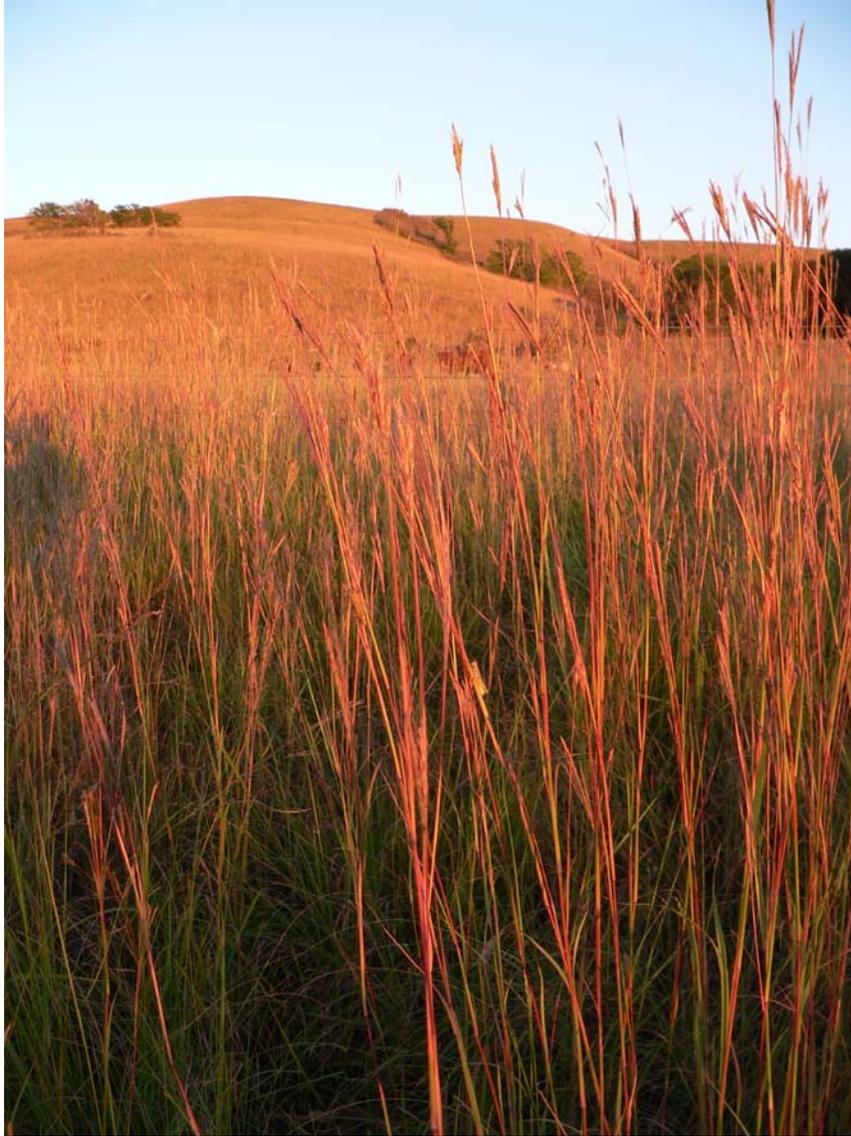
Easement restrictions may include but are not limited to development (residential, commercial and industrial), altering the natural topography, converting native grassland to cropland, draining wetlands, and introducing plants that are not native to the Flint Hills.

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

Project Area

The FHLCA project area consists of 3.3 million acres within the Flint Hills Ecoregion of Kansas, (EPA Omernick). A narrow band running north-south located within 14 counties in eastern Kansas (see figure 3), 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 90 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.

The total area within the proposed project boundary represents over 3.3 million acres, roughly twice the long-term project goal. 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 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.



Bluestem grass in tallgrass prairie

USFWS

Purpose of and Need for Proposed Action

The purpose this project is to provide the landscape-scale, strategic habitat conservation necessary to maintain ecological community function for eastern tallgrass prairie, including grassland- dependent wildlife. This is especially important for grasslands, because they do not have the localized diversity of geological and elevational gradients that most other ecosystems contain. (Kelly Kindscher, Plant Ecologist, University of Kansas: personal communication.) This conservation project is needed to help protect the Flint Hills prairie ecosystem from being drastically changed by widespread, unplanned residential or commercial development. The conversion of ranches and rural areas to residential, commercial and industrial developments, along with forest encroachment, threatens the open expanses of native rangeland that many grassland birds and other prairie-associated wildlife are dependent on (Huntsinger and Hopkinson 1996).

Based on known conservation principles of landscape ecology, the narrow north-south corridor of remaining tallgrass prairie is exceptionally vulnerable to ecological degradation associated with increased fragmentation. In essence, if this, the world's largest remaining tract of tallgrass prairie becomes any narrower its ecological functionality will be diminished, reducing the possibility of sustainable populations of fish and wildlife being maintained. The resiliency, or the capacity of the system to absorb changes and disturbances while maintaining its basic structure and function, will be lost.

Currently, the Flint Hills area provides essential breeding, wintering and migrational habitat for migratory birds such as the 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. Numerous other species of birds, mammals, reptiles and amphibians are known to use the habitat of the Flint Hills (see appendix B).

The Flint Hills represents North America's only remaining landscape-scale expression of tallgrass prairie. Virtually all of what remains is threatened by some form of development – energy including wind and coalbed methane development, residential, and general urban expansion. All express direct impacts to the ecosystem, and share a common threat of reducing the ability to use prescribed fire in a region dependent on fire for its existence – it is therefore, prudent to conserve the largest, highest quality, feasible representation of this ecosystem.

Due to these recognized threats, the Partners for Fish and Wildlife (PFW) program recognized the Flint Hills as a focus area in their strategic habitat plan. 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). However, without long-term, landscape-scale protection, the results of current conservation efforts through this program and by the many partners will not be sustainable. The FHLCA program is necessary to protect additional habitat that is not eligible or covered by the current Service programs, and will greatly enhance and augment efforts by other agencies and organizations to restore and protect habitats in the Flint Hills prairie region.

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 at a landscape-scale 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 prairieland associated prairie waters 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 effect of climate change

Decisions to be Made

The Service's planning team (see appendix A) will complete an analysis of the environment and management alternatives. Based on the analysis, documented in this environmental assessment, the Service's director of Region 6, with the concurrence of the director of the U.S. Fish and Wildlife Service, will make three decisions:

- Determine whether the Service should establish the Flint Hills Legacy Conservation Area.
- If yes, select an approved, conservation-easement project boundary that best fulfills the habitat protection purposes.
- If yes, determine whether the selected alternative would have a significant impact on the quality of the human environment. The National Environmental Policy Act of 1969 requires this decision. If the quality of the human environment would not be significantly affected, a finding of no significant impact will be signed and made available to the public. If the alternative would have a significant impact, completion of an environmental impact statement would be required to address those impacts.

Issues Identified and Selected for Analysis

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, 90 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, conservation groups, which have expressed an interest in and a desire to provide a sustainable future for the Flint Hills tallgrass region. Approximately 400 factsheet flyers were mailed out, and project information was also made available on the refuge and regional planning websites.

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

- The effect of wind energy easements and oil and gas exploration.
- Concern that only a small percentage of tallgrass prairie remains.
- Concern about short term activities 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

- The effect of wind energy easements and oil and gas exploration.
- Possible tax implications of conservation easements.
- Need to preserve the working ranches, and culture of the region.
- Need to preserve the 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 to the counties when land protection programs take place. Since the proposed 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 would generally be an offset of any perceived reduction in the tax base since the county would 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 would be monitored 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 would 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)
- Migratory Non-game 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 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 have been working for more than a decade to conserve grasslands in the Flint Hills. The Ranchland Trust of Kansas, Kansas Land Trust, U.S. Department of Agriculture, Kansas Department of Agriculture and The Nature Conservancy have all also been active in preserving portions of the Flint Hills using conservation easements. Organizations or agencies that are currently holding conservation easements within the conservation boundary include;

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 proposed project area.

The Grassland Reserve Program 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 open spaces for future generations through the conservation of working

landscapes. Ranchland Trust of Kansas 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, scenic open spaces, and to preserving outdoor recreational opportunities and the historic uses of land. Founded in 1990, the KLT advocated in its first years for the passage of conservation easement enabling legislation by the Kansas Legislature, which occurred in 1993. The Kansas Land Trust accepted its first easement in 1994, and has completed 36 easements, 3,311 acres of which are in the Service's proposed 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. The Tallgrass Legacy Alliance 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.

Private landowners and ranchers have been instrumental in working with the 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 to work 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. Since the inception of PFW in 1992 over 349,342 acres of tallgrass prairie have been restored or enhanced.

Invasive plant projects—Infestations of invasive plants such as *Sericea lespedeza*, eastern red cedar and Osage orange currently are not pervasive in the Flint Hills project area. 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 invasives, the Service's PFW program, The Nature Conservancy, Tallgrass Legacy Alliance, county weed districts, and private landowners have initiated cooperative efforts region wide. Current tools include educational efforts demonstrating the benefits of prevention with use of prescribed fire, as well as financial assistance for mechanical, biological, and chemical treatments.

Habitat Protection and Easement Acquisition Process

On approval of a project boundary, habitat protection would 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 proposed Flint Hills Legacy Conservation Area is the Fish and Wildlife Act of 1956 (16 U.S.C.742 a-742j). The federal monies used to acquire conservation easements are 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 for fish and wildlife conservation purposes through congressional appropriations and donations from non-profit organizations and other possible sources.

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 would occur with willing sellers only and will be subject to available funding.

Chapter 2—Alternatives, Including the Proposed Action

This chapter describes the two alternatives identified for this project:

- no-action alternative
- proposed action, giving the Service the authority to create the Flint Hills Legacy Conservation Area

The alternatives consider the effects of a conservation easement program within the project area boundary identified in this environmental assessment.

Alternative A (No Action)

Habitat enhancement or restoration projects on private lands such as water developments, grazing systems, and grassland management could continue through cooperative efforts with private landowners.

Private efforts by land trusts would continue to secure conservation easements.

Alternative B (Proposed Action)

The Service would establish the Flint Hills Legacy Conservation Area in eastern Kansas. The project boundary encompasses roughly 3.3 million acres, of which the Service would strategically acquire conservation easements on up to 1,100,000 acres of private land. The geographic project area extends north almost to the Nebraska state line, south to Oklahoma, west of Topeka, and east of Wichita (see figure 2 in chapter 1).

The Service would seek to purchase conservation easements from willing sellers on privately owned native tallgrass prairie grasslands. The easement contract would specify perpetual protection of habitat for trust species and restrict development.

Prioritization of areas considered for conservation easements within the 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 land protection plan within this volume describes these priorities in detail.

Development for residential, and commercial or industrial purposes, such as energy and aggregate extraction may not be permitted on properties under a conservation easement. Alteration of the natural topography, conversion of native grassland to cropland, and the drainage of wetlands would also be prohibited.

All land would remain in private ownership; property tax and land management, including invasive weed and tree control, would remain the responsibility of the landowner. The Service would seek to provide participating landowners with additional assistance with invasive plant control. Control of public access to the land would remain under the control of the landowner.

The easement program would be managed by staff located at the Flint Hills National Wildlife Refuge near Hartford, Kansas. The Service staff would be responsible for monitoring and administration of all easements on private land. Monitoring will include periodically reviewing land status through correspondence and/or meetings with the landowners or land managers to ensure that the stipulations of the conservation easement are being met. Photo documentation would be used at the time the easements are established to document baseline conditions.

Alternatives Considered but not Studied

There was no further analysis for the following two alternatives.

Voluntary Landowner Zoning

Landowners would voluntarily petition the county commissioners to create a zoning district to direct the types of development that can occur within an area. This is “citizen-initiated” zoning. For example, landowners would petition the county government to zone an area as agricultural, precluding certain types of non-agricultural development such as residential subdivision. “Citizen initiatives” are rarely used and this alternative was not studied further.

County Zoning

In a traditional approach used by counties and municipalities, the local government would use zoning as a means of designating what type of development could occur in an area. Kansas law grants cities and counties the authority to regulate land use, and therefore engaging in planning and zoning activities is optional. Many counties in Kansas have opted to have no planning or zoning requirements and the alternative was not studied further. Comments received from county commissioners to date have expressed support instead for conservation easements (alternative B as a means of maintaining rural area values and potentially reducing the need for future zoning). Zoning would be subject to frequent changes, and would not ensure the long-term prevention of residential or commercial development in the conservation area.

Expansion of Project

After the initial phases of the Flint Hills Legacy Conservation Area project were well underway, the possibility of expanding the project area into Oklahoma to incorporate the tallgrass prairie (referred to as the Osage Hills) found there, was brought up. As the FHLCA project planning and outreach efforts had been addressed toward Kansas throughout the process, the Service determined that conservation efforts for the Oklahoma tallgrass will be conducted by Region 2 (Southwest Region) that it is located in. The Mountain-Prairie Region, (Region 6), will assist Region 2 with any future conservation efforts undertaken in the Osage Hills.

Chapter 3—Affected Environment

This chapter describes the biological, cultural, and socioeconomic resources most likely affected by establishing the Flint Hills Legacy Conservation Area.

The Flint Hills region provides habitat integral to larger national conservation efforts. Located in the Eastern Tallgrass Prairie Geographic Area, the Flint Hills region is a north-south migration corridor for many species.

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 such as that found in the project area. Intact, open landscapes are essential habitat components for the greater prairie-chicken and other grassland birds that are the priority species guild for this project.

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 some of the most fertile in the world.

The rich soils, combined with gently rolling topography, made the region prime 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/endangered ecosystems (Noss et al. 1995). Still relatively unspoiled by the pressures of modern development is the greater Flint Hills landscape of eastern Kansas.

Biological Environment

Climate

The climate of Kansas is continental, with very hot summers, subject to periodic drought coupled with very cold winters. Temperatures can range from -40°F to 121°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 three inches or more. The moist air flow and warm temperatures are the source for convectational 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 (U.S. Global Change Research Program 2009). The FHLCA provides the elements necessary to minimize the impact on wildlife: resilience, redundancy, adaptation potential, and habitat connectivity, drought-tolerant plant communities, large and connected ecosystem segments, and 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 would 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 (U.S. Global Climate Change Research Program 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

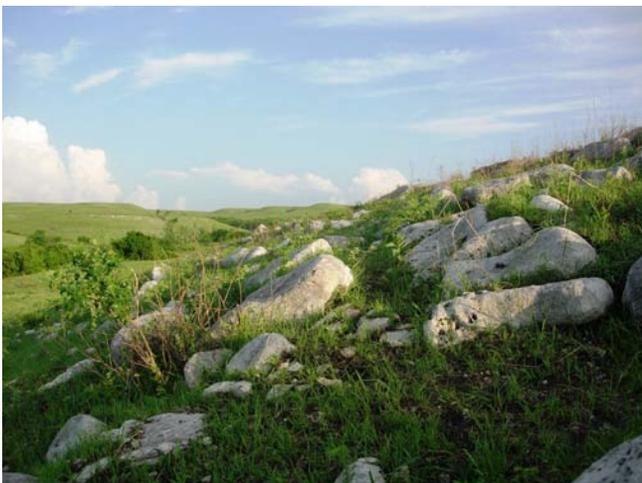
The Service's strategic response to climate change involves three core strategies: adaptation, mitigation, and engagement (USFWS 2009). Through adaptation, the impacts of climate change on wildlife can be reduced by conserving habitats expected to be resilient. The FHLCA provides an anticipatory, rather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



Flint Hills hillside

Kansas State University

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 prairies. 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 (Sampson et al.) Tallgrass prairie is considered by ecologist as a “fire climax” system, meaning without fire the tallgrass prairie will begin to shift towards a forest environment (Jana L. Heisler, John M. Briggs, and Alan K. Knapp; American Journal of Botany). 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 1987). Lightning caused fires presumably drove the region’s early beginnings as a fire/herbivore driven plant community (Mulchunas et al.). As prehistoric man gained a landscape presence, it is suggested that fire frequency and temporal occurrence shifted from summer to one dominated by a fall burn period (James H. Shaw and Martin Lee).

This altering of fire shaped the tallgrass eco-regional plant community for several thousands of years (Moore). 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 (Edwin et al. 1996) 2–5 times per decade (Hulbert 1973), 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 and Hulbert, 1976) suggest a 3–5 year pre-settlement burn interval for Nebraska and Kansas tallgrass prairie. (Kelly Kindscher and Craig Freeman, personal communications) 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 to receive 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, 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 burns have largely been conducted by ranchers in the spring on an annual basis. Some ranchers have begun to use patch burning that is more representative of historical burn regimes in the region.

Prairie Uplands

Although the Flint Hills landscape is most often associated with bluestem grasses, about 90 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, each week from March through September will bring into flowering new species. 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.



Tallgrass prairie flowers

USFWS

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, 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 1998). It boasts many of the state's most pristine surface waters (e.g., 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 (e.g., Kansas Department of Health and Environment 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, Kansas Department of Health and Environment 2008).

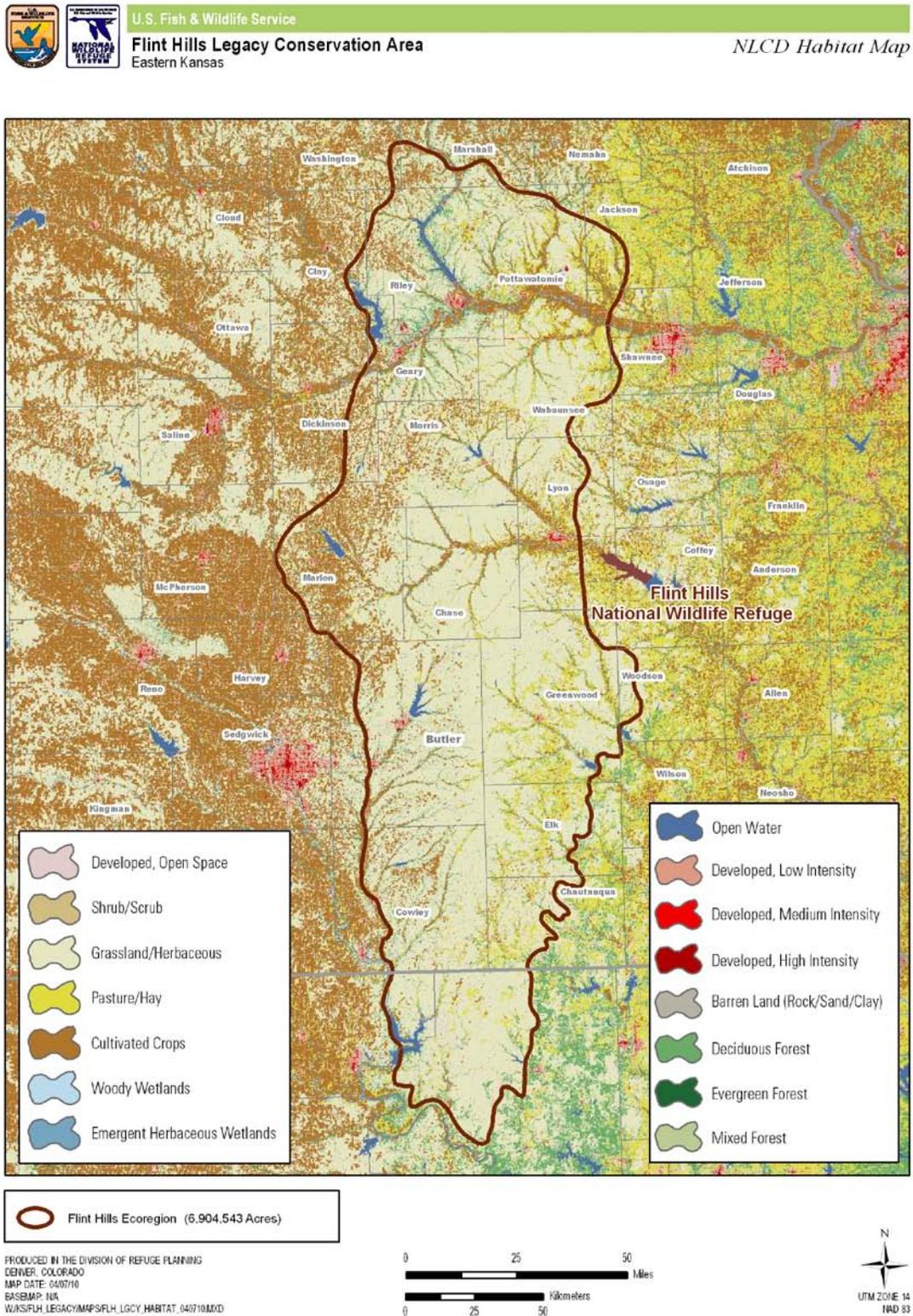


Figure 3. Land cover and habitat types.

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.

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 (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).

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 would 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 36 species believed to have become extinct during the past century. Unfortunately, mussels in Kansas have undergone a similar trend of decline. Of the 48 species known to have occurred in Kansas, at least five of these are now believed to be extirpated from the state, and 21 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: personal communication). 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 46 grassland-breeding bird species, 48% are species of conservation concern nationwide, including 4 populations that are federally endangered. Of the 42 grassland species with sufficient monitoring, 23 are declining significantly (North American Bird Conservation Initiative, 2009).



Henslow's sparrow

Dave Rintoul

Within the Flint Hills, birds require a mosaic of vegetation structure within the tallgrass prairie. The 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 (25–150 centimeters/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.



Greater prairie-chicken

USFWS

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 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 focal 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 (USGS Northern Prairie Wildlife Research Center, Effects of management practices on grassland birds).

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, red fox are examples of carnivores that occur throughout the project area.

Species of Special Concern

At the Federal level, 11 Flint Hills species are listed as threatened and endangered, or are candidates for listing: these include the American burying beetle, Arctic peregrine falcon, piping plover, Topeka shiner, least tern, whooping crane, Neosho madtom, western prairie-fringed orchid, Arkansas River shiner, and the Arkansas darter (candidate 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 the big game hunting, including mammoths and the huge now-extinct ancient bison, *Bison antiquus*. 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 21 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 2008). 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 18th 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 cattle industry. The grasslands of the Flint Hills provide summer grazing grounds that will 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 Agricultural Statistics). 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.

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 \$558 million dollars 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 dollars 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.



Hikers in the Konza prairie

USFWS

Chapter 4—Environmental Consequences

This chapter assesses the environmental impacts expected to occur from the implementation of alternatives A or B, as described in chapter 2. Environmental impacts are analyzed by issues for each alternative and appear in the same order as discussed in Chapter 2.

Effects on the Biological Environment

This section describes the estimated effects on wildlife habitat and water and soil resources of carrying out alternatives A and B.

Wildlife Habitat—Alternative A (No Action)

Although efforts by the Service’s PFW program and partners would continue to enhance habitat on some private lands, degradation of resources on many unprotected lands would continue. These potential impacts could result in the further decline of migratory birds, resident wildlife, and listed species. Wildlife species, particularly grassland birds, would continue to decline due to habitat fragmentation resulting from intensification of agricultural processes, conversion to forest cover, or residential and commercial development. Stream quality could become degraded from development, impacting the Topeka shiner, Neosho madtom, and mollusk species.

Subsequent effects, including those listed below, would likely impact wildlife:

- Fragmentation of habitat and loss of migration corridors for wildlife.
- Reduction or elimination of grazing and prescribed fire used to maintain intact tallgrass prairie.
- Increased non-native and invasive species.

Habitat Fragmentation

Habitat fragmentation can be defined as a “landscape-level process in which a specific habitat is progressively sub-divided into smaller, geometrically altered and more isolated fragments as a result of both natural and human activities, and this process involves changes in landscape composition, structure, and function at many scales and occurs on a backdrop of a natural patch mosaic created by changing landforms and natural disturbances (McGarigal and McComb 1999).”

Habitat loss and fragmentation is the greatest threat to the Flint Hills tallgrass ecosystem, and is much more likely to occur under this alternative. Fragmentation is primarily caused by commercial, industrial and residential development, which reduces the use of prescribed fire and results in the encroachment of trees. Habitat loss and fragmentation may also act synergistically with climate change and other factors to magnify deleterious effects to species and ecosystems by limiting the ability of species to adapt or migrate (Hill et al. 2006, Ewers and Didham 2006). Habitat loss and fragmentation are considered the most significant threat to global biodiversity, with infrastructure development playing a key role (Wilcove et al. 1998).

Flint Hills grassland species are dependent on open expanses of intact tallgrass prairie habitat. As a non-migratory bird species the greater prairie-chicken must be able to meet all life requirements within a relatively limited area of prairie, and are therefore useful as a benchmark for evaluating habitat for other grassland bird species. Habitat requirements of prairie-chickens are thought to magnify the impact of fragmentation and other agents of habitat change (Dunn et al. 1991, Knick and Rotenberry 2000), and declining grouse populations have been linked to broad spatial landscape changes (Woodward et al. 2001, Fuhlendorf et al. 2002). Patten et al. (2004) suggested that landscape fragmentation would result in a need for greater home range size for greater prairie-chickens, which could decrease survivorship due to increased predation, collisions, and energy expenditures. It is essential to maintain contiguous habitat for the maintenance of prairie grouse populations in order to provide connectivity of multiple leks (Woodward et al. 2001); as much as 15,000 acres is required to support a single prairie-chicken lek (Hagen and Giesen 2005). Intact grassland habitats like the Flint Hills may not be able to sustain prairie-chicken and other grassland-interior specialist species if fragmentation goes unchecked.

A 6-year study in southwestern Kansas found that lesser prairie-chickens strongly avoid certain anthropogenic

features, resulting in sizable areas of habitat rendered less suitable (Pitman 2003, Robel et al. 2004). Similarly, Braun (2001) found that greater sage-grouse abandoned portions of their habitats affected by oil production activity, including areas adjacent to regularly traveled oil field service roads. Edges of habitat caused by roads may create an avenue for predators and the spread of invasive weeds (Hansen and Clevenger 2005, Lockwood et al. 2007). Robel et al (2002) observed mean avoidance buffers (mean distances based on 90% avoidance by 187 nesting lesser prairie-chicken hens) of 363 meters (1,191 feet) from transmission lines, 177 meters (581 feet) from oil or gas wellheads, 1,254 meters (4,114 feet) from buildings, 307 meters (1,007 feet) from center pivot irrigation fields, and 786 meters from either side of improved roads (29 meters/95 feet from 2-track ranch trails). Likewise, 18,866 radio telemetry locations of lesser prairie-chickens revealed strong avoidance behavior (95% absence ratio) from human intrusions; e.g., prairie-chickens avoided buildings and transmission lines by mean distances of 603 meters and 634 meters (1,978 and 2,081 feet), respectively. Large arrays of turbines may also serve as a barrier to birds (Drewitt and Langston 2006), potentially altering migratory corridors, local flight paths, immigration and emigration among populations. The disturbance of tall foreign structures and noise may also disrupt mating vocalizations. Lesser prairie-chicken vocalizations, for example, are high frequency (ca. 750 Hz) and antiphonal, and thus are easily drowned out by peripheral noise (Bain and Farley 2002). Braun et al. (2002) reported that Gunnison and greater sage-grouse were particularly susceptible to noise near leks.

Many more acres of land would likely be developed for residential home sites or isolated commercial uses, as economic forces change in the future. The project area has more than 3,000,000 privately owned acres, with the majority remaining in large ranch ownership. Under Kansas state law, the subdivision process is not difficult. Moreover, with no county zoning in place, small lot subdivisions are possible. The Flint Hills prairie is essentially surrounded by urbanizing areas and areas of commercial development. Residential development around Wichita, Topeka, Manhattan, and Emporia has been claiming thousands of acres of tallgrass prairie annually. Long-time family ranches are beginning to be sold and are commanding high prices for residential properties.

Habitat and travel corridors for key geographic and functional biological linkages can be lost, and wildlife populations isolated, once an area is fragmented by subdivisions or other development. Studies have shown that an increase in urbanization and associated fragmentation has a negative effect on abundance of grassland nesting birds. In one study, all species of song birds reviewed decreased with an increase in urbanization. For two species, the horned lark and Savanna sparrow, no birds were observed in plots where 4–7% of the surrounding landscape was urbanized, suggesting a high sensitivity to urbanization and associated fragmentation of habitat. Grasshopper sparrows declined abruptly in abundance at approximately 10% urbanization (Bock, Bock, and Bennett 1999).

Additionally, human settlement results in the introduction of trees which spread and provide habitat for non-native perching birds which exacerbate the rate of spread. Woody species, such as the red cedar (*Juniperus virginiana*), have been increasing in the Flint Hills since around 1970 (Owensby et al. 1973). Research has shown that the increase in woody species is a result of reduction in the use of fire, along with human population growth and resultant land fragmentation (Hoch 2000). Habitat loss, fragmentation and the resulting genetic isolation



Red cedar invasion of prairie

USFWS

constitute the most serious threats to grassland biological diversity. These factors have been repeatedly shown to decrease species richness. Ecologists use two theoretical frameworks to explain this phenomenon: the theory of island biogeography and metapopulation dynamics. The relationship of fragmentation and lost diversity holds especially true in grassland ecosystems, where many grassland interior specialists, such as the prairie-chicken, require large expanses of relatively unfragmented habitat. (Brian Obermeyer, Flint Hills project coordinator, The Nature Conservancy: personal communication).

Wind energy is of particular concern in the Flint Hills due to the high potential for wind development in the region and also of adversely impacting the ecological integrity of the Flint Hills. Wind power offers an emission-free source of electricity and lacks many of the environmental hazards

associated with fossil fuels (Therkelsen et al. 1998). However, if 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.

Prairie-chickens are prairie-interior specialists, which exhibit high site fidelity, require extensive grasslands and open horizons (Giesen 1994, Fuhlendorf et al. 2002), and are thought to be especially vulnerable to wind energy development. Robel (2002) predicted utility scale (1.5 MW) wind turbines would create an approximate 1-mile radius avoidance zone for greater prairie-chicken nesting and brood rearing activities. Based on this estimate, he projected that a proposed 100 MW wind facility in the Flint Hills of Kansas would render 6,070–7,280 hectares (15,000–17,990 acres) of very good to excellent tallgrass prairie habitat unsuitable for nesting and brood-rearing purposes; the actual project size of this proposed project was roughly half this area.

Other Fragmentation Issues

Today's Flint Hills tallgrass prairie landscape is considered by ecologists to be a "fire climax" system. When tallgrass prairie remains unburned for 10 or more years it begins to convert to woodlands (Abrams and Gibson 1991) and will become unsuitable habitat for the many grassland species currently associated with the tallgrass prairie region.

With the currently increasing encroachment of residential and commercial development, and fragmentation by road networks it is becoming much more difficult to use the combination of prescribed fire and grazing necessary to maintain a healthy mosaic of tallgrass prairie habitat in a fire climax ecosystem like the Flint Hills.



Riders and prescribed fire

Jim Richardson

No action would result in loss of opportunity to protect important tallgrass prairie and 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. The increased likelihood of development in the Flint Hills under alternative A, and the resultant fragmentation, would further exacerbate grassland bird declines and ultimately speed the listing of grassland-dependent species.

Wildlife Habitat —Alternative B (Proposed Action)

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

Habitat Fragmentation

Establishing the Flint Hills Legacy Conservation Area would provide for the conservation of up to 1,100,000 acres of the only remaining landscape-scale expression of tallgrass prairie. This program would provide protection and prevent the fragmentation of essential tallgrass habitat, and prairie-dependent resident and

migratory wildlife species.

Under the proposed action, areas with FHLCA conservation easements would not permit commercial and industrial-scale development of wind energy, new residential, oil and gas developments, or commercial aggregate extraction projects on easement lands due to the serious fragmentation effects on grassland species associated with these types of activities and their associated infrastructure (wind towers, roads, transmission lines). Perpetual conservation easements would 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 would support management activities such as prescribed fire, grazing, and efforts to control the spread of woody vegetation and invasive weeds. Retaining large, unfragmented areas would also greatly reduce 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, powerlines, 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) would be greatly reduced in the project area under this alternative.

Compatible agricultural practices such as livestock grazing, prescribed burning, and haying would continue, while sodbusting (i.e., breaking of native grassland) would be prohibited. Easements would 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 (i.e., oil and gas deposits), the U.S. Fish and Wildlife Service easement would 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 would require a developer to access minerals from off-site. Surface occupancy of the easement for mineral development would be prohibited.

In many places where the subsurface estate has been severed, including along the Flint Hills, the landowner does not own the subsurface rights; this means that the easement that the Service acquires from the landowner is subject to the outstanding mineral rights. In those cases, the Service would work on a voluntary basis with the developer to minimize surface degradation and would 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 of all of the 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 guild 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 would provide for the conservation of up to 1,100,000 acres of important tallgrass habitat on private land. This program would help maintain the intactness of the Flint Hills tallgrass prairie region and complement conservation efforts of Ranchland Trust of Kansas, Tallgrass Legacy Alliance, Kansas Land Trust, The Nature Conservancy, KDWP, and other federal and state agencies.

Other Fragmentation Issues

Conservation easements within the Flint Hills Tallgrass Legacy Conservation Area would 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 would be maintained. The conservation of large, unfragmented blocks of tallgrass prairie would 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 would be maintained through objective, voluntary management in this alternative.

Water and Soil Resources—Alternative A (No Action)

The prospect of residential development in the Flint Hills represents a potentially significant threat to the aquatic habitat. Sewage derived nutrient additions to streams could have detrimental effects on the aquatic ecology (Wernick et al. 1998). Housing developments can also result in water diversion, and introduction of invasive species. Development could also change drainage patterns or rate of surface runoff, increasing soil erosion and non-point source pollution.

As demand for potable water increases for new subdivisions, water rights could be questioned and challenged to a greater extent in the future. Groundwater aquifers would receive more demand, resulting in potential degradation to the hydrology of some wetland areas.

Conversion of grasslands to cropland has been documented to increase sedimentation and pesticide runoff into wetlands. Tillage increases the sediment load into wetlands when compared to grasslands (Gleason and Euliss 1998, Kantrud et al. 1989), primarily due to wind erosion (Natural Resources Conservation Service 1992).

Carbon Sequestration Effects

Although *J. virginiana* forests may provide strong regional carbon sinks, these sinks are vulnerable to significant losses through volatilization in fire, as well as losses through soil erosion caused by reduced herbaceous cover in these forests.

Water and Soil Resources—Alternative B (Proposed Action)

Water resources on 1,100,000 acres would be protected from increased non-point source pollution from residential subdivision, commercial development, increased erosion, and draining of wetlands, all of which are prohibited under the proposed easement program.

Compatible agricultural practices such as livestock grazing or haying would continue, while sodbusting would be prohibited. The landowner would 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 CO₂ concentrations (Williams et al. 2004). Therefore, conservation of the Flint Hills grasslands would not only ensure the storage of existing soil CO₂, but also provide a place for future sequestration if atmospheric CO₂ concentrations increase. Some studies have indicated under conditions of elevated levels of CO₂ carbon is stored in greater proportions below-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 above ground 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

This section describes the estimated effects of alternatives A and B on landownership, land use, intact ecosystems, oil and gas exploration and development, wind energy development, and public use.

Landownership and Land Use—Alternative A (No Action)

More than 90 percent of the Flint Hills prairie would remain in private ownership. Ranching opportunities could be reduced when landowners begin to split tracts into smaller lots for residential and commercial development. However, landowners that subdivide could increase their revenue by developing recreational home sites. With subdivision, tracts could potentially increase in value if there is desire to cluster housing or to keep open space for future housing developments.

Subdivision and development would reduce agri-tourism, hunting and wildlife observation opportunities, resulting in diminished economic benefits associated with these activities to local communities.

During the 1960s, demographers documented that, for the first time in American history, higher proportions of people were leaving cities for rural areas than were making the return trip (Fuguitt 1985). Residential development and subdivision tend to fragment wildlife habitat, and generally increase the costs to county governments that have to provide services to rural subdivisions.

The community would lose open space and the aesthetics of the tallgrass prairie, and the stunning scenic vistas would be diminished.

Landownership and Land Use—Alternative B (Proposed Action)

The easement program would enhance the 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 66 million American participating in wildlife viewing (www.outdoorindustry/foundation.org).

The proposed action would affect location and distribution, but not rate or density, of human population growth and of energy development. Ongoing, traditional agricultural uses such as livestock grazing would allow compatible ranching to continue. This alternative would 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 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 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 would provide “ecosystem services” that are often unrecognized, or considered “free” (e.g., pollination, water purification, nutrient cycling, carbon sequestration, soil conservation, control of pest insect populations by birds) that would not be provided in areas that have undergone residential or commercial development.

The easement program would 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.

Value of Intact Ecosystems—Alternative A (No Action)

Under the no action alternative, the threat of grassland fragmentation will continue unabated. Landowners may continue to face economic pressures to subdivide their ranches. Tree encroachment and urban fragmentation will compress the Flint Hills region, leaving fewer larger parcels of tallgrass prairie.

Value of Intact Ecosystems—Alternative B (Proposed Action)

Under the proposed action, Flint Hills grasslands would 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 grasslands of the Great Plains (Dodds et al. 2008). Overall, the native grasslands of the Great Plains produce \$1,189 billion/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 proposed action would help protect valuable ecosystem services as shown in figure 4. Furthermore, it would prevent the prohibitively high cost of restoration.

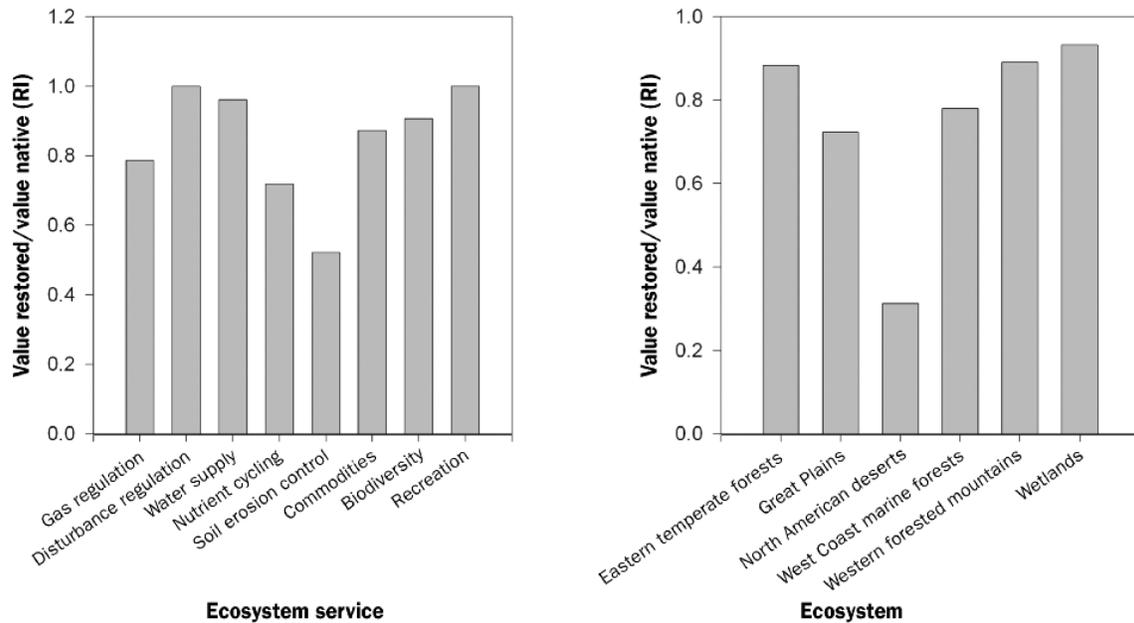


Figure 4. Relative native and restored benefits of ecosystem goods and services. (The relative value (RI) is determined as the ratio of values summed across rows or columns from tables 2 and 3.) (Source: Dodds et al. 2008)

Oil and Gas Exploration and Development—Alternative A (No Action)

Oil and gas development would continue to occur on private lands in the Flint Hills. Stipulations to protect the surface estate would be governed by existing state regulations.

Oil and Gas Exploration and Development—Alternative B (Proposed Action)

The proposed easement program would preclude oil and gas exploration or development, and wind energy development on private land. Typically, conservation easements do not affect subsurface estates (i.e., 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; 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 (i.e., oil and gas deposits), the U.S. Fish and Wildlife Service easement would 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 would require a developer to access minerals from off-site. Surface occupancy of the easement for mineral development would be prohibited.

Wind Energy Development—Alternative A (No Action)

The Flint Hills Conservation Area project would remain in private ownership, having no additional restrictions. Landowners could increase their revenue by allowing wind energy infrastructure to be developed on their land.

Those landowners and the surrounding communities, however, would lose open space and the aesthetics of the wide open vistas in the conservation area would diminish with the anticipated increase in commercial wind energy development. Development could reduce tourism, hunting and wildlife observation opportunities and diminish revenue associated with these activities to local communities.

Increased wind energy development would limit prescribed burn activities, allowing tree encroachment in the surrounding areas around these developments.

Wind Energy Development—Alternative B (Proposed Action)

The easement program would 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 the easements.

The proposed action would affect location and distribution, but not rate or density, of wind energy infrastructure development. Ongoing, traditional agricultural uses such as livestock grazing would allow compatible ranching to continue. This alternative would maintain open space on a large landscape scale, thereby preserving the rural lifestyle of the area.

The purchase of an easement would not result in a transfer of land title, and private landowners would continue to pay property taxes.

Public Use—Alternative A (No Action)

The Service would not purchase conservation easements, and landowners would manage public use.

Public Use—Alternative B (Proposed Action)

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

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

Unavoidable Adverse Impacts

Any adverse effects that may be unavoidable while carrying out alternatives A and B are described below.

Alternative A (No Action)

The adverse impacts of degradation and habitat fragmentation would be expected to be more widespread and prevalent in the project area.

Alternative B (Proposed Action)

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

Irreversible and Irretrievable Commitments of Resources

Any commitments of resources that may be irreversible or irretrievable as a result of carrying out alternatives A and B are described below.

Alternative A (No Action)

There would be no additional commitment of resources by the Service if no action is taken.

Alternative B (Proposed Action)

There would not be any irreversible or irretrievable commitments of resources associated with establishing 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) would exist.

Short-term Use versus Long-term Productivity

This section describes the short-term effects versus long-term production from the expected actions in alternatives A and B.

Alternative A (No Action)

Ranches may be sold to developers for short-term gains, which would have a negative impact on the long-term biological productivity of the area.

Over the long-term, the costs to counties to sustain development in rural areas could be significant (see the landownership and use section above). Wind energy and oil and gas development would provide short-term income gains, but would have a long-term adverse impact on the tallgrass ecosystem.

Alternative B (Proposed Action)

The proposed conservation easement program would 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 would gain the protection of tallgrass prairie species for future generations of Americans. The public would gain long-term opportunities for wildlife-dependent recreational activities.

Cumulative Impacts

This section describes the cumulative impacts that may result from the combination of expected actions in alternatives A or B, together with other biological and socioeconomic conditions, events, and developments.

Alternative A (No Action)

Current Service program work such as Partners for Fish and Wildlife would continue within the conservation project area. The Service would continue to work cooperatively with landowners to voluntarily improve habitat on private land.

Alternative B (Proposed Action)

Through the proposed easement program, approximately 1,100,000 acres of privately owned native tallgrass prairie habitats would be added to the 31,000 acres 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 of the Flint Hills tallgrass prairie.

Chapter 5—Coordination and Environmental Review

The Service coordinated within the agency, as well as with other federal agencies and local agencies, while developing this environmental assessment. The analysis and documentation was prepared by a combination of field and regional Service staff, along with partners (refer to appendix A). In addition, the coordination effort for contaminants and hazardous materials is described below.

The Service conducted this environmental analysis under the authority of the National Environmental Policy Act. The resulting document will be distributed to the project mailing list; copies can be requested.

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.

The Service is holding 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 21 counties included in the project area.

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

Non-governmental conservation groups are key 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.

Contaminants and Hazardous Materials

Fieldwork for the pre-acquisition contaminant surveys would be conducted, on a tract-by-tract basis, prior to the purchase of any land interest. Any suspected problems or contaminants requiring additional surveys would 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 environmental assessment 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 environmental assessment serves as the basis for determining whether implementation of the proposed action would constitute a major federal action significantly affecting the quality of the human environment.

The analysis for, and development of this environmental assessment, facilitated the involvement of government agencies and the public in the decision making process.

Strategic Habitat Conservation and Landscape Conservation Cooperatives

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

Strategic Habitat Conservation

The FHLCA will apply the strategic habitat conservation framework as outlined in the National Ecological Assessment Team (NEAT) 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 focused on improving the ability to apply conservation delivery actions which results in landscapes capable of supporting populations of 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.

The USFWS Region 6 Refuges Program has co-located Habitat and Population Evaluation Team Office of Conservation Science (HAPET) staff and equipment at Flint Hills NWR to provide support for the biological planning, conservation design, conservation delivery, and monitoring/research elements of SHC necessary to implement the FHLCA project. The preparation of the Flint Hills project environmental assessment addresses the four key elements of strategic habitat conservation: planning, design, delivery, and monitoring and research.

Biological Planning

Trust resources 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 keeping 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/reducing population limiting factors of greater prairie-chicken will also adequately address the limiting factors of priority grassland dependent federal trust species (e.g. dickcissel, grasshopper sparrow, Henslow's sparrow, upland sandpiper) throughout the Flint Hills ecoregion. Conceptual and/or quantitative models will be developed predicting greater prairie-chicken population response to landscape-level habitat conditions to aid in initial conservation design and delivery efforts. 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 Design

Service biologists identified and mapped the core area containing the highest quality, least fragmented tallgrass habitat within the Flint Hills of Kansas (see figure 2 in chapter 1). This remaining 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. This narrow north-south corridor reflects the shape of the remaining intact Flint Hills tallgrass. The identification of priority grasslands for inclusion in the project area was based on a conceptual model representing greater prairie-chicken response to landscape-level habitat conditions. Using a geographic information system (GIS) and existing data from the National Land Cover Database (NLCD) (2001) an 800 meter moving window analysis was applied to all grassland habitat within the Flint Hills ecoregion. 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 (GBCA) conceptual model which was found to be very effective at identifying priority areas for some grassland birds in the Prairie Pothole Region. Applying the GPC 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:

1. The greater prairie- chicken is an appropriate focal species for other FWS priority trust species in the Flint Hills ecoregion
2. 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 and/or declining (as measured by some population response metric such as probability of occurrence, density, survival,

recruitment, population persistence). 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.

3. The greater prairie- chicken responds to landscapes as quantified with an 800 meter radius
4. The greater prairie- chicken show the strongest response to landscapes with >95% grassland habitat
5. 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 (see Reynolds et al. 2001).

Conservation Delivery

Partners for Fish and Wildlife (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 the many partner organizations and agencies will be essential for the effective delivery of 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 the effectiveness and improve conservation delivery 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 delivery 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 FWS 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/or the effectiveness of management actions at minimizing/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 project (easement) lands and on non-easement properties. Similar modeling approaches may be developed or incorporated for priority non-trust species (e.g. greater prairie-chicken) in cooperation with partners such as NGOs 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 NGOs 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 (See Reynolds et al. 2001, Reynolds et al. 2006 and Niemuth et al. 2009).

Landscape Conservation Cooperatives

The Service will use landscape conservation cooperatives as a means of implementing strategic habitat conservation. Although not officially designated as part of a land conservation cooperative, the FHLCA meets many of the criteria: cooperation among private landowners, and other agencies (federal, state, local, non-governmental 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 The Nature Conservancy, but operated under agreement with Kansas State University. The FHLCA would receive further science support from the Geographic Information System 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, a treasured landscape.

The Secretary of the Interior recently outlined the importance of landscape conservation cooperatives as a response to climate change (U.S. Department of Interior 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 would link existing Flint Hills conservation easement areas held by The Nature Conservancy and the U.S. Department of Agriculture. The Council Grove Wildlife Area (KDWP) also manages land within the easement boundary.

The Eastern Tallgrass Prairie Geographic Area was not adopted as a region in the first year for implementing landscape conservation cooperatives. However, these cooperatives will continue to grow as a means of delivering strategic habitat conservation. The Service and U.S. Geological Survey (USGS) 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 being proposed for the Flint Hills Legacy Conservation Area.

Distribution and Availability

Copies of the environmental assessment 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
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530 West Maple Avenue
Hartford, Kansas 66854
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U.S. Fish and Wildlife Service
Region 6, Division of Refuge Planning
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P.O. Box 25486-DFC
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Appendix A—List of Preparers and Reviewers

| <i>Author's Name</i> | <i>Position</i> | <i>Work Unit</i> |
|----------------------|--|--|
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| David C. 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 | State coordinator | USFWS, PFW, Manhattan, KS |
| Mike Spratt | Former 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 |

Appendix B—List of Plants and Animals

Plants

| SCIENTIFIC NAME | COMMON NAME |
|--|------------------------------|
| Acanthaceae | Acanthus Family |
| <i>Dicliptera brachiata</i> | dicliptera |
| <i>Justicia americana</i> | water willow |
| <i>Ruellia humilis</i> | fringeleaf ruellia |
| <i>Ruellia strepens</i> | limestone ruellia |
| Aceraceae | Maple Family |
| <i>Acer negundo</i> | boxelder |
| <i>Acer saccharinum</i> | silver maple |
| <i>Acorus calamus</i> | calamus sweetflag |
| Adiantaceae | Fern Family |
| <i>Argyrochosma dealbata</i> | powdery cloak fern |
| <i>Cheilanthes lanosa</i> | hairy lip fern |
| <i>Pellaea atropurpurea</i> | purple cliff-brake |
| <i>Pellaea glabella</i> ssp. <i>glabella</i> | smooth cliffbrake |
| Agavaceae | Agave Family |
| <i>Yucca arkansana</i> | Arkansas soapweed |
| <i>Yucca filamentosa</i> | limp soapweed |
| <i>Yucca glauca</i> | small soapweed |
| Alismataceae | Water Plantain Family |
| <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</i> var. <i>graminea</i> | grassy arrowhead |
| <i>Sagittaria latifolia</i> | common arrowhead |
| <i>Sagittaria montevidensis</i> ssp. <i>calycina</i> | giant arrowhead |
| Amaranthaceae | Pigweed Family |
| <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 |
| <i>Amaranthus rudis</i> | water hemp |
| <i>Amaranthus tuberculatus</i> | tall water-hemp |
| <i>Froelichia gracilis</i> | slender snakecotton |
| <i>Iresine rhizomatosa</i> | bloodleaf |
| Anacardiaceae | Sumac Family |

| SCIENTIFIC NAME | COMMON NAME |
|---|-----------------------------|
| <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 |
| Annonaceae | Custard-apple Family |
| <i>Asimina triloba</i> | Pawpaw |
| Apiaceae | Parsley Family |
| <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 |
| Apocynaceae | Dogbane Family |
| <i>Apocynum cannabinum</i> | hemp dogbane |
| <i>Vinca major</i> | periwinkle |
| <i>Vinca minor</i> | common periwinkle |
| Araceae | Arum Family |
| <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 |
| Asclepiadaceae | Milkweed Family |
| <i>Asclepias amplexicaulis</i> | bluntleaf milkweed |
| <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> | butterfly 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 |

| SCIENTIFIC NAME | COMMON NAME |
|---|-------------------------------|
| Aspleniaceae | Fern Family |
| <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 |
| Asteraceae | Aster Family |
| <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 |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|---|--------------------------|
| <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 |
| <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</i> var. <i>occidentalis</i> | smooth oxeye |
| <i>Heliopsis helianthoides</i> var. <i>scabra</i> | smooth oxeye |
| <i>Heterotheca canescens</i> | goldenaster |
| <i>Heterotheca latifolia</i> | broad-leaf golden-aster |
| <i>Heterotheca stenophylla</i> var. <i>angustifolia</i> | narrow-leaf golden-aster |
| <i>Heterotheca subaxillaris</i> ssp. <i>latifolia</i> | camphorweed |
| <i>Hieracium gronovii</i> | Gronovius' hawkweed |
| <i>Hieracium longipilum</i> | longbeard hawkweed |
| <i>Hymenopappus scabiosaesus</i> var. <i>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</i> var. <i>hirsuta</i> | — |
| <i>Matricaria discoidea</i> | disc mayweed |
| <i>Microseris cuspidata</i> | prairie false dandelion |
| <i>Packera plattensis</i> | plains groundsel |
| <i>Packera pseud aurea</i> var. <i>semicordata</i> | false golden ragwort |
| <i>Parthenium integrifolium</i> var. <i>hispidum</i> | wild quinine |
| <i>Pluchea odorata</i> | purple marsh-fleabane |
| <i>Prenanthes aspera</i> | rough rattlesnakeroot |
| <i>Pseudognaphalium obtusifolium</i> | fragrant false-cudweed |

| SCIENTIFIC NAME | COMMON NAME |
|---|---------------------------------|
| <i>Pyrrohappus carolinianus</i> | Carolina false dandelion |
| <i>Pyrrohappus 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</i> var. <i>pulcherrima</i> | black-eyed Susan |
| <i>Rudbeckia laciniata</i> | cutleaf coneflower |
| <i>Rudbeckia triloba</i> | brown-eyed Susan |
| <i>Senecio plattensis</i> | plains groundsel |
| <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>Symphiotrichum divaricatum</i> | southern annual saltmarsh aster |
| <i>Symphiotrichum drummondii</i> | Drummond's aster |
| <i>Symphiotrichum ericoides</i> var. <i>ericoides</i> | white heath aster |
| <i>Symphiotrichum hesperium</i> | lance-leaf aster |
| <i>Symphiotrichum laeve</i> var. <i>laeve</i> | smooth aster |
| <i>Symphiotrichum lanceolatum</i> var. <i>lanceolatum</i> | lance-leaf aster |
| <i>Symphiotrichum novae-angliae</i> | New England aster |
| <i>Symphiotrichum oblongifolium</i> | aromatic aster |
| <i>Symphiotrichum oolentangiense</i> | azure aster |
| <i>Symphiotrichum parviceps</i> | Smallhead aster |
| <i>Symphiotrichum patens</i> var. <i>gracile</i> | spreading aster |
| <i>Symphiotrichum pilosum</i> | frost-weed aster |
| <i>Symphiotrichum praealtum</i> var. <i>praealtum</i> | willowleaf aster |
| <i>Symphiotrichum 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 megapotaamicum</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> | — |
| <i>Xanthium strumarium</i> | common cocklebur |

| SCIENTIFIC NAME | COMMON NAME |
|--|-------------------------------|
| Azollaceae | Water Fern Family |
| <i>Azolla mexicana</i> | Mexican mosquito fern |
| Balsaminaceae | Touch-me-not Family |
| <i>Impatiens capensis</i> | spotted touch-me-not |
| Berberidaceae | Barberry Family |
| <i>Berberis thunbergii</i> | Japanese barberry |
| <i>Podophyllum peltatum</i> | may-apple |
| Betulaceae | Birch Family |
| <i>Corylus americana</i> | American hazelnut |
| <i>Ostrya virginiana</i> | hop-hornbeam |
| Bignoniaceae | Trumpet-creeper Family |
| <i>Campsis radicans</i> | trumpet creeper |
| <i>Catalpa bignonioides</i> | common catalpa |
| <i>Catalpa speciosa</i> | catalpa |
| Boraginaceae | Borage Family |
| <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 |
| Brassicaceae | Mustard Family |
| <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 |
| <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> | — |

| SCIENTIFIC NAME | COMMON NAME |
|---|------------------------------------|
| <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 |
| Cactaceae | Cactus Family |
| <i>Coryphantha missouriensis</i> | Missouri foxtail cactus |
| <i>Opuntia macrorhiza</i> | bigroot prickly pear |
| Callitrichaceae | Water-starwort Family |
| <i>Callitriche heterophylla</i> | — |
| <i>Callitriche terrestris</i> | — |
| Campanulaceae | Bellflower Family |
| <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 |
| Cannabaceae | Hemp Family |
| <i>Cannabis sativa</i> | domestic hemp |
| <i>Humulus japonicus</i> | Japanese hops |
| <i>Humulus lupulus</i> var. <i>pubescens</i> | — |
| Capparaceae | Caper Family |
| <i>Polanisia dodecandra</i> ssp. <i>trachysperma</i> | — |
| Caprifoliaceae | Honeysuckle Family |
| <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 |
| Caryophyllaceae | Pink Family |
| <i>Arenaria serpyllifolia</i> | thyme-leaved sandwort |
| <i>Arenaria serpyllifolia</i> var. <i>serpyllifolia</i> | thyme-leaved sandwort |

| SCIENTIFIC NAME | COMMON NAME |
|--|-----------------------------|
| <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 |
| Celastraceae | Bittersweet Family |
| <i>Celastrus scandens</i> | American bittersweet |
| <i>Euonymus atropurpurea</i> | wahoo |
| <i>Euonymus fortunei</i> | Chinese wintercreeper |
| Ceratophyllaceae | Hornwort Family |
| <i>Ceratophyllum demersum</i> | common hornwort |
| <i>Ceratophyllum echinatum</i> | prickly hornwort |
| Chenopodiaceae | Goosefoot Family |
| <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 |
| <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> | — |
| Cistaceae | Rock-rose Family |
| <i>Helianthemum bicknellii</i> | Bicknell's frostweed |
| <i>Lechea tenuifolia</i> | narrowleaf pinweed |
| Clusiaceae | Mangosteen Family |
| <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 |
| Commelinaceae | Spiderwort Family |
| <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 tharpia</i> | Tharp's spiderwort |
| Convolvulaceae | Morning-glory Family |

| SCIENTIFIC NAME | COMMON NAME |
|---|----------------------------|
| <i>Calystegia macounii</i> | Macoun's bindweed |
| <i>Calystegia sepium</i> | — |
| <i>Calystegia silvatica</i> ssp. <i>fraterniflora</i> | — |
| <i>Convolvulus arvensis</i> | field bindweed |
| <i>Evolvulus nuttallianus</i> | Nuttall's evolvulus |
| <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 |
| Cornaceae | Dogwood Family |
| <i>Cornus amomum</i> ssp. <i>obliqua</i> | pale dogwood |
| <i>Cornus drummondii</i> | roughleaf dogwood |
| Crassulaceae | Stonecrop Family |
| <i>Crassula drummondii</i> | — |
| <i>Penthorum sedoides</i> | ditch stonecrop |
| Cucurbitaceae | Cucumber Family |
| <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 |
| Cupressaceae | Cypress Family |
| <i>Chamaecyparis lawsoniana</i> | — |
| <i>Juniperus virginiana</i> var. <i>virginiana</i> | eastern red-cedar |
| Cuscutaceae | Dodder Family |
| <i>Cuscuta coryli</i> | hazel dodder |
| <i>Cuscuta glomerata</i> | cluster dodder |
| <i>Cuscuta indecora</i> var. <i>indecora</i> | — |
| <i>Cuscuta pentagona</i> | — |
| Cyperaceae | Sedge Family |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|---|----------------------------------|
| <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 |
| <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 |
|---|-------------------------|
| Dipsacaceae | Teasel Family |
| <i>Dipsacus laciniatus</i> | cutleaf teasel |
| Dryopteridaceae | Wood Fern Family |
| <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> | — |
| Ebenaceae | Ebony Family |
| <i>Diospyros virginiana</i> | persimmon |
| Elatinaceae | Waterwort Family |
| <i>Bergia texana</i> | Texas bergia |
| Equisetaceae | Horsetail Family |
| <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 |
| Euphorbiaceae | Spurge Family |
| <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 |
| <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 |
| Fabaceae | Pea Family |
| <i>Acacia angustissima</i> var. <i>hirta</i> | — |

| SCIENTIFIC NAME | COMMON NAME |
|---|----------------------------|
| <i>Albizia julibrissin</i> | silk tree |
| <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 |
| <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</i> var. <i>unifoliolatus</i> | — |

| SCIENTIFIC NAME | COMMON NAME |
|--|----------------------------|
| <i>Medicago lupulina</i> | black medick |
| <i>Medicago minima</i> | prickly medick |
| <i>Medicago sativa</i> ssp. <i>sativa</i> | alfalfa |
| <i>Melilotus albus</i> | white sweet clover |
| <i>Melilotus officinalis</i> | yellow sweet clover |
| <i>Mimosa quadrivalvis</i> var. <i>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</i> ssp. <i>elegans</i> | — |
| <i>Trifolium pratense</i> | red clover |
| <i>Trifolium repens</i> | white clover |
| <i>Vicia americana</i> | American vetch |
| <i>Vicia villosa</i> ssp. <i>villosa</i> | hairy vetch |
| Fagaceae | Beech Family |
| <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> | — |
| Fumariaceae | Fumitory Family |
| <i>Corydalis crystallina</i> | mealy corydalis |
| <i>Corydalis micrantha</i> ssp. <i>micrantha</i> | — |
| <i>Dicentra cucullaria</i> | Dutchman's breeches |
| Gentianaceae | Gentian Family |
| <i>Gentiana puberulenta</i> | downy gentian |
| <i>Sabatia campestris</i> | prairie rose gentian |
| Geraniaceae | Geranium Family |
| <i>Erodium cicutarium</i> | filaree |
| <i>Geranium carolinianum</i> | Carolina cranesbill |
| <i>Geranium pusillum</i> | small cranesbill |
| Grossulariaceae | Currant Family |
| <i>Ribes aureum</i> var. <i>villosum</i> | — |
| <i>Ribes missouriense</i> | Missouri gooseberry |
| Haloragaceae | Watermilfoil Family |

| SCIENTIFIC NAME | COMMON NAME |
|--|------------------------------|
| <i>Myriophyllum heterophyllum</i> | water milfoil |
| <i>Myriophyllum pinnatum</i> | green parrot's feather |
| Hippocastanaceae | Horse Chestnut Family |
| <i>Aesculus glabra</i> var. <i>arguta</i> | Ohio buckeye |
| Hydrocharitaceae | Waterleaf Family |
| <i>Najas guadalupensis</i> | common naiad |
| <i>Najas guadalupensis</i> ssp. <i>guadalupensis</i> | common naiad |
| Hydrophyllaceae | Waterleaf Family |
| <i>Ellisia nyctelea</i> | waterpod |
| <i>Hydrophyllum virginianum</i> | Virginia waterleaf |
| Iridaceae | Iris Family |
| <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 |
| <i>Sisyrinchium angustifolium</i> | common blue-eyed grass |
| <i>Sisyrinchium campestre</i> | prairie blue-eyed grass |
| Isoetaceae | Quillwort Family |
| <i>Isoetes butleri</i> | Butler's quillwort |
| Juglandaceae | Walnut Family |
| <i>Carya cordiformis</i> | bitternut hickory |
| <i>Carya illinoensis</i> | pecan |
| <i>Carya ovata</i> | shagbark hickory |
| <i>Juglans nigra</i> | black walnut |
| Juncaceae | Rush Family |
| <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 |
| Lamiaceae | Mint Family |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|---------------------------------|-------------------------------|
| <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 |
| Lemnaceae | Duckweed Family |
| <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 |
| Lentibulariaceae | Bladderwort Family |
| <i>Utricularia macrorrhiza</i> | common bladderwort |
| Liliaceae | Lily Family |
| <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> | — |
| Linaceae | Flax Family |
| <i>Linum pratense</i> | Norton's flax |
| <i>Linum sulcatum</i> | grooved flax |
| Loasaceae | Loasa Family |
| <i>Mentzelia oligosperma</i> | stick-leaf chickenthief |
| Lythraceae | Loosestrife Family |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|--|----------------------------------|
| <i>Lythrum salicaria</i> | purple loosestrife |
| <i>Rotala ramosior</i> | rotala |
| Malvaceae | Mallow Family |
| <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 |
| Marsileaceae | Water Clover Family |
| <i>Marsilea vestita</i> | western water-clover |
| Menispermaceae | Moonseed Family |
| <i>Cocculus carolinus</i> | Carolina snailseed |
| <i>Menispermum canadense</i> | moonseed |
| Molluginaceae | Carpetweed Family |
| <i>Mollugo verticillata</i> | carpetweed |
| Moraceae | Mulberry Family |
| <i>Maclura pomifera</i> | Osage orange |
| <i>Morus alba</i> | white mulberry |
| <i>Morus rubra</i> | red mulberry |
| Nelumbonaceae | Lotus-lily Family |
| <i>Nelumbo lutea</i> | American lotus |
| Nyctaginaceae | Four-o'clock Family |
| <i>Mirabilis albida</i> | white four-o'clock |
| <i>Mirabilis linearis</i> | narrowleaf four-o'clock |
| <i>Mirabilis nyctaginea</i> | wild four-o'clock |
| Nymphaeaceae | Water-lily Family |
| <i>Nymphaea odorata</i> ssp. <i>odorata</i> | fragrant water-lily |
| Oleaceae | Olive Family |
| <i>Fraxinus americana</i> | white ash |
| <i>Fraxinus pennsylvanica</i> | green ash |
| <i>Fraxinus quadrangulata</i> | blue ash |
| <i>Syringa vulgaris</i> | common lilac |
| Onagraceae | Evening Primrose Family |
| <i>Calylophus serrulatus</i> | plains yellow evening-primrose |
| <i>Circaea lutetiana</i> ssp. <i>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 |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|--|--------------------------------|
| <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 |
| Ophioglossaceae | Fern Family |
| <i>Botrychium virginianum</i> | rattlesnake fern |
| <i>Ophioglossum engelmannii</i> | limestone adder's-tongue |
| Orchidaceae | Orchid Family |
| <i>Platanthera praeclara</i> —Threatened | 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 |
| Osmundaceae | Royal Fern Family |
| <i>Osmunda regalis</i> var. <i>spectabilis</i> | — |
| Oxalidaceae | Wood-sorrel Family |
| <i>Oxalis dillenii</i> | green wood sorrel |
| <i>Oxalis stricta</i> | yellow wood-sorrel |
| <i>Oxalis violacea</i> | violet wood sorrel |
| Papaveraceae | Poppy Family |
| <i>Argemone polyanthemus</i> | prickly poppy |
| <i>Papaver rhoeas</i> | field poppy |
| Phytolaccaceae | Pokeweed Family |
| <i>Phytolacca americana</i> var. <i>americana</i> | American pokeweed |
| Pinaceae | Pine Family |
| <i>Pinus nigra</i> | — |
| <i>Pinus ponderosa</i> | — |
| <i>Pinus sylvestris</i> | — |
| Plantaginaceae | Plantain Family |
| <i>Plantago aristata</i> | bottlebrush plantain |
| <i>Plantago elongata</i> ssp. <i>elongata</i> | slender plantain |
| <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 |
| Platanaceae | Sycamore Family |
| <i>Platanus occidentalis</i> | sycamore |
| Poaceae | Grass Family |
| <i>Aegilops cylindrica</i> | jointed goatgrass |
| <i>Aegilotriticum sancti-andreae</i> | — |
| <i>Agrostis elliottiana</i> | awned bentgrass |
| <i>Agrostis gigantea</i> | redtop |

| SCIENTIFIC NAME | COMMON NAME |
|---|--------------------------|
| <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 |
| <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</i> ssp. <i>scribnerianum</i> | Scribner's dichanthelium |
| <i>Dichanthelium ovale</i> ssp. <i>praecocius</i> | — |
| <i>Dichanthelium perlongum</i> | long-spike dichanthelium |
| <i>Dichanthelium sphaerocarpon</i> | roundseed dichanthelium |
| <i>Digitaria ciliaris</i> | southern crabgrass |
| <i>Digitaria cognata</i> ssp. <i>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 |

| SCIENTIFIC NAME | COMMON NAME |
|---|-------------------------|
| <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 |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|---|-----------------------|
| <i>Paspalum floridanum</i> var. <i>glabratum</i> | — |
| <i>Paspalum laeve</i> var. <i>circularae</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 |
| <i>Phleum pratense</i> ssp. <i>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>Schedonnardus 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</i> var. <i>obtusata</i> | wedgescale |
| <i>Sporobolus airoides</i> | alkali sacaton |
| <i>Sporobolus asper</i> var. <i>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</i> var. <i>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 |
| Polemoniaceae | Phlox Family |
| <i>Phlox divaricata</i> | wild blue phlox |
| <i>Phlox oklahomensis</i> | Oklahoma phlox |

| SCIENTIFIC NAME | COMMON NAME |
|--|--------------------------------|
| <i>Phlox pilosa</i> ssp. <i>pilosa</i> | downy phlox |
| Polygalaceae | Milkwort Family |
| <i>Polygala incarnata</i> | slender milkwort |
| <i>Polygala verticillata</i> | whorled milkwort |
| Polygonaceae | Buckwheat Family |
| <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 pennsylvanica</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 |
| Pontederiaceae | Pickerel-weed Family |
| <i>Eichhornia crassipes</i> | — |
| <i>Heteranthera limosa</i> | blue mud plantain |
| <i>Heteranthera multiflora</i> | — |
| <i>Heteranthera rotundifolia</i> | — |
| <i>Pontederia cordata</i> | common pickerelweed |
| Portulacaceae | Purslane Family |
| <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 |
| Potamogetonaceae | Pondweed Family |
| <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 |
| Primulaceae | Primrose Family |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|---|-------------------------|
| <i>Lysimachia nummularia</i> | moneywort |
| Ranunculaceae | Buttercup Family |
| <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 |
| Rhamnaceae | Buckthorn Family |
| <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> | — |
| Rosaceae | Rose Family |
| <i>Agrimonia parviflora</i> | many-flowered agrimony |
| <i>Agrimonia pubescens</i> | downy agrimony |
| <i>Amelanchier arborea</i> | tall service berry |
| <i>Amelanchier sanguinea</i> | — |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|--|-----------------------------|
| <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 |
| Rubiaceae | Madder Family |
| <i>Cephalanthus occidentalis</i> | buttonbush |
| <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 |
| Rutaceae | Rue Family |
| <i>Poncirus trifoliata</i> | — |
| <i>Ptelea trifoliata</i> | common hop tree |
| <i>Zanthoxylum americanum</i> | common prickly ash |
| Salicaceae | Willow Family |
| <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 |
| Santalaceae | Sandalwood Family |
| <i>Comandra umbellata</i> | umbellate bastard toad-flax |
| Sapindaceae | Soapberry Family |
| <i>Cardiospermum halicacabum</i> | common balloon vine |

| SCIENTIFIC NAME | COMMON NAME |
|--|-----------------------------------|
| <i>Sapindus saponaria</i> var. <i>drummondii</i> | southern soapberry |
| Sapotaceae | Sapodilla Family |
| <i>Bumelia lanuginosa</i> var. <i>oblongifolia</i> | gum bully |
| Saxifragaceae | Saxifrage Family |
| <i>Heuchera richardsonii</i> | Richardson's alumroot |
| Scrophulariaceae | Figwort Family |
| <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 |
| <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 |
| Selaginellaceae | Spike-moss Family |
| <i>Selaginella rupestris</i> | rock spike-moss |
| Simaroubaceae | Quassia Family |
| <i>Ailanthus altissima</i> | tree-of-heaven |
| Smilacaceae | Catbrier Family |
| <i>Smilax herbacea</i> | — |
| <i>Smilax hispida</i> | bristly greenbrier |
| <i>Smilax lasioneura</i> | — |
| <i>Smilax tamnoides</i> | — |
| Solanaceae | Nightshade Family |
| <i>Datura stramonium</i> | jimsonweed |
| <i>Lycium barbarum</i> | matrimony vine |
| <i>Physalis angulata</i> var. <i>pendula</i> | cut-leaf ground-cherry |

| SCIENTIFIC NAME | COMMON NAME |
|--|---------------------------|
| <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> | — |
| <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 |
| Sparganiaceae | Bur-reed Family |
| <i>Sparganium eurycarpum</i> | giant bur-reed |
| Staphyleaceae | Bladder-nut Family |
| <i>Staphylea trifolia</i> | American bladdernut |
| Tamaricaceae | Tamarix Family |
| <i>Tamarix parviflora</i> | small-flowered tamarisk |
| <i>Tamarix ramosissima</i> | salt cedar |
| Taxodiaceae | Taxodium Family |
| <i>Taxodium distichum</i> var. <i>distichum</i> | bald cypress |
| Thelypteridaceae | Marsh Fern Family |
| <i>Thelypteris palustris</i> var. <i>pubescens</i> | — |
| Tiliaceae | Linden Family |
| <i>Tilia americana</i> | American basswood |
| Typhaceae | Cattail Family |
| <i>Typha angustifolia</i> | narrow-leaved cattail |
| <i>Typha domingensis</i> | southern cattail |
| <i>Typha latifolia</i> | common cattail |
| Ulmaceae | Elm Family |
| <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 |
| Urticaceae | Nettle Family |
| <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 |
| Valerianaceae | Valerian Family |
| <i>Valerianella radiata</i> | corn salad |
| Verbenaceae | Verbena Family |
| <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 moechina</i> | pasture vervain |
| <i>Vitex agnus-castus</i> | — |
| Violaceae | Violet Family |
| <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> | — |
| Vitaceae | Grape Family |
| <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 |
| Zannichelliaceae | Horned Pondweed Family |
| <i>Zannichellia palustris</i> | horned pondweed |
| Zygophyllaceae | Creosotebush Family |
| <i>Tribulus terrestris</i> | puncture vine |

Animals

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

| SCIENTIFIC NAME | COMMON NAME |
|----------------------------------|-------------------------------|
| <i>Obliquaria reflexa</i> | Threehorn wartyback |
| <i>Pyganodon grandis</i> | Floater |
| <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 parvus</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 |
| Amphibians and Reptiles | |
| <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 sphenocephala</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 |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|---|-------------------------|
| <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 |
| Fish | |
| <i>Scaphirhynchus albus</i> —Endangered | Pallid sturgeon |
| <i>Scaphirhynchus platyrhynchus</i> | Shovelnose Sturgeon |
| <i>Lepisosteus osseus</i> | Longnose Gar |
| <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 buchmanii</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 |

| SCIENTIFIC NAME | COMMON NAME |
|-------------------------------------|------------------------|
| <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> | Bluntnose 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>Carpionodes carpio</i> | River Carpsucker |
| <i>Carpionodes cyprinus</i> | Quillback |
| <i>Catostomus commersoni</i> | White Sucker |
| <i>Cycleptus elongatus</i> | Blue Sucker |
| <i>Ictiobus bubalus</i> | Smallmouth Buffalo |
| <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> —Threatened | 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 |

| SCIENTIFIC NAME | COMMON NAME |
|------------------------------------|-----------------------------|
| <i>Etheostoma flabellare</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 |
| Birds | |
| Grebes | |
| <i>Podilymbus podiceps</i> | Pied-billed Grebe |
| <i>Podiceps auritus</i> | Horned Grebe |
| <i>Podiceps nigricollis</i> | Eared Grebe |
| Pelicans | |
| <i>Pelecanus erythrorhynchos</i> | American White Pelican |
| Cormorants | |
| <i>Phalacrocorax auritus</i> | Double-crested Cormorant |
| Bitterns, Herons and Egrets | |
| <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 |
| <i>Butorides virescens</i> | Green Heron |
| <i>Nycticorax nycticorax</i> | Black-crowned Night-heron |
| <i>Nyctanassa violacea</i> | Yellow-crowned Night-heron |
| Ibises and Spoonbills | |
| <i>Plegadis chihi</i> | White-faced ibis |
| New World Vultures | |
| <i>Coragyps atratus</i> | Black Vulture |
| <i>Cathartes aura</i> | Turkey Vulture |
| Swans, Geese and Ducks | |
| <i>Gavia immer</i> | Common Loon |
| <i>Anser albifrons</i> | Greater White-fronted Goose |
| <i>Chen caerulescens</i> | Snow Goose |
| <i>Chen rossii</i> | Ross' Goose |
| <i>Branta bernicla</i> | Brant |
| <i>Branta canadensis</i> | Canada Goose |
| <i>Aix sponsa</i> | Wood Duck |
| <i>Anas crecca</i> | Green-winged Teal |
| <i>Anas rubripes</i> | American Black Duck |
| <i>Anas platyrhynchos</i> | Mallard |
| <i>Anas acuta</i> | Northern Pintail |
| <i>Anas discors</i> | Blue-winged Teal |
| <i>Anas clypeata</i> | Northern Shoveler |

| SCIENTIFIC NAME | COMMON NAME |
|---------------------------------------|-------------------------|
| <i>Anas strepera</i> | Gadwall |
| <i>Anas americana</i> | American Wigeon |
| <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 clangula</i> | Common Goldeneye |
| <i>Bucephala albeola</i> | Bufflehead |
| <i>Lophodytes cucullatus</i> | Hooded Merganser |
| <i>Mergus merganser</i> | Common Merganser |
| <i>Oxyura jamaicensis</i> | Ruddy Duck |
| Osprey, Hawks, and Eagles | |
| <i>Pandion haliaetus</i> | Osprey |
| <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 |
| Falcons | |
| <i>Falco sparverius</i> | American Kestrel |
| <i>Falco columbarius</i> | Merlin |
| <i>Falco peregrinus</i> | Peregrine Falcon |
| <i>Falco mexicanus</i> | Prairie Falcon |
| Gallinaceous Birds | |
| <i>Phasianus colchicus</i> | Ring-necked Pheasant |
| <i>Tympanuchus cupido</i> | Greater Prairie-chicken |
| <i>Meleagris gallopavo</i> | Wild Turkey |
| <i>Colinus virginianus</i> | Northern Bobwhite |
| Rails | |
| <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 |
| Cranes | |
| <i>Grus Americana</i> —Endangered | Whooping crane |
| Plovers | |
| <i>Pluvialis squatarola</i> | Black-bellied Plover |
| <i>Pluvialis dominica</i> | American Golden-plover |
| <i>Charadrius melodus</i> —Threatened | Piping plover |
| <i>Charadrius alexandrinus</i> | Snowy Plover |
| <i>Charadrius semipalmatus</i> | Semipalmated Plover |
| <i>Charadrius vociferus</i> | Killdeer |

| SCIENTIFIC NAME | COMMON NAME |
|--|----------------------------------|
| | Stilts and Avocets |
| <i>Himantopus mexicanus</i> | Black-necked Stilt |
| <i>Recurvirostra americana</i> | American Avocet |
| | Sandpipers and Phalaropes |
| <i>Tringa melanoleuca</i> | Greater Yellowlegs |
| <i>Tringa flavipes</i> | Lesser Yellowlegs |
| <i>Tringa solitaria</i> | Solitary Sandpiper |
| <i>Catoptrophorus semipalmatus</i> | Willet |
| <i>Actitis macularia</i> | Spotted Sandpiper |
| <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 delicata</i> | Common Snipe |
| <i>Scolopax minor</i> | American Woodcock |
| <i>Phalaropus tricolor</i> | Wilson's Phalarope |
| <i>Phalaropus lobatus</i> | Red-necked Phalarope |
| | Gulls and Terns |
| <i>Larus atricilla</i> | Laughing Gull |
| <i>Larus pipixcan</i> | Franklin's Gull |
| <i>Larus philadelphia</i> | Bonaparte's Gull |
| <i>Larus delawarensis</i> | Ring-billed Gull |
| <i>Larus argentatus</i> | Herring Gull |
| <i>Larus hyperboreus</i> | Glaucous Gull |
| <i>Xema sabini</i> | Sabine's Gull |
| <i>Sterna caspia</i> | Caspian Tern |
| <i>Sterna forsteri</i> | Forster's Tern |
| <i>Sterna antillarum anthalassos</i> —Endangered | Interior least tern |
| <i>Chlidonias niger</i> | Black Tern |
| | Doves |
| <i>Zenaida macroura</i> | Mourning dove |
| | Cuckoos |
| <i>Coccyzus erythrophthalmus</i> | Black-billed Cuckoo |
| <i>Coccyzus americanus</i> | Yellow-billed Cuckoo |
| | Barn Owls |
| <i>Tyto alba</i> | Barn Owl |
| | Typical Owls |
| <i>Otus asio</i> | Eastern Screech-owl |
| <i>Bubo virginianus</i> | Great Horned Owl |

| SCIENTIFIC NAME | COMMON NAME |
|-----------------------------------|-------------------------------|
| <i>Nyctea scandiaca</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 |
| Nightjars | |
| <i>Chordeiles minor</i> | Common Nighthawk |
| <i>Phalaenoptilus nuttallii</i> | Common Poorwill |
| <i>Chaetura pelagica</i> | Chimney Swift |
| Hummingbirds | |
| <i>Archilochus colubris</i> | Ruby-throated Hummingbird |
| Kingfishers | |
| <i>Ceryle alcyon</i> | Belted Kingfisher |
| Woodpeckers | |
| <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 |
| Tyrant Flycatchers | |
| <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 |
| <i>Sayornis phoebe</i> | Eastern Phoebe |
| <i>Myiarchus crinitus</i> | Great Crested Flycatcher |
| <i>Tyrannus forficatus</i> | Scissor-tailed Flycatcher |
| Shrikes and Vireos | |
| <i>Lanius ludovicianus</i> | Loggerhead Shrike |
| <i>Vireo griseus</i> | Blue-headed vireo |
| <i>Vireo bellii</i> | White-eyed Vireo |
| <i>Vireo solitarius</i> | Bell's Vireo |
| <i>Vireo flavifrons</i> | Blue-headed Vireo |
| <i>Vireo gilvus</i> | Yellow-throated Vireo |
| <i>Vireo philadelphicus</i> | Warbling Vireo |
| <i>Vireo olivaceus</i> | Philadelphia Vireo |
| <i>Vermivora pinus</i> | Red-eyed Vireo |
| Crows, Jays, and Magpies | |
| <i>Cyanocitta cristata</i> | Blue Jay |
| <i>Gymnorhinus cyanocephalus</i> | Pinyon Jay |
| <i>Pica hudsonia</i> | Black-billed Magpie |
| Larks | |
| <i>Eremophila alpestris</i> | Horned Lark |
| Swallows | |
| <i>Progne subis</i> | Purple Martin |
| <i>Stelgidopteryx serripennis</i> | Northern Rough-winged Swallow |
| <i>Riparia riparia</i> | Bank Swallow |
| Chickadees | |
| <i>Poecile carolinensis</i> | Carolina Chickadee |
| <i>Baeolophus bicolor</i> | Tufted Titmouse |

| SCIENTIFIC NAME | COMMON NAME |
|--------------------------------|------------------------------|
| | Nuthatches |
| <i>Sitta canadensis</i> | Red-breasted Nuthatch |
| <i>Certhia americana</i> | Brown Creeper |
| | Wrens |
| <i>Troglodytes aedon</i> | House Wren |
| <i>Troglodytes troglodytes</i> | Winter Wren |
| | Dippers |
| <i>Cinclus mexicanus</i> | American dipper |
| | Kinglets |
| <i>Regulus satrapa</i> | Golden-crowned Kinglet |
| <i>Regulus calendula</i> | Ruby-crowned Kinglet |
| | Gnatcatchers |
| <i>Poliophtila caerulea</i> | Blue-gray Gnatcatcher |
| | Thrushes |
| <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 |
| | Starlings |
| <i>Sturnus vulgaris</i> | European Starling |
| | Pipits |
| <i>Anthus rubescens</i> | American Pipit |
| <i>Anthus spragueii</i> | Sprague's Pipit |
| | Waxwings |
| <i>Bombycilla garrulus</i> | Bohemian Waxwing |
| <i>Bombycilla cedrorum</i> | Cedar Waxwing |
| | Wood Warblers |
| <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 vermivorus</i> | Worm-eating Warbler |
| <i>Seiurus aurocapillus</i> | Ovenbird |

| SCIENTIFIC NAME | COMMON NAME |
|---------------------------------------|----------------------------|
| <i>Seiurus noveboracensis</i> | Northern Waterthrush |
| <i>Seiurus motacilla</i> | Louisiana Waterthrush |
| <i>Oporornis formosus</i> | Kentucky Warbler |
| <i>Oporornis philadelphia</i> | Mourning Warbler |
| <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 |
| Tanagers, Cardinals and Allies | |
| <i>Piranga rubra</i> | Summer Tanager |
| <i>Piranga olivacea</i> | Scarlet Tanager |
| <i>Cardinalis cardinalis</i> | Northern Cardinal |
| Grosbeaks and Allies | |
| <i>Pheucticus ludovicianus</i> | Rose-breasted Grosbeak |
| <i>Guiraca caerulea</i> | Blue Grosbeak |
| <i>Passerina cyanea</i> | Indigo Bunting |
| <i>Passerina ciris</i> | Painted Bunting |
| <i>Spiza americana</i> | Dickcissel |
| Sparrows and Towhees | |
| <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 bairdii</i> | Baird's Sparrow |
| <i>Ammodramus savannarum</i> | Grasshopper 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 leucophrys</i> | White-crowned Sparrow |
| <i>Zonotrichia querula</i> | Harris' 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 |
| Blackbirds and Orioles | |
| <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 |
| <i>Euphagus carolinus</i> | Rusty Blackbird |
| <i>Euphagus cyanocephalus</i> | Brewer's Blackbird |
| <i>Quiscalus mexicanus</i> | Great-tailed Grackle |

| SCIENTIFIC NAME | COMMON NAME |
|-----------------------------|----------------------|
| <i>Quiscalus quiscula</i> | Common Grackle |
| <i>Molothrus ater</i> | Brown-headed Cowbird |
| <i>Icterus spurius</i> | Orchard Oriole |
| <i>Icterus galbula</i> | Baltimore Oriole |
| Finches | |
| <i>Carpodacus purpureus</i> | Purple Finch |
| <i>Loxia curvirostra</i> | Red Crossbill |
| <i>Carduelis flammea</i> | Common Redpoll |
| <i>Carduelis pinus</i> | Pine Siskin |
| <i>Carduelis tristis</i> | American Goldfinch |
| Old World Sparrows | |
| <i>Passer domesticus</i> | House Sparrow |

Mammals

| | |
|--------------------------------------|--------------------------------|
| <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 |
| <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 |

| SCIENTIFIC NAME | COMMON NAME |
|---------------------------------|-----------------------|
| <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 |

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Draft Land Protection Plan

Flint Hills Legacy Conservation Area

April 2010

Prepared by

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Draft Land Protection Plan

This Land Protection Plan provides a general description of the operations and management of the proposed Flint Hills Legacy Conservation Area (FHLCA), as outlined in the Preferred Alternative of the Flint Hills Legacy Conservation Area Environmental Assessment. The U.S. Fish and Wildlife Service developed this Land Protection Plan 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 proposed easement program. The purpose of the Land Protection Plan is to present a broad overview of the Service's proposed management approach to wildlife and associated habitats, public uses, interagency coordination, public outreach and other operational needs.



Black Sampson prairie vista

USFWS

Introduction and Project Description

The Flint Hills Legacy Conservation Area (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, (EPA Omernick). This remaining, high quality, ecologically functioning tallgrass is as narrow as 20 miles wide (see figure 1). The project boundary takes this narrow shape, 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 90 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.

The total area within the proposed project boundary of 3.3 million acres is roughly three times the size of

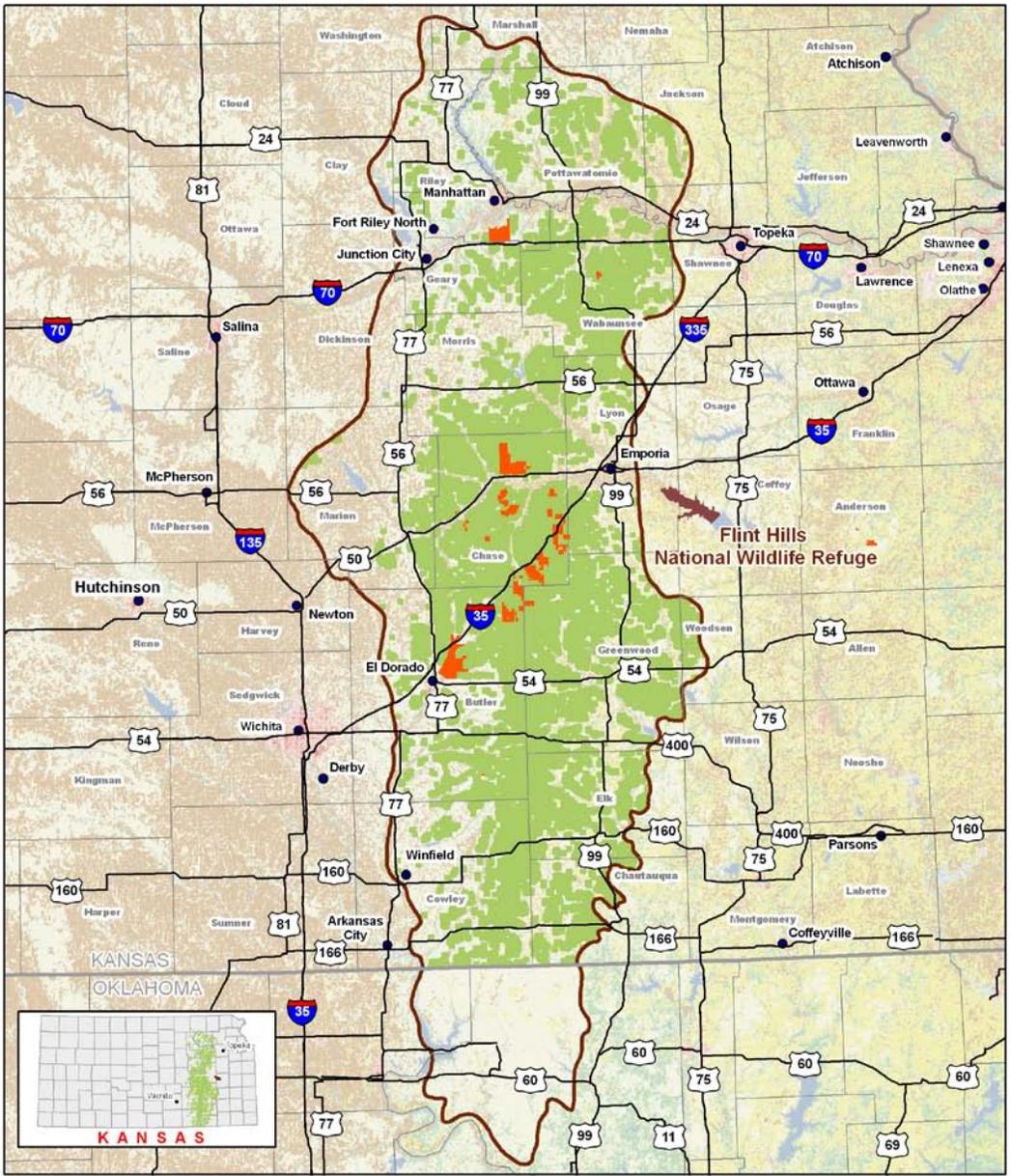
2 Draft Land Protection Plan—Flint Hills Legacy Conservation Area

the long-term project goal of conserving 1.1 million acres within the project area.

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 project area.

The Service intends to purchase or receive donated conservation easements on approximately 1,100,000 acres of private land from willing landowners within the approved project boundary. 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 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 at a landscape-scale 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, and 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 effect of climate change



PRODUCED IN THE DIVISION OF REFUGE PLANNING
DENVER, COLORADO
MAP DATE: 04/06/10
BASEMAP: N/A
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Figure 1. Flint Hills Legacy Conservation Area project boundary

Threats to and Status of the Resources

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 in part to a declining fire culture within the agricultural communities of the region. The inner core of this region is to date relatively intact, 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 proposed 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 would 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 non-native fishes into aquatic ecosystems.

Proposed Action

The Service intends to purchase or receive donated perpetual conservation easements on up to approximately 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 U.S. 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 to provide the necessary level of protection for the resources.

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

The easement program would be managed by staff located at the Flint Hills National Wildlife Refuge near Hartford, Kansas. The Service staff would be responsible for monitoring and administration of all easements on private land. Monitoring would 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 would be used at the time the easements are established as part of documentation of baseline conditions.

Protection Alternatives

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. Various alternatives for protecting this area include no action, acquisition or management by others, or conservation easement acquisition by the Service.

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.

Conservation Easements (Proposed Action)

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 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 ensuring 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 project area, including state or federal fee-title ownership, and conservation-oriented non-governmental organization ownership (Tallgrass Legacy Alliance, The Ranchland Trust of Kansas, Kansas Land Trust, U.S. Department of Agriculture, Kansas Department of Agriculture, The Kansas Department of Wildlife and Parks, and The Nature Conservancy). 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 (see figure 1 above). 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 the 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) (2001) for grasslands was evaluated. All areas consisting of > 95% grassland were selected as potential

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priority areas. The selection of a 95% grassland threshold is similar to that used for development of a Grassland Bird Conservation Area (GBCA) conceptual model which was found to be very effective at identifying priority areas for grassland birds in the Prairie Pothole Region.

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 2 priority zones which will be used to focus the acquisition of conservation easements on private lands which will provide the greatest benefit to grassland dependent wildlife (see figure 2 below).

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 protection of a mosaic of 10,000-acre parcels separated by a maximum distance of 20 miles to prevent genetic isolation. The Hamerstrom plan (Hamerstrom, Mattson and Hamerstrom 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.

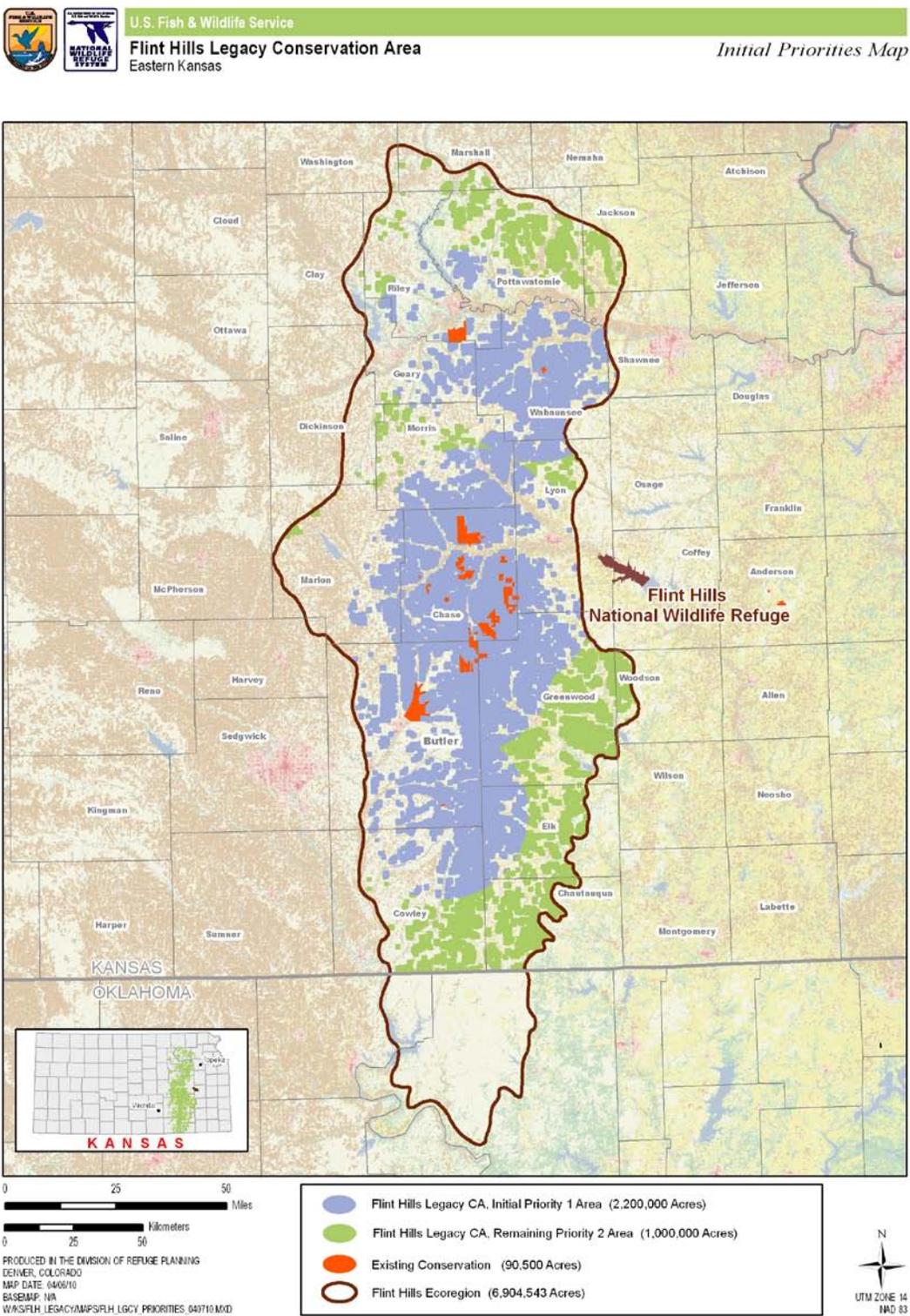


Figure 2. Flint Hills Legacy Conservation Area project priority areas

| Description | Total Area (acres) | Total Protected “Core” Lands ¹ | Priorities for Easements Private: Non-Protected |
|----------------------|--------------------|---|---|
| Priority 1 Zone | 2,200,000 | 90,500 | 880,000 |
| Priority 2 Zone | 1,000,000 | 0 | 220,000 |
| Total (acres) | 3,300,000 | 90,500 | 1,100,000 |

Table 1. Summarization of priority lands.

Acquisition Alternatives

The Service proposes to acquire conservation easements principally by using funds appropriated under the Land and Water Conservation Act (LWCF), 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.

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

Coordination

The proposed 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 Environmental Assessment addresses the protection of native habitats, primarily through acquisition of conservation easements, by the Service to be managed as part of the National Wildlife Refuge System.

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, 90 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 are to be held on April 21-23, 2010 in El Dorado, Cottonwood Falls and Alma, Kansas, following publication of the Environmental Assessment and this Land Protection Plan for the proposed FHLCA project.

Socio-cultural Considerations

Although the Flint Hills region is not totally dependent on the cattle industry now, many towns still rely on the economics of the cattle industry. The grasslands provide summer grazing grounds for cattle that are sent to the numerous feed lots and processing facilities, in other portions of Kansas, supporting a state-wide cattle industry. 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 Agricultural Statistics).

Wildlife-related recreational activities are also a source of income in Kansas. The 2006 National Survey

of Fishing, Hunting, and Wildlife-Associated Recreation found that \$558 million was 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).

Generally ownerships are relatively large in size, ranging in size from 160 to 30,000 acre blocks that help maintain an intact landscape. The human population is sparse and towns are widely scattered in the project area.

Historically, concerns have been expressed by residents and county governments about the amount of taxes paid to the counties when land protection programs such as this occur. Because this project is a conservation easement program, the land enrolled does not change hands; therefore taxes paid to the counties by the landowner are not affected. Over the short-term, money paid by the Service for the conservation easement becomes another source of income for the landowner, and logically, a portion of those dollars likely will be spent locally in the region. In addition, development of rural landscapes often leads to increased demand for services and higher costs to rural counties; these costs likely would not be incurred if the rural landscape remains intact. Proximity of protected lands also tends to enhance the property value of adjoining lands.

The ranchers' livelihoods depend on natural resources (grass, water and open space) and the key to protecting the FHLCA lies primarily in sustaining the current pattern of ranching and low density use. The easement program is not expected to cause any significant changes to the socio-cultural climate in the Flint Hills, but rather, will help sustain the current condition. Unlike many other areas in the country, the key to protecting the tallgrass prairie lies primarily in sustaining the current land use of livestock ranching and the use of prescribed fire.

Summary of Proposed Action

The Service intends to 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 (LWCF).

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